

B. Arrindell

Dangers of Vertical oil gas Wells - the 2010 Reports - part 2 of 3

Continuing the comment begun in Part 1, This part has 4 of the 8 Reports submitted by Damascus Citizens for Sustainability and Delaware RiverKeeper Network attached. They are important information and give reasons to stress that NO gas or oil drilling should be allowed in the Delaware Basin. The proposed prohibition of high volume hydraulic fracturing is good and should be adopted, but additionally all - even low volume and/or vertical wells should also be prohibited.

Adams

Bishop - report and PA record of gas industry violations, plus 6 spread-sheets of violations found here: <https://www.dropbox.com/sh/omn9f4qthlaow5f/AAAWyeuIWKgn6qRgmz9Dv5lMa?dl=0>

Demicco

Miller

**Risks Associated with Permitting Exploration Wells
in the Delaware River Basin
to**

**Delaware Riverkeeper Network
and Damascus Citizens for Sustainability**

By

**Glenn C. Miller, Ph.D.
Consulting Environmental Chemist**

November 12, 2010

The following comments are a response to a request for a determination of the risk of chemical contamination from exploration gas wells. In my professional opinion, the chemicals introduced into the environment during exploratory well construction, along with the naturally occurring substances that may be introduced to the surface system via drilling, pose a significant threat to ground and surface waters in the Delaware River Basin. Additionally, the Delaware River Basin Commission's lack of oversight with respect to siting of these wells increases the risk of harm from these wells, an issue that will be further exacerbated should they allowed to be converted to production wells.

1. The 11 wells listed by the Delaware River Basin Commission (DRBC) are not truly exploration wells, since they are not planned to be plugged and capped at the end of the exploratory period. While others have examined this issue in more detail (see S. Harvey's report), it is reasonably clear that these wells are intended to be used for production, should they tap into a sufficient gas reservoir. However, it is apparent that these wells have not undergone the same level of detailed scrutiny that a normal production well would undergo. Normal siting criteria for an exploratory well would include, at a minimum, the following:

- a. Potential for groundwater contamination from leakage or chemical additive release;
- b. Potential for surface water contamination from migration of gases or drilling additives from the exploration well;
- c. Potential for release of odors that could affect nearby residents;
- d. Potential for impacts on a variety of organisms that may suffer adverse effects from activities associated with the exploration wells; and
- e. Impacts on sensitive ecological areas from activities and releases from drilling the wells.

Siting characteristics are critical component of protecting human health and the environment from gas wells, and allowing "exploration" well construction

without the rigorous hard look for the potential for water and air contamination is creating an unnecessary increase in risk.

2. Additives and the quantities of those additives used in drilling of the wells are not specifically indicated, but should be, in order to assess the risk of these wells. Following review of Material Safety Data Sheet (MSDS) data from several of the PaDEP permits for the 11 well sites grandfathered under the Supplemental Executive Director Determination, it is clear that a variety of chemical additives and cement products are used during the exploratory well construction (Exhibit 1). The amount of each of these substances is not reported and certain of these compounds present an uncertain risk. Some of the chemicals of concern include the following:

- a. Halad 344 Cement additive: This appears to be a modified acrylamide copolymer. No indication is present as to the amount of monomer present in the polymer. The monomer is more chemically active (or "available") to interact with other chemicals and organisms (including aquatic animals and people) and very often provides the primary risk for use of polymers. This is a particular concern due to the carcinogenicity of acrylamide. Also not indicated is how the polymer will be used, or the amount of polymer used.
- b. Ethylene glycol monobutyl ether (EGBE) and diethylene glycol monobutyl ether. These are fairly low toxicity to humans, but can still contribute to water quality degradation, simply by adding in organic carbon that will be a source of microbial reactions. EGBE (also known as 2-butoxyethanol) has been identified as a carcinogen in animals for formation of adrenal tumors, but not in humans. Exposure to EGBE can cause irritation of mucous membranes and other respiratory problems including pulmonary edema and coma at high doses. It is used in more limited quantities
- c. HR-601: Modified lignosulfates. These materials are not well chemically characterized and can add also add organic carbon that can adversely affect water quality.
- d. Cellulose derivative: No information is provided on what type of derivative is used. This material is presumably a modification of cellulose (which is not a risk, when unmodified) but no information is presented on what that modification is.
- e. Diesel and motor oil: Both of these materials, when used in wells, can release organics including benzene, toluene, ethylbenzene and xylene to surface and ground waters. Benzene presents the largest cancer risk, in that it is known human carcinogen. The other compounds, although less toxic, are general indicators of fuel contamination, are flammable, and, at high concentrations are central nervous system depressants (Klaassen, et. al., 1996)
- h. Quaternary ammonium compounds: Essentially no information is provided as to which compounds are being used. The toxicity will vary

with the type of compound. All the structural information that is provided with the term “quaternary ammonium compounds” is that the molecule contains a nitrogen bonded to four carbon atoms, but does not provide information sufficient to even speculate on the risks of this class of compounds.

- i. Duratone HT: This additive contains nonylphenol, a compound which is biologically long-lived, slightly bioaccumulative, and is a toxic substance and an endocrine disruptor in aquatic organisms (US EPA, 2010).
3. Gaseous odors from the well sites have been demonstrated, and have the clear potential for release of unknown chemical and unhealthful exposure to chemicals from the wells. Drilling of the Woodland Management Gas Drilling Site near Damascus in September, 2010 (Exhibit 2, statement by Greg Swartz and Tannis Kowalchuk) released a “sulfuric chemical odor.” While the source of this odor was unclear, it may have come from the well, the water stored in the pond, or during emptying of the pond. While a limited set of water samples was analyzed, the source of the odor remains unclear. What is concerning is that there was no serious attempt to determine the source of the odor, or the chemical characterization of the odor. If it was from the well, it could represent a serious source of hydrogen sulfide; if it was from biological reduction of sulfate, it would have required carbon sources to reduce sulfate to sulfide. Yet the analysis of the water (WMP-Tophole), did not show hydrocarbons normally present in gas releases from gas wells (e.g. toluene, xylene, ethyl benzene, etc.). It did, however have a high biological oxygen demand (BOD) of 432 mg/L. The source of this biological reduction equivalent was, however, not clear. Whether it was chemical additives used during drilling or organic chemicals from the produced water was unclear. While the source of the water was not described, the water had characteristics that may have indicated that it was produced water, including elevated salinity as well as elevated barium, strontium and iron. The lack of concern of the regulatory agency was noted in a comment regarding hydrogen sulfide that said that “H₂S is primarily an eye irritant”, while in fact, hydrogen sulfide is highly toxic, and has a toxic LC₅₀ value of 444-585 ppm [ATSDR, 2008]. Gases can come from several sources at these wells, and often contain a variety of odorous materials, including hydrogen sulfide, other sulfides, and a variety of malodorous organic compounds. While odors in a completely cased and sealed well may be minimal, these very volatile compounds often find ways to be emitted to the surface air, most commonly from either inadequately sealed wells, or from transport pathways created from the formation during the well construction. These odors can have a serious impact on the quality of life of surrounding residents, since odors are unpredictable and, in my experience with odors, very difficult to regulate.
4. **Exploration gas wells have not gone through the siting analysis that would have been conducted for production wells.** This involves consideration of the receptors, including surface and groundwater, as well as nearby residents, schools and work places that may be affected by proximity to the wells. Natural

gas is not simply methane, and contains a variety of hydrocarbons and contaminants that may present risks to persons and other organisms exposed to these chemicals. These include benzene and a variety of organic small molecules (toluene, xylenes and other alkyl aromatics, alkanes). These will move more slowly in soil and groundwater systems but ultimately can migrate to surface water systems. Benzene in particular is a known carcinogen, and transport to groundwater systems is a serious problem.

Transport mechanisms will vary with the specific conditions of the gas well. Spills can occur at the site, or from the near surface casing that experiences a failure. Contaminating chemicals, including produced water, or additives used in the drilling process, and these chemicals can then be introduced directly into the near-surface aquifers, or in surface water from runoff. Gas pressure that is released during drilling can push natural gas to the surface when a migration pathway is created. This is likely to also carry a variety of volatile hydrocarbon constituents that exist in the formation. Finally, blowouts, although infrequent, can result in uncontrolled release of contaminated water that will result in degradation of water quality in near surface aquifers, and surface water.

Because exploration wells will not undergo any siting analysis by DRBC, the risks from these wells can potentially be larger than from production wells. As has been argued by others, gas producers will likely seek to convert exploration wells into production wells in the Delaware River Basin if they intercept gas reservoirs that are economic. Drilling additional wells under an exploration permit is unwise, and has an increased potential to affect human health and the environment in the Delaware River Basin.

References:

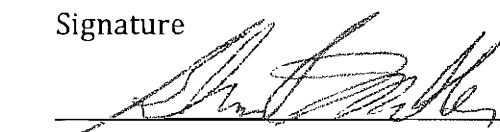
ATSDR [Agency for Toxic Substances and Disease Registry], (2006). "Toxicological Profile for Hydrogen Sulfide" US Public Health Service. US Dept. of Health and Human Services"

Klaassen, C.D. (1996) Casarett and Doull's Toxicology, The Basic Science of Poisons. McGraw Hill, New York.

ATSDR (Agency for Toxic Substances and Disease Registry), (2006). "Toxicological Profile for Hydrogen Sulfide" US Public Health Service. US Dept. of Health and Human Services"

The opinions expressed in this report are stated to a reasonable degree of scientific and professional certainty.

Signature


Glenn C. Miller

Date

11-16-2010

COPY

5500-FM-OG0001A Rev. 11/2007



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

| DEP USE ONLY | |
|-----------------------------------|-------------------|
| Permittee's eFACTS ID 277879 | Auth ID 830957 |
| Watershed Name Hollister Creek | Quality HQ |

WELL PERMIT

| | | | |
|--|---|--|---|
| Permittee NEWFIELD APPALACHIA PA LLC | OGO.# OGO-67425 | Permit Number 37-127-20017-00 | Date Issued 05/27/2010 |
| Address 363 N SAN HOUSTON PKWY E | | Farm Name & Well Number WOODLAND MGMT PARTNERS 1 1 | Well Serial # |
| SUITE 2020 | | Municipality Damascus | County Wayne |
| HOUSTON, TX 77060-2424 | | 7 1/2' Quadrangle Name Callicoon | Map Section # 7 |
| Phone (281) 847-6031 | Project # | Latitude 41-45-57.2000 | Longitude -75-6-33.8000 |
| Surf Elev at Site 1193 feet | Anticipated Total Depth 8350 feet | Well Type GS | Offset distances referenced to NE corner of map section. South 9393 feet West 7108 feet |

This permit covering the well operator and well location shown above is evidence of permission granted to conduct activities in accordance with the Oil and Gas Act and the Oil and Gas Conservation Law, if the well is subject to that act and any rules and regulations promulgated thereunder, subject to the conditions contained herein and in accordance with the application submitted for this permit. This permit does not convey any property rights.

This permit and the permittee's authority to conduct the activities authorized by this permit are conditioned upon operator's compliance with applicable law and regulations.

Notification must be given to the district oil and gas inspector, the surface landowner and political subdivision of the date well drilling will begin at least 24 hours prior to commencement of drilling activities.

The permittee hereby authorizes and consents to allow, without delay, employees or agents of the Department to have access to and to inspect all areas upon presentation of appropriate credentials, without advance notice or a search warrant. This includes any property, facility, operation or activity governed by the Oil and Gas Act, the Oil and Gas Conservation Law, the Coal and Gas Resource Coordination Act and other statutes applicable to oil and gas activities administered by the Department. The authorization and consent shall include consent to the Department to collect samples of wastewaters or gases, to take photographs, to perform measurements, surveys, and other tests, to inspect any monitoring equipment, to inspect the methods of operation and disposal, and to inspect and copy documents required by the Department to be maintained. The authorization and consent includes consent to the Department to examine books, papers, and records pertinent to any matter under investigation pursuant to the Oil and Gas Act or pertinent to a determination of whether the operator is in compliance with the above referenced statutes. This condition in no way limits any other powers granted to the Department under the Oil and Gas Act and other statutes, rules and regulations applicable to these activities as administered by the Department.

This permit does not relieve the operator from the obligation to comply with the Clean Streams Law and all statutes, rules and regulations administered by the Department.

Special Permit Conditions:

This permit expires 05/27/2011 unless drilling is commenced on or before that date and prosecuted with due diligence.

Regional Oil and Gas Program Manager

Stephen Watson
Oil & Gas Inspector

2 Public Square
Wilkes-Barre, PA 18711-0790

570-826-2320
Telephone

| |
|--|
| DEP USE ONLY |
| AUTH # <u>CNC</u> |
| Check # <u>1064287</u> Amount \$ <u>1500</u> |

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PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL

| | | | | |
|--|---------------------|----------------|---------------------------------------|--|
| Notes | | DEP USE ONLY | Objection Date - Do not issue before: | Well Permit # <u>127-20017</u> |
| OGO # <u>67425</u> | Bond # <u>12382</u> | | <u>5/3/10</u> | Special Cond. A B C D E F |
| C: <u>4/13/10</u> n: <u>5/3/10</u> s: <u>5/11/10</u> | INV: <u>5-27-10</u> | Date Approved: | <u>5/11/10</u> | Watershed Name: <u>HOLLISTER CREEK</u> |
| | | | | Designation: <u>(AO)</u> EV |

Please read instructions before you begin filling in this form.

| | | | | |
|--|---------------------------------|------------------------------|-----------------------------|--|
| Applicant (Operator) Name Newfield Appalachia PA LLC | DEP Client ID# 277879 | Phone 281-847-6031 | FAX 281-847-6160 | Check if new address. <input type="checkbox"/> |
| Mailing Address (Street or PO Box) 363 N. Sam Houston Pkwy E. Suite 2020 | City Houston | State TX | Zip +4 77060-2424 | Country (if not USA) |

| | | | | | |
|---|---------------------------------|----------------------|---|--|---|
| (Well) Farm Name Woodland Management Partners | Well # 1-1 | Serial # | PERMIT TYPE Check applicable. | TYPE OF WELL Check one. | APPLICATION FEE Check applicable. |
| County WAYNE | Municipality DAMASCUS | Project # (from DEP) | Application is to: <input checked="" type="checkbox"/> Drill a new well <input type="checkbox"/> Deepen a well <input type="checkbox"/> Redrill a well <input type="checkbox"/> Alter a well <input type="checkbox"/> E&S Control Module <input type="checkbox"/> Other (specify) | <input type="checkbox"/> Gas <input type="checkbox"/> Oil <input type="checkbox"/> Comb. (gas & oil) <input type="checkbox"/> Injection, recovery <input type="checkbox"/> Injection, disposal <input type="checkbox"/> Coalbed Methane <input type="checkbox"/> Gas Storage <input checked="" type="checkbox"/> Other (specify) vertical test well | <input type="checkbox"/> Marcellus Well: Non-Vertical <input type="checkbox"/> Marcellus Well: Vertical <input type="checkbox"/> Non-Marcellus Well: Non-Vertical <input checked="" type="checkbox"/> Non-Marcellus Well: Vertical <input type="checkbox"/> \$200 (Home Use Well) <input type="checkbox"/> \$500 E&S Fee <input type="checkbox"/> \$0 (Rehab orphan) <input checked="" type="checkbox"/> Vertical: Length <u>8350</u> ft. <input type="checkbox"/> Marcellus: Length _____ ft. <input type="checkbox"/> Non-Vertical: Length _____ ft. Total Application Fee \$ <u>1500</u> |

COORDINATION WITH REGULATIONS AND OTHER PERMITS

| | Yes | No | DEP USE ONLY |
|---|-------------------------------------|-------------------------------------|--------------------|
| 1. Will the well be subject to the Oil and Gas Conservation Law? If "No," go to 2). | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Date Stamps/Notes |
| a. If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Auth <u>830957</u> |
| b. Does the location fall within an area covered by a spacing order? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Site <u>73335</u> |
| 2. Will the well penetrate a workable coal seam? If "No," include justification and supporting documentation. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Cint <u>277879</u> |
| 3. If the well will penetrate a workable coal seam, and the well is a "non-conservation" gas well, does the location comply with the distance requirements of Section 7 of the Coal and Gas Resource Coordination Act? (At least 1,000 feet from all existing wells). | <input type="checkbox"/> | <input type="checkbox"/> | APS <u>717958</u> |
| a. If "No," is the required exception request attached? (Check here if re-working an existing well: <input type="checkbox"/> N/A) | <input type="checkbox"/> | <input type="checkbox"/> | Acct <u>676721</u> |
| 4. Will the well be drilled at a location where the coal has been removed? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | PF <u>729777</u> |
| 5. Will the well be drilled through an active (operating or projected) coalmine, or within 1,000 feet of the boundary? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | SF <u>101251</u> |
| a. If "Yes," print the names of: Mine: _____ Operator: _____ | | | |
| 6. Will the well penetrate or be within 2,000 feet of an active gas storage reservoir boundary? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. If Yes, print the names of: Storage Field: _____ Operator: _____ | | | |
| 7. Is the proposed well location within the permitted area of a landfill? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 8. Will the well site be within 100 feet (measured horizontally) of a stream, spring or body of water identified on the most current 7 1/2' topographic map? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. If "Yes," is a request for a waiver (form 5500-FM-OG0057), and E&S control plan attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| 9. Will the well site be within 100 feet of a wetland or in a wetland? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. Is the well site within 100 feet of a wetland greater than one acre in size? | <input type="checkbox"/> | <input type="checkbox"/> | |
| If yes, is a waiver request (form 5500-FM-OG0057) and E&S control plan attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| 10. Will the well be drilled within 200 feet (horizontally) from any existing building or an existing water supply? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. If "Yes," is written consent from the owner attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| b. If written consent is not attached, is a variance request (form 5500-FM-OG0058) attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| 11. Will the well be located where it may impact a public resource as outlined in the "Coordination of a Well Location with Public Resources" form 5500-PM-OG0076? If yes, attach a completed copy of the form. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 12. Is the well site in a Special Protection High Quality (HQ) or Exceptional Value (EV) watershed? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |
| 13. Is this well part of a development where you need an Earth Disturbance Permit for Oil and Gas Activities disturbing more than 5 acres? If yes, attach a completed Erosion Sediment and Stormwater Control Module or list the number and date of the ESCGP-1 Approval. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |

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 NORTHWEST REGIONAL OFFICE

| | | | |
|--|-----------------|---|-----------------------|
| The person signing this form attests that they have the authority to submit this application on behalf of the applicant, and that the information, including all related submissions, is true and accurate to the best of their knowledge. | | | |
| Signature of Person Authorized to Submit Application <u>Donald F. Sleeth</u> | (Print or Type) | Name of Signer: DONALD F. SLEETH | Date <u>4-6-10</u> |
| Application Preparer/Contact: BETSY COLLINS | | Title: Drilling Manager | |
| Phone: 412-921-8250 | | | |



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL & GAS MANAGEMENT PROGRAM

Farm Name - Well #
Woodland Management Partners-Well #1-1
Applicant Name
Newfield Appalachia PA LLC
DEP ID#
277879
APPS #

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL
Page 2 --- Record of Notification / Written Consent

List the following: surface landowner, all landowners or water purveyors whose water supplies are within 1,000 feet of this proposed well location; gas storage operator if within 2000 feet; all coal owners and lessees of all underlying workable coal seams; operators of underground coal mines at the proposed location; and coal operators with a deep mine within 1,000 feet. Mark the boxes, "X," which show the parties' interests. Use additional forms if you need more space. You are required to notify each of these parties.

| Name: | Address: | Surface Landowner | Coal Owner | Coal Lessee | Coal Mine Operator | Gas Storage Operator | Within 1,000 feet | | | Notification | | | |
|------------------------------|--|-------------------|------------|-------------|--------------------|----------------------|-----------------------|----------------|--------------------|--------------|----------------|-------------------|-----------------|
| | | | | | | | Surf Owner With Water | Water Purveyor | Coal Mine Operator | Surf Owner | Return Receipt | Address Affidavit | Written Consent |
| Donald and Marie Hartnett | 841A Calicoon Rd. Damascus, PA 18415-3514 | | | | | | X | | | 3/25/10 | 3/29/10 | | |
| Woodland Management Partners | 308 Egypt Rd. Taffon, PA 18464 | X | | | | | | | | 3/25/10 | 4/1/10 | | X |
| Alfred Cimino | 124 Monroe St, Apt. 1 Archibald, PA 18403-1818 | | | | | | X | | | | | | X |
| Leon N Clause, Sr. | PO Box 241 Stanhope, NJ 07874-0241 | | | | | | X | | | | | | X |
| Name: | Address: | | | | | | | | | | | | |
| Name: | Address: | | | | | | | | | | | | |
| Name: | Address: | | | | | | | | | | | | |

Optional: Signature below indicates the party's approval of the well location, and waives the 15-day objection period. Check applicable box.

| | | | |
|---|------|--|------|
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| Surface Landowner at proposed location | Date | Coal Operator within 1,000 feet of proposed location | Date |
| Surface Landowner at proposed location | Date | Gas Storage Operator within 2,000 feet | Date |

Signature below indicates written consent. Check applicable box.

Owner of: water supply, or building within 200 feet Date: 3/16/10

Address (of above):
Leon N Clause

Owner of: water supply, or building within 200 feet Date:

Address (of above):

127-20017



Farm Name - Well #
Woodland Management Partners-Well #1-1

Applicant Name
Newfield Appalachia PA LLC

DEP ID#
277879

APPS #

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL
Page 2 -- Record of Notification / Written Consent

| Name | Address | Surface Landowner | Coal Owner | Coal Lessee | Coal Mine Operator | Gas Storage Operator | Surt Owner | Within 1,000 feet | | | Notification | | |
|------------------------------|--|-------------------|------------|-------------|--------------------|----------------------|------------|-------------------|--------------------|----------|----------------------|----------------|-------------------|
| | | | | | | | | Water Purveyor | Coal Mine Operator | Operator | Certified Mail Dates | Return Receipt | Address Affidavit |
| Donald and Marie Harneit | 841A Calicoon Rd. Damascus, PA 18415-3514 | | | | | | X | | | 3/25/10 | 3/29/10 | | |
| Woodland Management Partners | 308 Egypt Rd. Taffton, PA 18464 | X | | | | | | | | | | | X |
| Alfred Cimino | 124 Monroe St, Apt. 1 Archibald, PA 18403-1818 | | | | | | X | | | 3/25/10 | 4/1/10 | | X |
| Leon N Clouse, Sr. | PO Box 241 Starbuck, NJ 07874-0241 | | | | | | X | | | | | | |
| Name: | Address: | | | | | | | | | | | | |
| Name: | Address: | | | | | | | | | | | | |
| Name: | Address: | | | | | | | | | | | | |

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Optional: Signature below indicates the party's approval of the well location, and waives the 15-day objection period. Check applicable box.

Water Purveyor or Landowner with water supply within 1,000 ft. Date _____

Coal Operator, Owner, or Lessee Date _____

Water Purveyor or Landowner with water supply within 1,000 ft. Date _____

Coal Operator, Owner, or Lessee Date _____

Water Purveyor or Landowner with water supply within 1,000 ft. Date _____

Coal Operator, Owner, or Lessee Date _____

Water Purveyor or Landowner with water supply within 1,000 ft. Date _____

Coal Operator, Owner, or Lessee Date _____

Surface Landowner at proposed location
WOODLAND MANAGEMENT PARTNERS LP Date **3/14/2010**

Surface Landowner at proposed location
WOODLAND MGT SERVICES INC General
Todd M. ...
PRESIDENT

Signature below indicates written consent. Check applicable box.

Owner of: water supply, or building within 200 feet Date _____

Address (of above) _____

Owner of: water supply, or building within 200 feet Date _____

Address (of above) _____

Signature below indicates written consent. Check applicable box.

Owner of: water supply, or building within 200 feet Date _____

Address (of above) _____

Owner of: water supply, or building within 200 feet Date _____

Address (of above) _____

Signature below indicates written consent. Check applicable box.

Owner of: water supply, or building within 200 feet Date _____

Address (of above) _____

Owner of: water supply, or building within 200 feet Date _____

Address (of above) _____

127-20017



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Oil and Gas Management Program
WELL LOCATION PLAT

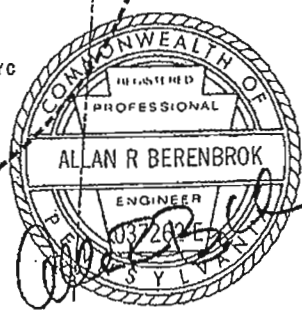
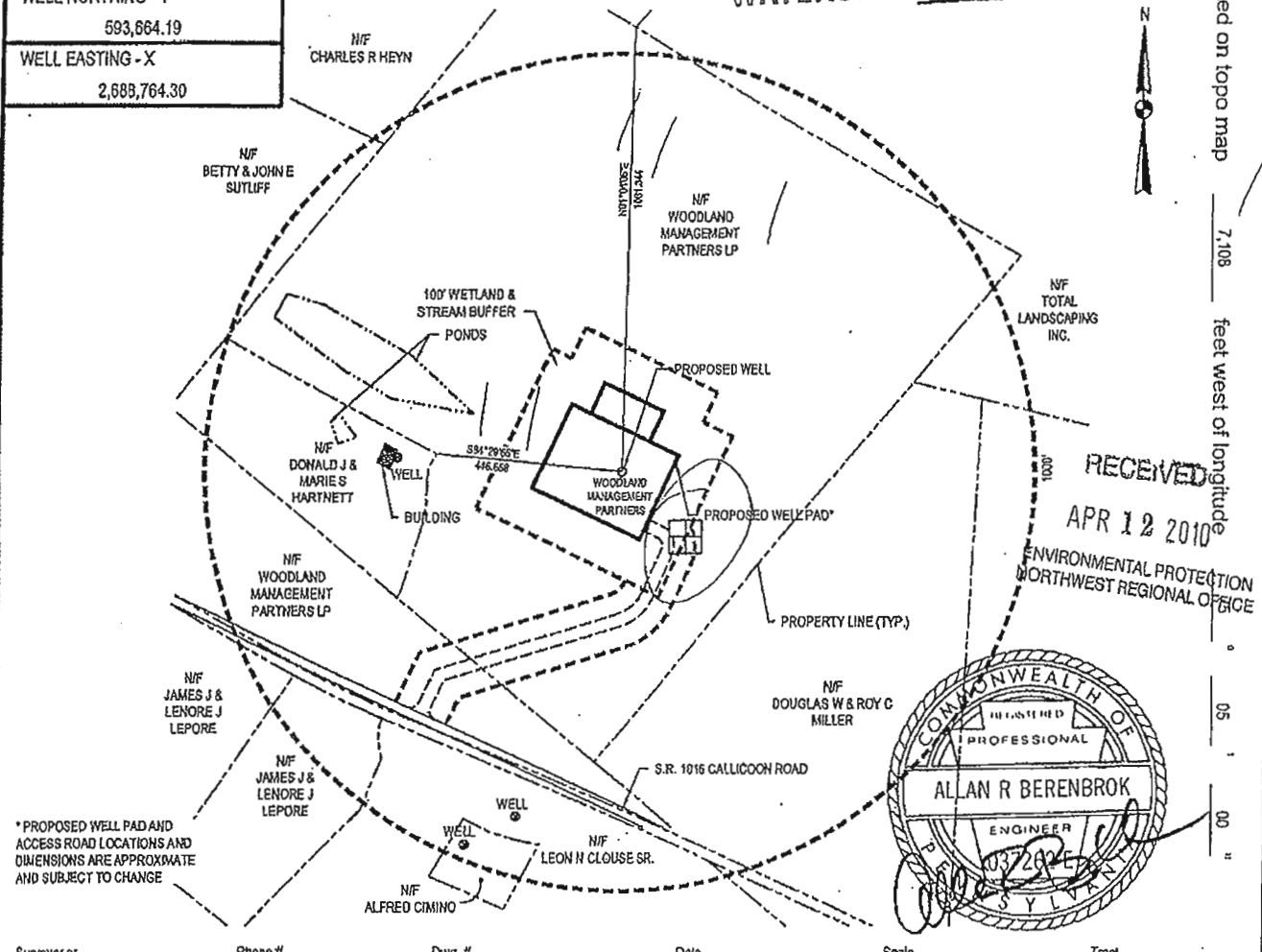
| | |
|----------------------------|------------------|
| DEP Application Tracking # | G: <i>ju</i> |
| Permit # | C: <i>5/3/10</i> |
| Project # | <i>127-20017</i> |

| |
|--|
| <input type="checkbox"/> Denotes location of well on topo map. |
| True Latitude: NORTH 41° 45' 57.2" |
| True Longitude: WEST 75° 06' 33.8" |
| WELL NORTHING - Y 593,664.19 |
| WELL EASTING - X 2,688,764.30 |

Well is located on topo map 9,393 feet south of latitude 41° 37' 30"

HQ

WATERSHED Hollister Creek



Surveyor or Engineer: **TETRA TECH** Phone # (412) 921-8873 Dwg. # 1 Date 4/6/2010 Scale 1" = 400' Tract Acreage

| | | | | |
|--|--|--|--------------------------|-------------------------------|
| Lat. & Long Metadata Method GPS Accuracy +/- 1 ft. Datum NAD83 | | Elevation Metadata Method GPS Accuracy +/- 1 ft. Datum NAD83 | | Survey Date Jan. 2010 |
| Applicant / Well Operator Name Newfield Appalachia PA LLC | | Well (Farm) Name Woodland Management Partners | | Well # 1-1 |
| Address 363 N. Sam Houston Parkway E., Suite 2020, Houston, TX 77080 | | County - Code Wayne | Municipality Damascus | Well Type Vertical Test |
| Surface Landowner / Lessor Woodland Management Partners | | USGS 7 1/2 Quadrangle Map Name Callicoon, PA | | Map Section 7 |
| Target Formation(s) Onondaga | | Angle & Course of Deviation (Drilling) N/A | | Surface Elevation 1193 ft. |
| Anticipated Total Depth TVD 8,350 ft. | | TMD 8,350 ft. | | |
| Donald and Marie Hartnett N86d 22° 34' W 537' | | N/A | | N/A |
| Leon N. Clouse Sr. S16d 46° 23' W 862' | | N/A | | N/A |
| Alfred Cimino S22d 36° 51' W 965' | | N/A | | N/A |

RA: Marcelus Shale Project\Newfield\0279 - Newfield Well\Well Plat\Permit\Drawings\Well Pad Plat Estdb3.dwg PTT BEN.HOPPE 4/22/10 10:54:04 AM



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

| DEP USE ONLY | |
|-----------------------------------|-------------------|
| Permittee's eFACTS ID 277879 | Auth ID 830967 |
| Watershed Name Hollister Creek | Quality HQ |

WELL PERMIT

| | | | |
|---|--------------------------------------|---|--|
| Permittee NEWFIELD APPALACHIA PA LLC | OGO.# OGO-67425 | Permit Number 37-127-20017-00 | Date Issued 05/27/2010 |
| Address 363 N SAN HOUSTON PKWY E | | Farm Name & Well Number WOODLAND MGMT PARTNERS 1 1 | Well Serial # |
| SUITE 2020 | | Municipality Damascus | County Wayne |
| HOUSTON, TX 77060-2424 | | 7 1/2' Quadrangle Name Callicoon | Map Section # 7 |
| Phone (281) 847-6031 | Project # | Latitude 41-45-57.2000 | Longitude -75-6-33.8000 |
| Surf Elev at Site 1193 feet | Anticipated Total Depth 8350 feet | Well Type GS | Offset distances referenced to NE corner of map section. South 9393 feet West 7108 feet |

This permit covering the well operator and well location shown above is evidence of permission granted to conduct activities in accordance with the Oil and Gas Act and the Oil and Gas Conservation Law, if the well is subject to that act and any rules and regulations promulgated thereunder, subject to the conditions contained herein and in accordance with the application submitted for this permit. This permit does not convey any property rights.

This permit and the permittee's authority to conduct the activities authorized by this permit are conditioned upon operator's compliance with applicable law and regulations.

Notification must be given to the district oil and gas inspector, the surface landowner and political subdivision of the date well drilling will begin at least 24 hours prior to commencement of drilling activities.

The permittee hereby authorizes and consents to allow, without delay, employees or agents of the Department to have access to and to inspect all areas upon presentation of appropriate credentials, without advance notice or a search warrant. This includes any property, facility, operation or activity governed by the Oil and Gas Act, the Oil and Gas Conservation Law, the Coal and Gas Resource Coordination Act and other statutes applicable to oil and gas activities administered by the Department. The authorization and consent shall include consent to the Department to collect samples of wastewaters or gases, to take photographs, to perform measurements, surveys, and other tests, to inspect any monitoring equipment, to inspect the methods of operation and disposal, and to inspect and copy documents required by the Department to be maintained. The authorization and consent includes consent to the Department to examine books, papers, and records pertinent to any matter under investigation pursuant to the Oil and Gas Act or pertinent to a determination of whether the operator is in compliance with the above referenced statutes. This condition in no way limits any other powers granted to the Department under the Oil and Gas Act and other statutes, rules and regulations applicable to these activities as administered by the Department.

This permit does not relieve the operator from the obligation to comply with the Clean Streams Law and all statutes, rules and regulations administered by the Department.

Special Permit Conditions:

This permit expires 05/27/2011 unless drilling is commenced on or before that date and prosecuted with due diligence.

S. Craig John

Regional Oil and Gas Program Manager

Stephen Watson
Oil & Gas Inspector

2 Public Square
Wilkes-Barre, PA 18711-0790

570-826-2320
Telephone



pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL & GAS MANAGEMENT PROGRAM

| | |
|--------------|---------|
| DEP USE ONLY | |
| AUTH # | CNC |
| Check # | 1064287 |
| Amount \$ | 1500 |

1950
200
50
\$1500

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL

| | | | |
|--------------|-----------|---------------------------------------|---------------------------------|
| Notes | | DEP USE ONLY | |
| OGO # | 67425 | Objection Date - Do not issue before: | Well Permit # |
| Bond # | 12382 | 5/3/10 | 127-20017 |
| C: 4/13/10 | G: 5/3/10 | Date Approved: | Special Cond. A B C D E F |
| INV: 5-21-10 | 5/11/10 | Roll | Watershed Name: Hollister Creek |
| | | | Designation: (HQ) EV |

Please read instructions before you begin filling in this form.

| | | | | |
|---|--------------------------|-----------------------|----------------------|--|
| Applicant (Operator) Name Newfield Appalachia PA LLC | DEP Client ID# 277879 | Phone 281-847-6031 | FAX 281-847-6160 | Check if new address. <input type="checkbox"/> |
| Mailing Address (Street or PO Box) 363 N. Sam Houston Pkwy E. Suite 2020 | City Houston | State TX | Zip +4 77060-2424 | Country (if not USA) |

| | | | | | |
|--|--------------------------|----------------------|---|---|--|
| (Well) Farm Name Woodland Management Partners | Well # 1-1 | Serial # | PERMIT TYPE Check applicable. | TYPE OF WELL Check one. | APPLICATION FEE Check applicable. |
| County WAYNE | Municipality DAMASCUS | Project # (from DEP) | Application is to: <input checked="" type="checkbox"/> Drill a new well <input type="checkbox"/> Deepen a well <input type="checkbox"/> Redrill a well <input type="checkbox"/> Alter a well <input type="checkbox"/> E&S Control Module <input type="checkbox"/> Other (specify) | <input type="checkbox"/> Gas <input type="checkbox"/> Oil <input type="checkbox"/> Comb. (gas & oil) <input type="checkbox"/> Injection, recovery <input type="checkbox"/> Injection, disposal <input type="checkbox"/> Coalbed Methane <input type="checkbox"/> Gas Storage <input checked="" type="checkbox"/> Other (specify) vertical test well | <input type="checkbox"/> Marcellus Well: Non-Vertical <input type="checkbox"/> Marcellus Well: Vertical <input type="checkbox"/> Non-Marcellus Well: Non-Vertical <input checked="" type="checkbox"/> Non-Marcellus Well: Vertical <input type="checkbox"/> \$200 (Home Use Well) <input type="checkbox"/> \$500 E&S Fee <input type="checkbox"/> \$ 0 (Rehab orphan) <input checked="" type="checkbox"/> Vertical: Length 8350 ft. <input type="checkbox"/> Marcellus: Length _____ ft. <input type="checkbox"/> Non-Vertical: Length _____ ft. Total Application Fee \$ 1500 |

| COORDINATION WITH REGULATIONS AND OTHER PERMITS | Yes | No | DEP USE ONLY |
|---|-------------------------------------|-------------------------------------|-------------------|
| 1. Will the well be subject to the Oil and Gas Conservation Law? If "No," go to 2). | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Date Stamps/Notes |
| a. If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Auth 830957 |
| b. Does the location fall within an area covered by a spacing order? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Site 73335 |
| 2. Will the well penetrate a workable coal seam? If "No," include justification and supporting documentation. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Cmt 271879 |
| 3. If the well will penetrate a workable coal seam, and the well is a "non-conservation" gas well, does the location comply with the distance requirements of Section 7 of the Coal and Gas Resource Coordination Act? (At least 1,000 feet from all existing wells). | <input type="checkbox"/> | <input type="checkbox"/> | APS 71958 |
| a. If "No," is the required exception request attached? (Check here if re-working an existing well: <input type="checkbox"/> N/A) | <input type="checkbox"/> | <input type="checkbox"/> | Acct 676721 |
| 4. Will the well be drilled at a location where the coal has been removed? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | PF 729777 |
| 5. Will the well be drilled through an active (operating or projected) coalmine, or within 1,000 feet of the boundary? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | SF 101201 |
| a. If "Yes," print the names of: Mine: _____ Operator: _____ | | | |
| 6. Will the well penetrate or be within 2,000 feet of an active gas storage reservoir boundary? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. If Yes, print the names of: Storage Field: _____ Operator: _____ | | | |
| 7. Is the proposed well location within the permitted area of a landfill? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 8. Will the well site be within 100 feet (measured horizontally) of a stream, spring or body of water identified on the most current 7 1/2' topographic map? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. If "Yes," is a request for a waiver (form 5500-FM-OG0057), and E&S control plan attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| 9. Will the well site be within 100 feet of a wetland or in a wetland? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. Is the well site within 100 feet of a wetland greater than one acre in size? | <input type="checkbox"/> | <input type="checkbox"/> | |
| If yes, is a waiver request (form 5500-FM-OG0057) and E&S control plan attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| 10. Will the well be drilled within 200 feet (horizontally) from any existing building or an existing water supply? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. If "Yes," is written consent from the owner attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| b. If written consent is not attached, is a variance request (form 5500-FM-OG0058) attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| 11. Will the well be located where it may impact a public resource as outlined in the "Coordination of a Well Location with Public Resources" form 5500-PM-OG0078? If yes, attach a completed copy of the form. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 12. Is the well site in a Special Protection High Quality (HQ) or Exceptional Value (EV) watershed? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |
| 13. Is this well part of a development where you need an Earth Disturbance Permit for Oil and Gas Activities disturbing more than 5 acres? If yes, attach a completed Erosion Sediment and Stormwater Control Module or list the number and date of the ESCGP-1 Approval. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |

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| | | | |
|---|--|----------------------------------|---------------------|
| Signature of Applicant | The person signing this form attests that they have the authority to submit this application on behalf of the applicant, and that the information, including all related submissions, is true and accurate to the best of their knowledge. | | |
| Signature of Person Authorized to Submit Application <i>Donald F. Sleeth</i> | (Print or Type) | Name of Signer: DONALD F. SLEETH | Date 4-6-10 |
| Application Preparer/Contact: BETSY COLLINS | | Title: Drilling Manager | Phone: 412-921-8250 |



| | |
|--|-------------------|
| Farm Name - Well # Woodland Management Partners-Well #1-1 | DEP ID# 277879 |
| Applicant Name Newfield Appalachia PA LLC | APS # |
| | |

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL
Page 2 --- Record of Notification / Written Consent

List the following: surface landowner, all landowners or water purveyors whose water supplies are within 1,000 feet of this proposed well location; gas storage operator if within 2000 feet; all coal owners and lessees of all underlying workable coal seams; operators of underground coal mines at the proposed location; and coal operators with a deep mine within 1,000 feet. Mark the boxes, "X", which show the parties' interests. Use additional forms if you need more space. You are required to notify each of these parties.

| Name: | Address: | Surface Landowner | Coal Owner | Coal Lessee | Coal Mine Operator | Gas Storage Operator | Within 1,000 feet | | | Notification | | | |
|------------------------------|--|-------------------|------------|-------------|--------------------|----------------------|-------------------|----------------|--------------------|----------------------------------|----------------|-------------------|------|
| | | | | | | | Surf Owner | Water Purveyor | Coal Mine Operator | Note the means and attach proof. | | Written Consent | |
| | | | | | | | Surf Owner | Water Purveyor | Coal Mine Operator | Certified Mail Dates | Return Receipt | Address Affidavit | Date |
| Donald and Marie Hartnett | 841A Calicoon Rd. Damascus, PA 18415-3514 | | | | | | X | | | 3/25/10 | 3/29/10 | | |
| Woodland Management Partners | 308 Egypt Rd. Tarton, PA 18464 | X | | | | | | | | | | | |
| Alfred Cimino | 124 Monroe St, Apt. 1 Archibald, PA 18403-1818 | | | | | | X | | | 3/25/10 | 4/1/10 | | X |
| Leon N Clouse, Sr. | PO Box 241 Stanhope, NJ 07874-0241 | | | | | | X | | | | | | X |
| Name: | Address: | | | | | | | | | | | | |
| Name: | Address: | | | | | | | | | | | | |
| Name: | Address: | | | | | | | | | | | | |

Optional: Signature below indicates the party's approval of the well location, and waives the 15-day objection period. Check applicable box.

| | | | |
|--|------|--|------|
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| Surface Landowner at proposed location | Date | Coal Operator within 1,000 feet of proposed location | Date |
| Surface Landowner at proposed location | Date | Gas Storage Operator within 2,000 feet | Date |

Signature below indicates written consent. Check applicable box.

| | |
|--|--------|
| Owner of: <input checked="" type="checkbox"/> water supply, or <input type="checkbox"/> building within 200 feet | Date |
| Address (of above) | Date |
| <i>Leon N Clouse</i> | 3/6/10 |
| Owner of: <input type="checkbox"/> water supply, or <input type="checkbox"/> building within 200 feet | Date |
| Address (of above) | Date |

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NORTHWEST REGIONAL OFFICE



Farm Name - Well #
Woodland Management Partners-Well #1-1
Applicant Name
Newfield Appalachia PA LLC
DEP ID#
277879



PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL
Page 2 --- Record of Notification / Written Consent

| Name | Address | Surface Landowner | Coal Owner | Coal Lessee | Coal Mine Operator | Gas Storage Operator | Within 1,000 feet | | | Notification | | | |
|------------------------------------|---|-------------------|------------|-------------|--------------------|----------------------|-----------------------|----------------|--------------------|----------------------|----------------|-------------------|-----------------|
| | | | | | | | Surf Owner With Water | Water Purveyor | Coal Mine Operator | Certified Mail Dates | Return Receipt | Address Affidavit | Written Consent |
| Name: Donald and Marie Hartnett | Address: 841A Calicoon Rd. Damascus, PA 18415-3514 | | | | | | X | | | 3/25/10 | 3/29/10 | | |
| Name: Woodland Management Partners | Address: 308 Egypt Rd. Tatton, PA 18464 | X | | | | | X | | | 3/25/10 | 4/1/10 | | X |
| Name: Alfred Cimino | Address: 124 Monroe St, Apt. 1 Archibald, PA 18403-1818 | | | | | | X | | | | | | X |
| Name: Leon N Clouse, Sr. | Address: PO Box 241 Stanhope, NJ 07874-0241 | | | | | | X | | | | | | X |
| Name: | Address: | | | | | | | | | | | | |
| Name: | Address: | | | | | | | | | | | | |
| Name: | Address: | | | | | | | | | | | | |

List the following: surface landowner; all landowners or water purveyors whose water supplies are within 1,000 feet of this proposed well location; gas storage operator; if within 2000 feet; all coal owners and lessees of all underlying workable coal seams; operators of underground coal mines at the proposed location; and coal operators with a deep mine within 1,000 feet. Mark the boxes "X," which show the parties' interests. Use additional forms if you need more space. You are required to notify each of these parties.

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NORTHWEST REGIONAL OFFICE

Optional: Signature below indicates the party's approval of the well location, and waives the 15-day objection period. Check applicable box.

| | | | |
|--|------|--|------|
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| <input type="checkbox"/> Surface Landowner at proposed location | Date | Coal Operator within 1,000 feet of proposed location | Date |
| <input type="checkbox"/> Surface Landowner at proposed location | Date | Gas Storage Operator within 2,000 feet | Date |

Surface Landowner at proposed location
WOODLAND MANAGEMENT PARTNERS LP 3/4/2010
Surface Landowner at proposed location
WOODLAND MANAGEMENT PARTNERS LP General
Donald M. Hartnett, President

127-20017



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Oil and Gas Management Program
WELL LOCATION PLAT

| | |
|----------------------------|------------------|
| DEP Application Tracking # | G: <i>ju</i> |
| Permit # | <i>5/3/10</i> |
| Project # | <i>127-20017</i> |

| |
|--|
| <input type="checkbox"/> Denotes location of well on topo map. |
| True Latitude: NORTH 41° 45' 57.2" |
| True Longitude: WEST 75° 06' 33.8" |
| WELL NORTHING - Y 593,664.19 |
| WELL EASTING - X 2,688,764.30 |

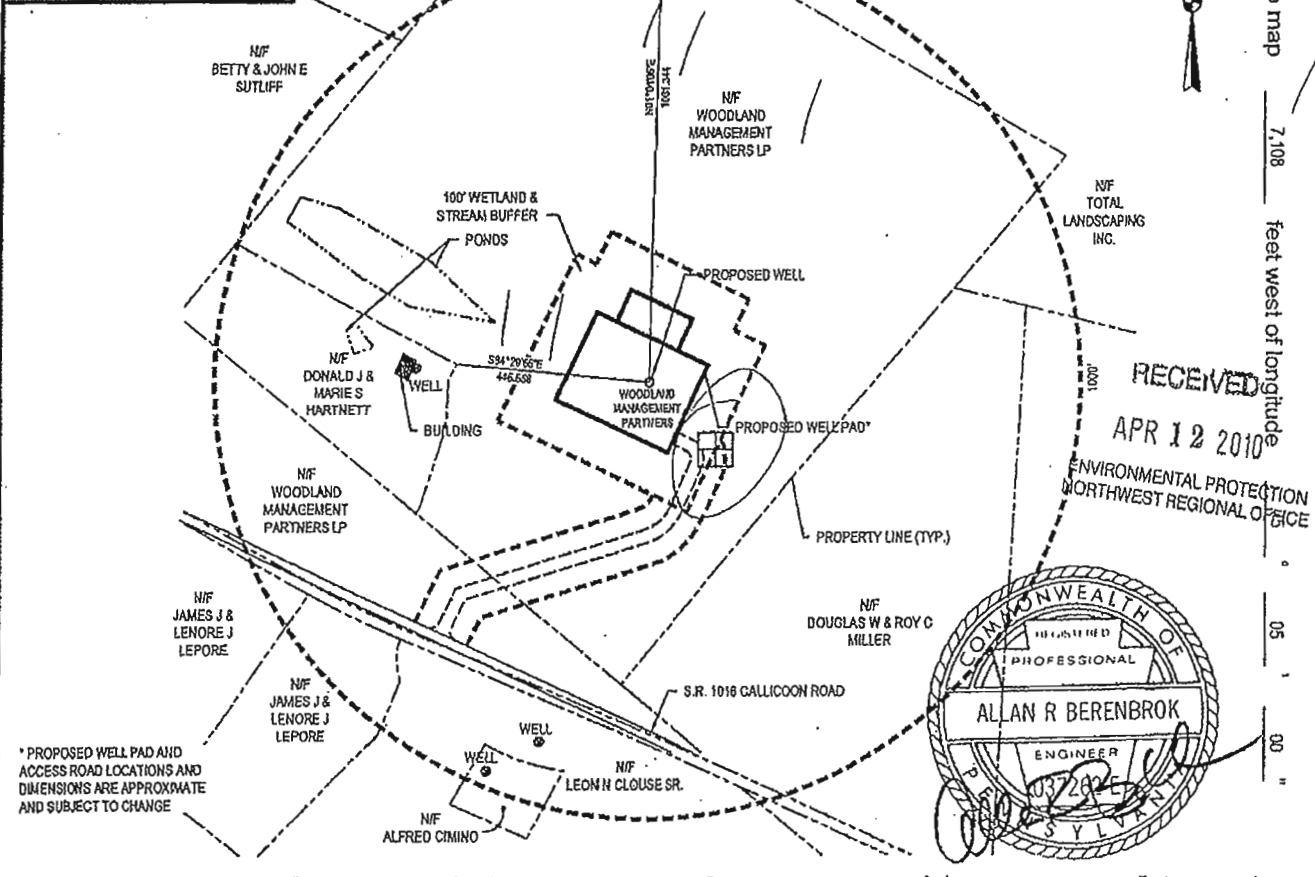
Well is located on topo map 9,393 feet south of latitude 41° 37' 30"

HQ

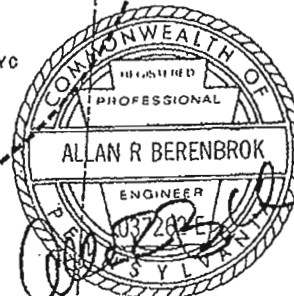
WATERSHED HOLLISTER CREEK

Well is located on topo map

7,108 feet west of longitude



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NORTHWEST REGIONAL OFFICE



Surveyor or Engineer: **TETRA TECH** Phone # **(412) 921-8873** Dwg. # **1** Date **4/6/2010** Scale **1" = 400'** Tract Acreage

| | | |
|---|---|--|
| Lat. & Long Metadata Method GPS Accuracy +/- 1 ft. Datum NAD83 | Elevation Metadata Method GPS Accuracy +/- 1 ft. Datum NAD83 | Survey Date Jan. 2010 |
| Applicant / Well Operator Name Newfield Appalachia PA LLC | Well (Farm) Name Woodland Management Partners | Well # 1-1 |
| Address 363 N. Sam Houston Parkway E., Suite 2020, Houston, TX 77060 | County - Code Wayne | Municipality Damascus |
| Surface Landowner / Lessor Woodland Management Partners | USGS 71/2 Quadrangle Map Name Callicoon, PA | Map Section 7 |
| Target Formation(s) Onondaga | Angle & Course of Deviation (Drilling) N/A | Anticipated Total Depth TVD 8,350 ft. |
| Donald and Marie Hartnett | N86d 22' 34"W 537' | N/A |
| Leon N. Clouse Sr. | S16d 46' 23"W 862' | N/A |
| Alfred Cimino | S22d 36' 51"W 965' | N/A |
| | | N/A |

R:\Hazardous Waste Projects\Newfield\Plat Permits\Permit Drawings\WAP Well Pad Plat Exhibit A.dwg PRT BERENBROS 4/12/2010 10:54:04 AM

PERMIT NO.

04043824

ORGANIZATION

046

DATE ISSUED

051010

PERMIT FEES

25.00

ACCOUNT NO.

COUNTY

53

TOWNSHIP/BORO

206



HIGHWAY OCCUPANCY PERMIT

PERMITTEE

WOODLAND MANAGEMENT PARTNERS LP

ADDRESS

308 EGYPT ROAD

POST OFFICE

TAFTON

PA

ZIP CODE

18454-

COUNTY

WAYNE

TOWNSHIP/BORO

DAMASCUS

BOND/AGREEMENT NUMBER

DESCRIPTION

512

1

STATE ROUTE NO.

1016

SEGMENT(S)

0090 0090

OFFSET TO OFFSET

0470 0470

ALL WORK UNDER THIS PERMIT MAY BE STARTED ON

05/10/10

AND SHALL BE COMPLETED ON OR BEFORE

05/10/11

Immediately upon completion of the work, Permittee shall notify the permit office where application was made. Subject to all the conditions, restrictions, and regulations prescribed by the Pennsylvania Department of Transportation, (see in particular 67 Pa. Code, Chapter 203/212, 441 and 459) and subject to the plans, special conditions, or restrictions herein set forth or attached hereto. This permit shall be located at the work site and shall be available for inspection by any police officer or department representative.

DESCRIPTION

2

STATE ROUTE NO.

SEGMENT(S)

OFFSET TO OFFSET

DESCRIPTION

3

STATE ROUTE NO.

SEGMENT(S)

OFFSET TO OFFSET

TOWNSHIP/BORO

4

DESCRIPTION

STATE ROUTE NO.

SEGMENT(S)

OFFSET TO OFFSET

DESCRIPTION OF WORK

INSTALL MINIMUM USE DRIVEWAY WITH DRAINAGE FACILITIES AT SR 1016 SEG 0090 OFFSET 0470 TO SEG 0090 OFFSET 0470 THIS PERMIT AUTHORIZES WORK ONLY IN DEPARTMENT HIGHWAY RIGHT OF WAY. IT IS THE PERMITTEE'S RESPONSIBILITY TO KEEP VEGETATION TRIMMED IN ORDER TO MAINTAIN MINIMUM SIGHT DISTANCE. NO OBJECTS MAY BE PLACED WITHIN THE LINE OF SIGHT. SHOULDERS MUST BE RESTORED IN ACCORDANCE WITH APPROPRIATE SECTION OF PUB. 408 AND ROADWAY CONSTRUCTION STANDARD RC-25. SURFACE DRAINAGE MAY NOT BE DIRECTED ONTO STATE HIGHWAY RIGHT OF WAY. PERMITTEE MUST MAINTAIN ACCESS FROM THE PAVEMENT EDGE TO AT LEAST 20 FEET OUTSIDE THE HIGHWAY RIGHT OF WAY. ALL DISTURBED AREAS OUTSIDE THE PAVEMENT OR SHOULDER SHALL BE RESTORED TO A CONDITION AT LEAST EQUAL TO THAT WHICH EXISTED BEFORE THE START OF WORK. MINIMUM WORK ZONE TRAFFIC CONTROL TO BE IN ACCORDANCE WITH PUB. 213, FIGURE(S): 5, 7, & 10A. SEE PUE 212 FOR ADDITIONAL DETAILS. DRAINAGE INSTALLED BY THIS PERMIT IS THE RESPONSIBILITY OF THE PERMITTEE TO CONTINUALLY MAINTAIN OR REPLACE. DEPARTMENT MUST BE NOTIFIED IN WRITING UPON COMPLETION OF WORK.

THIS PERMIT IS NOT VALID UNTIL SIGNED BY THE DISTRICT ENGINEER OR HIS AUTHORIZED REPRESENTATIVE

Acknowledgement of Completion

Permitted work has been completed.

Date _____ By _____

Allen D. Biehler
ALLEN D. BIEHLER, P.E.
5/13/10

Secretary of Transportation

GEORGE ROBERTS, P.E., D.E.

District Executive



APPLICATION FOR MINIMUM USE DRIVEWAY
 A Minimum Use Driveway Is A Residential Or Other Driveway Which Is
 Expected To Be Used By Not More Than 25 Vehicles Per Day (i.e. 50 A.D.T)

APPL. NO. **075293**

SEE PUBLICATION 312 GUIDE

| | | |
|---|--------------------------|--------------------------|
| APPLICANT/PROPERTY OWNER <i>WOODLAND MANAGEMENT PARTNERS, LP</i> | | |
| ADDRESS <i>308 Egypt Road</i> | | |
| POST OFFICE <i>TRIFTON PA</i> | ZIP CODE <i>18464</i> | |
| PHONE <i>570-857-1072</i> | FEE <i>25.00</i> | CHECK NO. <i>5049</i> |

LOCATION OF PROPOSED DRIVEWAY

County Wayne *63*

Township/Boro Damascus *206*

Route No. S.S. 1016 (Calliegon Rd)

Name of Nearest Intersection Little Kaminuk Creek

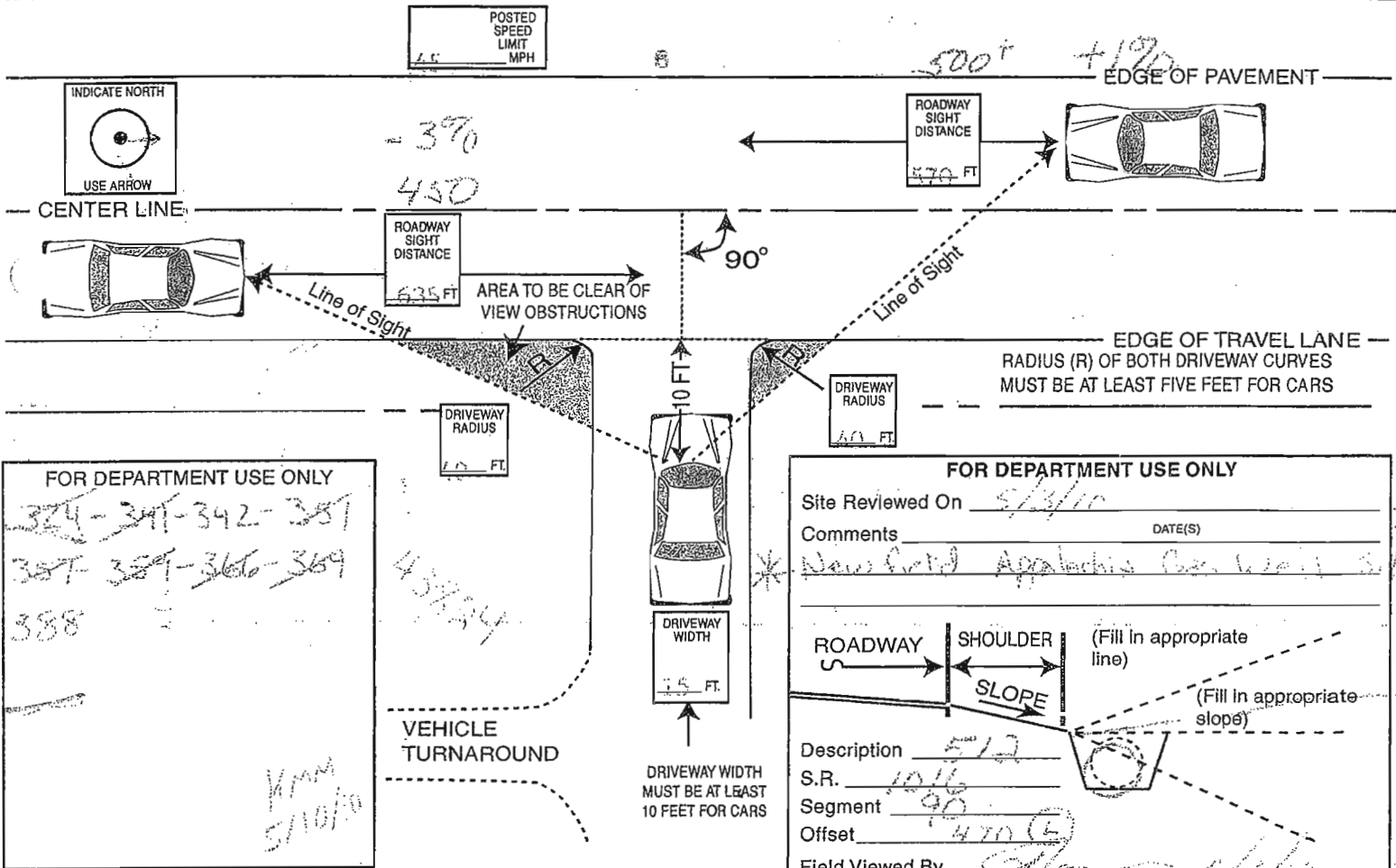
Distance to Nearest Intersection in Feet 3520 ft.

APPLICATION IS MADE TO

CONSTRUCT A NEW DRIVEWAY ALTER AN EXISTING DRIVEWAY

DATE WORK SCHEDULED TO BEGIN May 15, 2010

DATE WORK SCHEDULED TO BE COMPLETED August 31, 2010



FOR DEPARTMENT USE ONLY

Site Reviewed On 5/3/10 DATE(S)

Comments New Field Appalachia Gas Well Site

ROADWAY SHOULDER (Fill in appropriate line)

SLOPE (Fill in appropriate slope)

Description 512

S.R. 1016

Segment 90

Offset 470 ft

Field Viewed By [Signature] SIGNATURE DATE

Is any portion of the property reserved for a person with a disability or a severely disabled veteran? YES NO

Under and subject to all the conditions, restrictions and regulations prescribed by the Pennsylvania Department of Transportation and the issued Permit, Form M-945P.

The applicant certifies that all statements contained herein are true and correct.

By **X** [Signature] SIGNATURE(S) 4/17/2010 DATE

ROADWAY USE AND
MAINTENANCE AGREEMENT

AND NOW THIS 21 day of June, 2010, it is agreed by and between Damascus Township, Wayne County, Pennsylvania, by and through its Board of Supervisors and New Field Explorations, a duly formed corporation with its principal place of residence at 363 Sam Houston, Houston, TX, (jointly "the Parties") to enter into this agreement regarding the use and maintenance of township roadways necessary for transportation and travel of equipment and personnel to and from oil and gas wells on various leaseholds within the Township;

WHEREAS, Damascus Township, (Hereinafter reference to as the "Township") has control and jurisdiction of various Township owned roadways with its boundaries; and

WHEREAS, the Newfield (Hereinafter referred to as the "Operator"), is the owner of certain oil and gas leaseholds in Wayne County, Pennsylvania; and

WHEREAS, the Township and Operator are desirous of entering into a formal agreement for the use of Township roadways for the purposes of providing ingress, regress and egress to various leaseholds for which excess traffic and equipment transportation is necessary for the development of said oil and gas wells on said leaseholds, and

WHEREAS, the Township and Operator are desirous of addressing the excess road maintenance costs and expenditures necessary for and incurring from construction, drilling and completion stages of gas and oil operations utilizing said Township roadways.

NOW THEREFORE, in consideration of a faithful performance of each party of mutual covenants and promises hereinafter set forth, and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged as follows:

1. The Operator agrees to identify those Township roads or portions of roads to be used by its vehicles and equipment prior to the commencement of operations.

2. After receiving from the Operator a list of such roads, the Parties agree to inspect the pertinent roadways promptly to determine the road structure, its condition and the existence of any buried utility lines, and to depict any surface characteristics. Operator will prepare a pre-use road inspection report documenting the road conditions and characteristics.
3. The Operator agrees to restore any affected roadways to a condition equal or better than the pre-use condition of said road(s) within 180 days of the conclusion of Operator's use, weather permitting; provided that Operator's liability shall be limited to only that portion of the cost of repair and restoration which exceeds normal and routine maintenance, costs, and which is caused by the Operator's vehicles and equipment.
4. In the event that the pre-use condition of any roadway requires or warrants repaving or improvements prior to use, the Operator shall be liable for such improvements only to the extent that the parties agree that such improvements would reduce damage caused by the Operator's use, and agree on ratably sharing the costs of such improvements.
5. In the event that the Township incurs additional costs associated with maintenance of said roadway as a direct result of the Operator's activities (including those of their agents, employees and contractors), including dust suppression needed during peak activity periods, the Township will provide prior notice of such additional maintenance needed, and if possible, obtain a cost estimate, and deliver the same to the Operator. Operator will only be liable for such maintenance costs to the extent that the parties agree that such maintenance is necessary and that the parties shall share the costs.
6. The Operator agrees to reimburse the Township for reasonable additional costs agreed upon in a reasonable and prompt period of time, but not to exceed forty-five (45) days.
7. Upon completion of all improvements called for in the final inspection report, the Operator shall submit a certification of the improvements made to the Township, and such certification shall be deemed approved unless the Township gives

written notice of objections to the certification within ten days of receipt of the certification.

8. Upon conclusion of the drilling activities anticipated by this Agreement, both parties will promptly inspect the roadways utilized and make a determination as to what, if any, improvements or maintenance need to be performed by the Operator to discharge the obligations required by this Agreement. This final report then shall be deemed to be a complete list of improvements needed to discharge this Agreement, binding upon all parties.
9. In the event that future drilling activities occur utilizing the same or part of a Township roadway(s) previously improved by virtue of this agreement, then the future contemplated activities shall cause the provisions of this agreement to resume as if said roadway(s) were being initially contemplated, with a new pre-use road inspection report, and such follow up requirements as previously herein set forth.
10. The Operator shall be given the option of having any agreed upon repair work performed by a contractor of its choice.
11. This Agreement is entered into in lieu of the Township incurring the cost and inconvenience of implementing a state compliant road bonding system and shall survive any future creation of any such system as to the Operator and remain the operative relationship between the Township and the Operator until terminated by the mutual agreement of the Township and the Operator.
12. This agreement shall be binding upon the successors and assigns of the parties hereto and shall be deemed to be a covenant running with the roads described above. This agreement shall not be transferred or assigned by the Operator without the consent in writing of the Township, which consent will not be unreasonably withheld.

IN WITNESS WHEREOF, this instrument has been executed by the undersigned the
Production Manager, this 21 day of June, 2010.

TOWNSHIP:

Damascus Township Supervisors

By: [Signature]

By: [Signature]

By: [Signature]

OPERATOR:

Newfield Exploration

(Company Name)

By: [Signature]

Company Representative



DAMASCUS TOWNSHIP, WAYNE COUNTY, PA.

ROAD INSPECTION REPORT

PRINT NAME: _____ DATE: _____

SIGN: _____ COMPANY: _____

- PRE-INSPECTION
- POST INSPECTION
- VIDEO RECORD: YES
 NO

ROAD CONDITION: _____

ROAD SURFACE: ACP \ ASBC \ CRUDE \ GRAVEL:

DRAINAGE [CENTERLINE, CULVERTS, APPROACHES]:

SIGNAGE: _____

EXISTING DUST CONTROL: YES
 NO: _____

OTHER FACTORS EFFECTING THE ROADWAY: _____

WILL THE COMPANY PROVIDE A GRADER TO MAINTAIN THE DRIVING SURFACE? YES OR NO

COMMENTS: _____

**PREPAREDNESS, PREVENTION,
AND CONTINGENCY PLAN
WAYNE COUNTY FIELD
WAYNE COUNTY, PENNSYLVANIA**

Prepared for:

NEWFIELD APPALACHIA PA LLC
363 N. Sam Houston Pkwy E., Suite 2020
Houston, TX 77060



Prepared by:

TETRA TECH NUS INC
116 N. Washington Avenue
Scranton, PA 18503



May 2010

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1.0 DESCRIPTION OF FACILITY

1.1 DESCRIPTION OF THE INDUSTRIAL OR COMMERCIAL ACTIVITY

Newfield Appalachia PA LLC (Newfield) is a natural gas exploration company with operations planned for Wayne County, Pennsylvania. Operations will involve natural gas exploration of the Marcellus Shale formation, which will include site preparation, drilling, and well development and production activities. Wastes generated during these activities will be typical for gas drilling operations and will include drill cuttings, produced water, drilling and frac fluids, waste oil, municipal waste and trash. No hazardous waste is expected to be generated at the Newfield sites.

Newfield is currently in the exploratory phase of operations, which will require construction activities for new natural gas well pads and access roads.

This Prevention, Preparedness and Control (PPC) Plan applies to all well sites in Wayne County, Pa.

The attached map (Figure 1) in Appendix B shows the area covered under this PPC Plan. Figure 2 is the required 7.5 topographic map of the specific well site. The proposed Site Plan (Figure 3) shows the site layout, the well site boundaries, material storage areas, waste storage areas, dike drains and drainage that leads away from the well site, and the entrances and exits to the well site.

During the different stages of site preparation, construction, drilling, well development and production, the site will store various fuels, oils and chemicals on-site. A chemical and container inventory for the specific well site is located in Table 1 of Appendix C.

1.2 DESCRIPTION OF EXISTING EMERGENCY RESPONSE PLANS

This is a new facility and this plan has been prepared prior to construction of the well pad. There are no previous emergency response plans.

A separate Spill Prevention Control and Countermeasure (SPCC) Plan will be prepared for each facility meeting the requirements defined in 40 CFR§112.

1.3 MATERIAL AND WASTE INVENTORY

Information in this section is used to evaluate the prevention, containment, mitigation, cleanup, and disposal measures which would be used in the event of a spill, discharge, explosion, or fire. Oils, chemicals and other hazardous materials anticipated to be used and stored at the facility during site preparation and construction, drilling, well development and production are listed in Table 1.

MSDS's will be maintained onsite for chemicals and compounds used at the facility in accordance with the Occupational Safety and Health Administration (OSHA) worker right-to-know requirements, as appropriate.

1.4 POLLUTION INCIDENT HISTORY

Newfield has not had any reportable incidents for this facility.

1.5 IMPLEMENTATION SCHEDULE FOR PLAN ELEMENTS NOT CURRENTLY IN PLACE

All plan elements are in place.

1.6 PURPOSE AND IMPLEMENTATION OF PPC PLAN

Newfield has developed and will implement this PPC Plan for effective action to minimize and abate hazards to human health and the environment from fire, explosion, and emission or discharge of pollutants to air, soil, surface water or groundwater. This plan was prepared to satisfy the requirements set forth in 25 PA Code Section 78.

The Drilling Manager serves as the Primary Emergency Coordinator and is responsible for the preparation and implementation of the PPC Plan. The PPC Plan has been prepared and implemented in general accordance with Pennsylvania Department of Environmental Protection (PADEP) guidelines, and will be submitted to PADEP for approval at such time as the PADEP may prescribe.

This PPC Plan identifies and describes any arrangements with police departments, fire departments, hospitals, contractors, and state, county, and local emergency response teams to coordinate emergency services.

The PPC Plan lists names, addresses and phone numbers of all persons identified to act as Emergency Coordinator. One person is named as the Primary Emergency Coordinator and others are listed in the order in which they will assume responsibility as alternates. The PPC Plan also includes a list of emergency equipment at the facility, the location and a physical description of emergency equipment, and a brief outline of emergency equipment capabilities.

1.7 PLAN REVISIONS

This PPC Plan will be reviewed and amended, annually, or whenever:

- Applicable PADEP regulations are revised;
- The plan fails in an emergency;
- The list of Emergency Coordinators changes;
- The list of emergency equipment changes; and
- Construction, operation, maintenance, or other circumstances change in a manner that materially increases the potential for fires, explosions, or releases of toxic or hazardous constituents; or which changes the response necessary in an emergency.

2.0 IMPLEMENTATION OF PPC PLAN

2.1 ORGANIZATIONAL STRUCTURE OF FACILITY FOR IMPLEMENTATION

The Drilling Manager has been designated as the Primary Emergency Coordinator. The Primary Emergency Coordinator is responsible for the following:

- Coordination of spill cleanup activities;
- Notification of appropriate authorities; and
- Tank and chemical storage area inspections.

The Drilling Manager has administrative responsibility for updating, maintaining, and implementing this PPC Plan. Specifically, these responsibilities include:

- Identification of materials and wastes handled during site operation (inventory);
- Identification of potential spill sources (risk assessment);
- Establishment of spill reporting procedures;
- Coordination of the visual inspection program;
- Review of past incidents, spills, and countermeasures employed;
- Coordination and implementation of the PPC Plan goals;
- Training/educational programs and updates;
- Ensuring periodic review of the PPC Plan for adequacy and appropriateness;
- Administration and institution of appropriate changes at regular intervals;
- Review of new construction and process changes relative to the PPC Plan;
- Evaluation of PPC Plan effectiveness prior to, during and subsequent to its implementation; and
- Instituting improvements to the PPC Plan.

The Production Manager is designated as Secondary Emergency Coordinator, and, in the absence of the Drilling Manager, will assume the role of emergency coordinator for emergencies. The Secondary Emergency Coordinator will report directly to the Primary Emergency Coordinator in matters regarding this plan, and can assist with implementing the above-listed items.

2.2 LIST OF EMERGENCY COORDINATORS

As required by 25 PA Code 265.55, there will be at least one employee, either on the construction site or on call, with the responsibility for coordinating emergency response measures. The Primary and Secondary Emergency Coordinators will be thoroughly familiar with this PPC Plan, site operations and activities, the location and characteristics of materials and wastes, the location of the facility's records, and the layout of the facility. The Emergency Coordinators have the authority to commit the resources necessary to carry out the PPC Plan and for coordinating emergency response measures. In the event of a spill or release, one of the Emergency Coordinators will be immediately notified. The following individuals have been designated to act as Emergency Coordinators:

Primary Emergency Coordinator

Name: Don Sleeth
Title: Drilling Manager
Office: 281-674-2501
Cell: 281-974-0051

Secondary Emergency Coordinator

Name: Jack Cochran
Title: Production Manager
Office: 814-437-2344
Cell: 814-671-1557

2.3 DUTIES AND RESPONSIBILITIES OF THE EMERGENCY COORDINATOR

As required by 25 PA Code 265.56 and the PPC Plan Guidance Documents, whenever there is an imminent or actual emergency situation, the Emergency Coordinator or his designee must immediately:

1. Notify all facility personnel.
2. Notify appropriate state or local agencies with designated response roles and contracted emergency response companies if additional assistance is required.
3. Identify the problem. Is it a physical emergency such as a fire, explosion, or spill? Is it a natural disaster such as a flood, tornado, or other severe weather? Is it a social emergency such as a bomb threat, riot, or vandalism?

4. Assess the health or environmental hazards and how this problem or condition will affect employees or its affect on the surrounding community.
5. Take all reasonable measures to stabilize the situation. The Emergency Coordinator will take all reasonable measures to ensure that the fire, explosion, emission, or discharge does not reoccur or spread to other materials at the site. These measures can include, when appropriate, stopping operations, collecting and containing released materials or wastes, and removing or isolating containers.

Whenever there is an emission, discharge, fire, or explosion, the Emergency Coordinator or his designee must immediately attempt to identify the character, exact source, amount, and aerial extent of emitted or discharged materials. He/she may do this by observation, by review of facility records or manifests, and, if necessary, by instrumental and chemical analysis. Concurrently, the Emergency Coordinator or his designee must assess possible hazards to human health or the environment that may result from emission, discharge, fire, or explosion. This assessment must consider both direct and indirect effects of the emission, discharge, fire, or explosion.

If the Emergency Coordinator determines that the facility has had an emission, discharge, fire, or explosion which would threaten human health or the environment (beyond the limits of the site) and if evacuation of local areas may be advisable, he/she must immediately notify the applicable local authorities (police, fire, etc.); he/she must also immediately notify the PADEP by telephone at (800) 541-2050 (24-hour number), PADEP Northeast Region at (570) 826-2511 (24-hrs), the National Response Center at (800) 424-8802, Wayne County Emergency Management Agency (EMA) at (570) 253-1622, and the Pennsylvania Emergency Management Agency at (717) 651-2001, and report the following information:

- Name of the person reporting the incident;
- Name and location of the facility;
- Telephone number where the person reporting the spill can be reached;
- Date, time, and location of the incident;
- A brief description of the incident, nature of the materials involved, extent of any injuries, and possible hazards to human health or the environment;
- The estimated quantity of the materials spilled; and
- The extent of contamination of land, water, or air, if known.

If spills or discharges of a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) hazardous substance in greater than reportable quantities has occurred, the Emergency Coordinator must notify DEP at (800) 541-2050 and the National Response Center at (800) 424-8802 and report the above information. For an offsite release (spill or discharge) of a reportable quantity of a CERCLA hazardous substance or a Superfund Amendments and Reauthorization Act Extremely Hazardous Substance, the Emergency Coordinator must immediately notify the National Response Center at (800) 424-8802 and report the above information.

If a release occurs from a storage tank which enters a water supply or which threatens the water supply of downstream users, the Emergency Coordinator must immediately notify the Wayne County EMA (570) 253-1622, the Pennsylvania Emergency Management Agency at (717) 651-2001, and DEP at (800) 541-2050. If appropriate, the Emergency Coordinator may assist the Emergency Management Agencies in notifying the downstream water users. The priorities for notification will be by closest proximity to the release site.

During an emergency, the Emergency Coordinator will take all reasonable measures necessary to ensure that fire, explosion, emission, or discharge do not occur, recur, or spread to other materials at the facility. These shall include, where applicable, stopping facility operations, collecting and containing released materials, and removing or isolating containers. If the facility stops operations in response to a fire, explosion, emission, or discharge, the Emergency Coordinator must ensure that adequate monitoring is conducted for leaks, pressure buildup, gas generation, or ruptures in valves, pipes, or other equipment whenever this is appropriate.

The Emergency Coordinator will oversee and direct facility personnel in the performance of their responsibilities for addressing the emergency situation. Immediately following an emergency, the Emergency Coordinator (with PADEP approval) must provide for treating, storing, or disposing residues, contaminated soil, etc., from an emission, discharge, fire, or explosion at the construction site. The Emergency Coordinator must ensure that in the affected areas of the facility, no material incompatible with the emitted or discharged residues is processed, stored, treated, or disposed until cleanup procedures are completed and that all emergency equipment utilized in implementation of the PPC Plan is cleaned and fit for its intended use before operations are resumed. Newfield will notify PADEP and the appropriate State or local

authorities that the facility is in compliance before operations are resumed in the affected areas of the facility. Newfield will note the time, date and details of an incident that requires implementing the PPC Plan.

Within 15 days after the incident, Newfield will submit a written report on the incident to PADEP and the U.S. Environmental Protection Agency regional administrator. The report must be submitted to:

Director - Bureau of Water Quality Management
Pennsylvania Department of Environmental Protection
909 Elmerton Avenue
Harrisburg, PA 17110

Regional Administrator
U.S. Environmental Protection Agency
Region III
1650 Arch Street
Philadelphia, PA 19103

Director - PADEP Northeast Office
Pennsylvania Department of Environmental Protection
2 Public Square
Wilkes-Barre, PA 18711

The report should include the following information:

- Name, address, and telephone number of the individual filing the report;
- Name, address, and telephone number of the facility;
- Date, time, type, and location of incident;
- A brief description of the circumstances causing the incident;
- Description and estimated quantity (by weight) of materials or wastes involved;
- The extent of injuries, if any;
- An assessment of actual or potential threat to human health or the environment and assessment of contamination of land, water, or air, where applicable;
- Estimated quantity and disposition of recovered materials or wastes that resulted from the incident; and
- A description of what actions Newfield intends to take to prevent a similar occurrence in the future.

2.4 CHAIN OF COMMAND

Facility personnel must report emergency situations to the Emergency Coordinators. A Chain of Command flow chart (Table 5, Appendix C) has been developed and should be implemented during an emergency. The Emergency Response Chain of Command flow chart will be posted

next to all telephones onsite, posted in areas where potential emergency situations could arise, and placed in onsite company vehicles, as appropriate.

2.5 DISTRIBUTION OF THIS PPC PLAN

A copy of this PPC Plan and subsequent revisions will be distributed to:

- Drilling Manager (Primary Emergency Coordinator)
- Production Manager (Secondary Emergency Coordinator)

The PPC Plan will be reviewed and amended, if necessary, based on the criteria described earlier in Section 1.7.

3.0 SPILL AND LEAK PREVENTION AND RESPONSE

The site will be maintained and operated to minimize the possibility of a fire, explosion or discharge of oils, hazardous materials or their constituents to air, soil, surface water or groundwater which could threaten human health or the environment, in accordance with the requirements of 25 PA Code Section 265.31.

3.1 PRE-RELEASE PLANNING

The following sections discuss specific locations where the potential exists for accidental spills of oils and/or chemicals. The controls that are in place to minimize the potential for an uncontrolled release to the environment are also discussed. In the event that an uncontrolled spill of hazardous substances occurs, the procedures described in Section 4.0 will be followed.

To enhance spill prevention at the facility, great care will be exercised in handling oil and other materials covered in this PPC Plan. Any unusual conditions observed by any employees or contractors will be reported to one of the Emergency Response Coordinators. Management personnel whose responsibilities include involvement with the materials discussed in this document will also be familiar with this plan and the procedures recommended for spill prevention.

Spill Prevention Measures: Procedures that are to be followed to prevent and/or minimize oil spills at the Newfield facility include:

- ASTs and/or containers will be stored in secondary containment with sufficient volume;
- ASTs and regulated material containers will be visually inspected weekly for leaks;
- Special care will be taken when transferring regulated materials to prevent product loss;
- Regulated materials will be stored in a manner that minimizes the potential for contact with stormwater;
- Absorbent and spill control materials shall be maintained on-site for emergency use;

- Emergency response personnel will be familiar with procedures to follow in the case of a spill; and
- In cases where there may be leaking equipment or operations where oil or oil-related compounds are leaked, spilled, or otherwise released, containment booms or absorbent materials shall be used and equipment shall be repaired.

In the event that an uncontrolled spill of oil or a hazardous material occurs, the procedures described in Section 4.0 will be followed. Responses should be coordinated with federal, state and local agencies as appropriate.

3.2 MATERIAL COMPATIBILITY

The majority of materials received on-site in totes, drums, pails or other small containers are stored in the containers supplied by the manufacturer.

Construction materials used for the ASTs have been selected and designed to be compatible with the materials that are being stored and are typical for the natural gas industry.

3.3 INSPECTIONS AND MONITORING PROGRAM

Operating equipment will be inspected daily, and a copy of the inspection and maintenance form is included in Appendix A. Employees are responsible for detecting and reporting potential problems on the inspection and maintenance form.

Storage tank inspections will be conducted weekly and include evaluation of the following: pumps, valves, and fittings for leaks; the tank condition for evidence of corrosion; secondary containment; evidence of spilled materials; and effectiveness of housekeeping practices.

Completed inspection forms and inspection reports will be maintained in the Primary Emergency Coordinator's office. Noncompliance issues identified during the comprehensive site evaluation will be addressed in a timely manner. If additional control measures are required, implementation of the measures will generally occur within 90 days of the site evaluation. Compliance issues that require revisions to the PPC Plan (description of additional pollutant sources, measures, or controls) will be incorporated into the plan within approximately 15 days of the site evaluation.

Stormwater Management System: Stormwater inspections will include an evaluation of best management practices (BMPs), where appropriate. In accordance with the erosion and sedimentation control plan prepared for the site, erosion and sedimentation control (ESC) measures will be implemented where there is the potential for sediment or soil particles to impact stormwater quality. Repairs will be made, as necessary, following the site inspection.

Storage Tanks and Drum Storage Areas: Tanks and drum storage areas will be accessed daily. Spills or leaks that may occur will be contained by secondary containment and noted as part of routine facility operations. To enhance the daily observations, periodic inspections will be performed for the tank and drum storage areas as described in Table 2. The inspections will include observation of spill and/or leaks and observations of the condition of associated secondary containment structures. Records for the inspections will be maintained in the Primary Emergency Coordinator's office.

3.4 PREVENTIVE MAINTENANCE

Newfield will ensure that preventative maintenance of operating machinery on each construction site is performed regularly.

3.5 HOUSEKEEPING PROGRAM

The Newfield Construction Manager will be responsible for general construction site housekeeping. Specific steps taken under this program will include:

- Debris and/or sediment removal, as necessary.
- Regular refuse pickup and disposal.
- Proper filling and emptying of storage containers, tanks, and equipment to minimize spill potential.
- Periodic review of good housekeeping procedures in the employee-training program.

Once completed, the Production Manager will have overall responsibility for housekeeping at the facility. Newfield currently does not anticipate that bulk quantities of hazardous waste materials will be stored at the facility.

3.6 SECURITY

The facility is not fully fenced but is located in a remote location with limited access except via the site access road. The facility is normally manned during drilling and well development.

Flow and drain valves are locked and in the off position when in non-operational or non-standby status. The starter controls for each oil pump are locked in the off position when in non-operating or non-standby status. Master flow/drain valves are all located on the Facility and monitored by staff.

Any loading/unloading connections of facility piping is capped or blind flanged when not in service or is in standby service for an extended amount of time.

The facility has lighting sufficient for detection of spills during nighttime operations. Consideration has been given to: (a) discovery of spills occurring during hours of darkness, both by operating personnel, if present, and by non-operating personnel, and (b) prevention of spills occurring through acts of vandalism.

3.7 EXTERNAL FACTOR PLANNING

External factors are not anticipated to increase the risk of a spill or release that would impact human safety or the environment. Power outages, adverse weather conditions, or employee strikes could result in discontinuation of earth moving, drilling or well preparation activities. The Emergency Coordinator will monitor operations and initiate their orderly shutdown when necessary.

Access road conditions may be impacted by adverse weather conditions, possibly increasing the risk of a release of materials being delivered or removed. Truck drivers should report poor road conditions to the Construction or Drilling Manager. If conditions deteriorate to where they may impact safe movement of materials, the construction or Drilling Manager will review the conditions and initiate repairs or road closure as deemed necessary.

3.8 EMPLOYEE TRAINING PROGRAM

Newfield's employee training program enables employees to understand the processes and materials with which they are working, the safety and health hazards, the practices for preventing spills, and the procedures for responding properly and rapidly to spills. It also familiarizes personnel with emergency procedures.

All Newfield employees receive job specific training. Emergency Coordinators, Well Tenders, and other oil or hazardous material handling employees receive annual training on the facility's PPC and SPCC plans.

Job specific training includes preventive maintenance, inspection and monitoring activities, shut down procedures and housekeeping practices. PPC training will include spill/release recognition, initial response, initial notifications and follow-up. The training program is designed to ensure that personnel are able to respond effectively to emergencies by familiarizing them with emergency procedures, emergency equipment systems including, where applicable: procedures for using, inspecting, repairing, and replacing emergency and monitoring equipment; key parameters for automatic cut-off systems; communications and alarms systems; response to fires and explosions; site evacuation procedures; and shutdown of operations.

Annual right-to-know training for all facility employees is conducted relevant to the materials present at the facility. Employees will be given detailed instructions regarding the materials and wastes with which they are working; including safety and health hazards, handling methods, proper disposal procedures, and emergency procedures. The location of MSDS's for on-site materials will be identified to all employees.

Training records will be maintained at the facility and in the employee's personnel file.

4.0 COUNTERMEASURES

4.1 COUNTERMEASURES TO BE UNDERTAKEN BY FACILITY

The following sections present general spill response practices to be implemented at the Newfield facility, as appropriate.

4.1.1 Spill Clean-Up Procedures - General

Incidental spills should be contained and cleaned up when discovered per the employees job related training. Clean up material should be placed into a marked container and the Construction or Drilling Manager notified appropriately.

For large spills or spills of oils or hazardous materials which may reach surface water or impact the environment, the employee who first discovers the spill should contact the Emergency Coordinator. He should then work to contain and clean-up the spill.

Spill clean-up involves three steps: containment, removal, and disposal. In the event of a spill, it is very important that the material be contained to the maximum extent possible in order to minimize the effect of the spill and the cost of clean-up. **NOTE: ANY SHEEN ON A WATERBODY (STREAM, RIVER, OR WETLAND) IS A REPORTABLE RELEASE.** Once the spill is contained, the spilled material and contaminated material must be collected and physically removed from the area

4.1.2 Spill Clean-Up Procedures - Specific

The employee should do the following:

- Contain the spill to the smallest area possible using absorbent materials, earthen dikes or other diversion or containment structures. Stormwater collection structures will be either blocked or pumped.
- Block off the area to prevent traffic or employees from entering the area.
- For oils and other organic materials, apply a non-reactive sorbent material, such as Oil-Dri or Kitty Litter, to the spill.
- In the case of a spill of acids hazardous waste, check the MSDS and then neutralize with lime or soda ash if appropriate.
- If a leaking tank is involved, stop liquid flows as appropriate and dike the tank area with earth or absorbent material.

- If a leaking pail, drum or other small container is involved, place it in an over-pack container.
- Clean up spilled material and place it in a marked container.
- Work with the emergency coordinator to properly store the material and arrange for proper disposal

4.1.3 Fire or Explosion

In the case of a fire or explosion, the local fire department should be notified by calling 911. Employees may attempt to extinguish fires using handheld fire extinguishers based upon their job training.

The Emergency Coordinator will determine if evacuation per section 4.4 is required.

4.2 COUNTERMEASURES TO BE UNDERTAKEN BY CONTRACTORS

The following list shows area emergency response contractors to contact should the facility require outside help.

Company: Minuteman Spill Response, Inc.
Address: P.O. Box 10
Mifflinville, PA 18631
Telephone Number: 570-759-3658
Response Time: Approximately 2 to 3 hrs
Equipment and Services: Hazardous Materials Emergency Response

4.3 INTERNAL AND EXTERNAL COMMUNICATIONS AND ALARM SYSTEM

This section describes the internal communications or alarm used to provide immediate emergency instruction (voice or signal) to installation personnel, and the external communications or alarm system used to summon emergency assistance from local police or fire departments.

Newfield facilities in Wayne County are remote and generally do not have land-line telephone systems or alarm systems. The primary means of communication is via voice or mobile telephones. Mobile phones are provided to the Drilling and Production Managers (Primary and Secondary Emergency Coordinators).

Fire, police, and emergency service can be summoned by calling the 911 or per the numbers listed in Table 3.

4.4 EVACUATION PLAN

In the unlikely event that the site must be evacuated, the Emergency Coordinator will alert personnel to re-group at the pre-designated location for attendance taking. The Emergency Coordinator is responsible to verify that all site workers are accounted for during an evacuation. Periodic drills will be conducted, if deemed necessary, to evaluate the effectiveness of this evacuation plan.

If an emergency situation requires evacuation of personnel, the Emergency Coordinator will implement the following evacuation procedures:

1. The Emergency Coordinator will provide evacuation instructions to facility personnel via the construction site communications network, as appropriate.
2. Personnel evacuation will typically proceed as follows:
 - a. If downwind of incident: Evacuate via the most accessible route perpendicular to the prevailing wind direction.
 - b. If upwind of incident: Evacuate in an upwind direction.
3. Personnel will reassemble at the public road at the facility entrance as shown on Figure 3 or an alternate assembly point identified by the Emergency Coordinator, that is upwind of the incident location, and remain at this location until the Emergency Coordinator has accounted for all personnel.
4. The names of employees and the destination of employees transported to hospitals, etc. for treatment will be recorded by the Emergency Coordinator, first aid personnel or fire officials.

Once on public roadways, evacuation routes are left up to the individual.

4.5 EMERGENCY EQUIPMENT AVAILABLE FOR RESPONSE

This section provides a list of available emergency equipment, and procedures for maintenance and decontamination of emergency equipment. Newfield's emergency equipment at the facility will allow personnel to respond safely and quickly to emergency situations. Equipment will be inspected and maintained by Construction Manager to assure recommended quantities are available and its proper operation in time of emergency. After an emergency, equipment will be decontaminated, cleaned, and re-fit for its intended use before normal operations resume.

The Newfield facility will be equipped with the following emergency response equipment:

- (1) Mobile telephones are provided to the Drilling and Production Managers and are immediately available at the scene of operations for summoning emergency assistance from local police departments, fire departments or State or local emergency response teams.
- (2) Portable fire extinguishers, fire control equipment, spill control equipment and decontamination equipment. This equipment is detailed in Table 4 of Appendix C.

5.0 EMERGENCY SPILL CONTROL NETWORK

5.1 ARRANGEMENTS WITH LOCAL EMERGENCY RESPONSE AGENCIES AND HOSPITALS

This section provides a list of local emergency response agencies and hospitals, and associated phone numbers. Arrangements can be made, as appropriate, to inform local emergency response agencies and hospitals concerning the type of materials handled at the Newfield facility and the potential need for services.

If appropriate, arrangements can be made to designate who will be the primary emergency response agency and who will provide support services during emergencies. Efforts can be made to familiarize police, fire departments, emergency response teams, and the Wayne County Emergency Management Agency (EMA) Coordinator with the layout of the site, the properties and dangers associated with any hazardous materials handled, places where personnel would normally be working, entrances to roads inside the site, and potential evacuation routes.

If considered appropriate by Newfield's Emergency Coordinator, agreements with hospitals and emergency response agencies can be made and included in the periodic updating or amending of the PPC Plan. The agreements and/or arrangements include efforts to familiarize area agencies and emergency responders with facility operations and potential emergency operations. The following agencies can be contacted and provided with a copy of this PPC Plan, at the discretion of the Newfield Emergency Coordinator.

- Local fire companies;
- Local county emergency response personnel;
- Local ambulance personnel; and
- Local hospital.

Table 3 lists local emergency response agencies to be contacted in the event of an emergency or reportable spill. In the unlikely event that a widespread emergency exists, the Wayne County EMA would be contacted first, and the Coordinator in turn could contact appropriate emergency response agencies through their communications network.

The Wayne County Emergency Management Agency can be contacted at (570) 253-1622. Routing of injured persons will be performed by emergency medical services personnel based on the number and type of injuries requiring treatment. The emergency medical services coordinator may be provided with a copy of this PPC Plan to assist in planning. The nearest hospitals are Catskill Regional Medical Hospital in Callicoon, New York, and Wayne County Memorial Hospital in Honesdale, Pennsylvania. The nearest fire departments are Callicoon Fire District in Callicoon, New York, Protection Engine Co No. 3 in Honesdale, Pennsylvania, and Narrowsburg Fire Department, in Narrowsburg, New York. The nearest police departments are the Honesdale Police Department, located in Honesdale, Pennsylvania, and Waymart Police Department in Honesdale Pennsylvania. All emergency response departments shall be reached through the 911 system.

5.2 NOTIFICATION LISTS

If the Emergency Coordinator determines that the facility has had an emission, discharge, fire, or explosion that could threaten human health or the environment, he will contact and report as necessary his findings to the appropriate agencies listed in Table 3. When calling any of the agencies listed in Table 3, the following information should be available for reporting to the identified agencies:

- Company name and location;
- Name of person reporting the spill, title, and telephone number;
- The type of material released;
- Estimated or exact (if known) quantity of material released (i.e., gallons, pounds, etc.);
- A brief description of the incident, including type of incident, nature of hazardous material involvement, and possible hazards to human health and the environment outside the facility;
- Probable source and location of the spill source;
- Date and time of the spill;
- Location of entry point into surface water and amount reaching the waterway (if applicable);
- The name of the receiving water and the downstream water bodies of which it is a tributary;
- Confirmation that release has been stopped or, if not, when will it be stopped;
- Mitigation/containment actions initiated;
- Direction of material movement;

- Potential population affected by the release;
- Name of person to contact on behalf of the company who will be at the scene and will be directing response measures;
- Telephone number where the on-scene coordinator can be reached; and
- The extent of injuries, if any.

A reporting form is attached in Appendix D for use by the Emergency Coordinator.

A written report including the above listed information, and other information that may be required by the applicable regulations (see 25 PA Code Section 265.56) regarding the spilled material, will need to be transmitted within 15 days to the following agencies:

U.S. Environmental Protection Agency
Region III
Spill Response Section
1650 Arch Street
Philadelphia, PA 19103

Pennsylvania Department of Environmental Protection
Bureau of Water Quality Management
2 Public Square
Wilkes-Barre, Pennsylvania 18711

6.0 WASTE DISPOSAL PRACTICES

Produced water will be removed periodically from the tanks at each well site and transported by a licensed residual waste hauler to a permitted disposal facility. Other wastes generated onsite will include used hydraulic oil that will be reclaimed from operating equipment and transported offsite for recycling. All wastes will be disposed in accordance with applicable local, state, and federal regulations.

7.0 STORMWATER MANAGEMENT PRACTICES

Newfield implements several Best Management Practices (BMPs) at each well site to reduce the potential for stormwater runoff of suspended solids and other contaminants. These BMPs include routine visual inspections, preventive maintenance, good housekeeping, and management of stormwater run-on and runoff. Routine inspection and monitoring, preventive maintenance, and good housekeeping programs are discussed in Sections 3.3, 3.4, and 3.5 of this PPC Plan. These programs prevent accidental releases of contaminants and reduce contaminant migrations via stormwater discharges. Stormwater management activities are discussed in Section 3.1 of this PPC Plan. The certification statement regarding the evaluation of discharges and confirmation that they will be comprised solely of stormwater is presented at the beginning of this Plan. Potential "significant sources of non-stormwater at the site" may include condensate, brine, hydraulic oil drums and tanks, gasoline and diesel fuel. Storage areas for these significant sources will be inspected on a daily basis.

8.0 SEDIMENT AND EROSION PREVENTION

Erosion and sedimentation controls are managed in accordance with PADEP requirements. Copies of the site E&S Plan are available at the Newfield office in Honesdale, PA and at each well site.

APPENDIX A
INSPECTION FORMS

**NEWFIELD APPALACHIA PA LLC
Weekly Facility Inspection Form**

| | |
|----------------------------|------------------------|
| Facility: | Inspector Name: |
| | |
| Date of Inspection: | |
| | |

Instructions: Indicate yes or no. If no, record observations describing the specific equipment and discrepancy.

| Aboveground Storage Tanks | | |
|---|------------------------------|-----------------------------|
| • Equipment appears adequately supported | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • No evidence of active or past leaks from equipment, piping, connections, vales, vents, etc. | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Coating condition appears satisfactory | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Corrosion appears acceptable | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Level gauages/alarms are operative | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Containers are labeled | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Observations: | | |

| Processing Equipment | | |
|---|------------------------------|-----------------------------|
| • Equipment appears adequately supported | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • No evidence of active or past leaks from equipment, piping, connections, vales, vents, etc. | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Coating condition appears satisfactory | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Corrosion appears acceptable | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Observations: | | |

| Other Facility Equipment is Checked for: | | |
|---|------------------------------|-----------------------------|
| ❖ No evidence of active or past leaks | | |
| ❖ Condition of equipment appears to be satisfactory (i.e., not damaged, deteriorated, or worn), and | | |
| ❖ Corrosion appears to be acceptable. | | |
| • Wellheads | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Gathering systems | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Well test stations | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Traps/Sumps | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Drainage systems and nearby ditches | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Applicable flowlines including right-of-way areas | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Containment systems | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Facility piping | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Observations: | | |

**NEWFIELD APPALACHIA PA LLC
Weekly Facility Inspection Form**

Secondary Containment

- | | | |
|--|------------------------------|-----------------------------|
| • Passive containment (berm) has adequate capacity and integrity as intended | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Active containment measures are adequate | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • No evidence of active or past leaks (i.e., staining, sheen) | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Any valves are closed and plugged | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Active containment is free from a significant quantity of rain/snow | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

Observations:

Security

- | | | |
|--|------------------------------|-----------------------------|
| • Lighting is adequate to observe leaks, spills, and vandalism | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Pumps, valves, nozzles are locked | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

Observations:

Spill Response

- | | | |
|---|------------------------------|-----------------------------|
| • Spill response kits are stocked and located in readily accessible areas | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
|---|------------------------------|-----------------------------|

Observations:

Signature:

Date:

E&S INSPECTION FORM

The E&S plan contains a maintenance program which provides for inspection of BMPs (Best Management Practices such as filter sock, vegetation, construction entrances, etc.) on a weekly basis and after each measurable rainfall event, including the repair of BMPs to ensure effective and efficient operation. The maintenance program for both the temporary and permanent erosion and sediment control BMPs, including disposal of materials removed from the BMPs or project area, has been included in the narrative. The type of maintenance, such as cleanout, repair, replacement, regrading, re-stabilizing, etc. for each of the BMPs is included in the plan. **NOTE: This inspection report must be kept up to date and onsite.**

| INSPECTION DATE | INITIALS | RAINFALL OR WEEKLY? | LOCATION OF E&S CONTROL(S) | CONDITION NOTED | CORRECTIVE MEASURES TAKEN |
|-----------------|----------|---------------------|----------------------------|-----------------|---------------------------|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Facility: _____ Inspector: _____ Signed: _____ Date: _____
Print *Signature*

Tank Truck Loading and Unloading Checklist

Date: _____ Material being loaded/unloaded: _____

Driver/Loader present during loading or unloading of material _____
(signature)

_____ Current volume in storage tank was checked prior to loading.

_____ Fill hose inspected for condition prior to loading.

_____ Wheel chocks in place prior to loading.

_____ Tanker valve(s) were inspected for leakage prior to filling and departure.

_____ The loading of the tanker was monitored.

_____ Hoses were replaced and capped after loading.

_____ No material was spilled onto the containment pad or ground.

- These forms must be completed for every tank truck shipment and must be filed in the facility PPC Plan.
- All spills should be immediately reported to at least one of the following Newfield personnel:

Don Sleeth
Drilling Manager
Office: 281-674-2501
Cell: 281-974-0051

Jack Cochran
Production Manager
Office: 814-437-2344
Cell: 814-671-1557

Burl Eakle
Cell: 918-448-1296

Delivery Information

Invoice No. _____

Load No. _____

Company _____

APPENDIX B
FIGURES



TETRA TECH

Figure 1
Well Field Map
Newfield Exploration Company

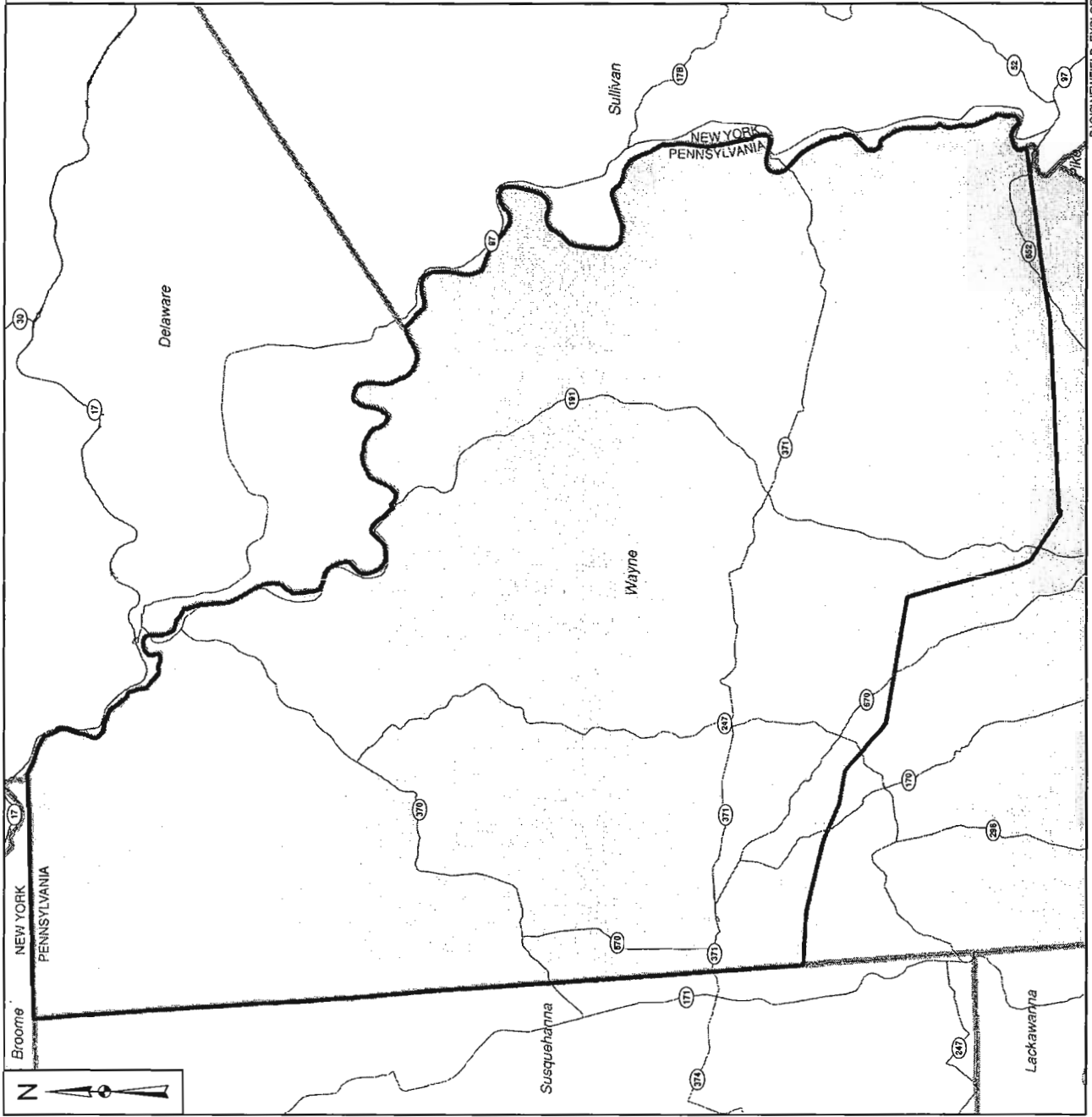
- Legend**
- Road (E)
 - County (E)
 - Wayne County (E)
 - Lease Area (N)

Sources:
 (E) - Indicates the data was provided by ESRI.
 (N) - Indicates the data was provided by Newfield Exploration Company

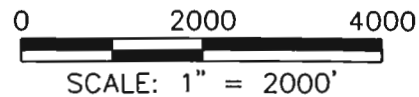


Drawn By: S. PAXTON 04/20/10
 Checked By: A. STRASSNER 04/20/10
 Approved By:

Contract Number: 112002679



C:\Documents and Settings\ben.hoppe\My Documents\CAD Work\2568\Woodland Management Partners Well\Figures\2568FC001.dwg PIT BEN.HOPPE 3/3/2010 4:01:53 PM



TETRA TECH

WWW.TETRATECH.COM

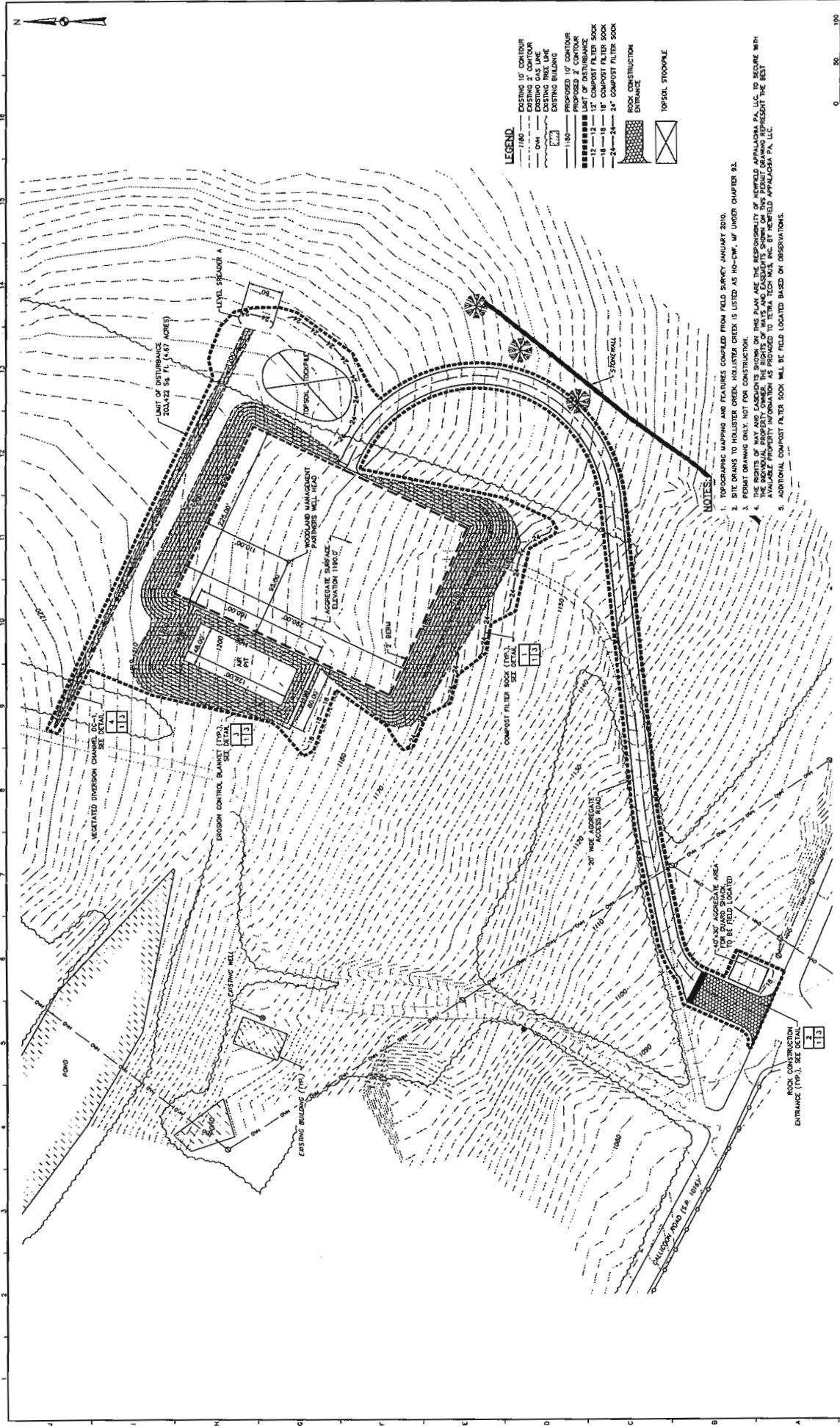
661 ANDERSEN DRIVE - FOSTER PLAZA 7
PITTSBURGH, PA 15220
T: (412) 921-7090 | F: (412) 921-4040

NEWFIELD APPALACHIA PA, LLC
WAYNE COUNTY, PENNSYLVANIA
WOODLAND MANAGEMENT PARTNERS
WELL PAD
LOCATION MAP
SCALE: 1" = 2000'

| | |
|--------------|-----------|
| DATE: | 3/4/10 |
| PROJECT NO.: | 112C02568 |
| DESIGNED BY: | RAL |
| DRAWN BY: | BH |
| CHECKED BY: | RAL |
| SHEET: | 1 OF 2 |

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FIGURE 2



- LEGEND**
- EXISTING 1' CONTOUR
 - EXISTING 2' CONTOUR
 - - - - - EXISTING GDE LINE
 - EXISTING BOUNDARY
 - EXISTING BUILDING
 - PROPOSED 1' CONTOUR
 - PROPOSED 2' CONTOUR
 - LIMIT OF DISTURBANCE
 - 1' COMPOST FILTER SOCK
 - 2' COMPOST FILTER SOCK
 - 24" COMPOST FILTER SOCK
 - ROCK CONSTRUCTION ENTRANCE
 - TOPSOIL STOCKPILE

NOTES:

1. TOPOGRAPHIC MAPPING AND FEATURES COMPILED FROM FIELD SURVEY JANUARY 2016.
2. SITE DRAWS TO HULLSTETER CREEK. HULLSTETER CREEK IS LISTED AS 10-CW, W/ UNDER CHAPTER 93.
3. EROSION CONTROL NOT FOR CONSTRUCTION.
4. THE CLIENT HAS ADVISED THAT THE RIGHTS OF THIS PROPERTY ARE OWNED BY WOODLAND APPALACHIA PA, LLC. TO SECURE WITH THE BOUNDARY PROPERTY OWNER, THE RIGHTS OF THIS PROPERTY SHOWN ON THIS PLANIT DRAWING REPRESENT THE BEST AVAILABLE PROPERTY INFORMATION AS PROVIDED TO TETRA TECH INC. BY WOODLAND APPALACHIA PA, LLC.
5. ADDITIONAL COMPOST FILTER SOCK WILL BE FIELD LOCATED BASED ON OBSERVATIONS.

SCALE: 1" = 50'

DATE: 01/23/16
 PROJECT NO.: 1132203
 DESIGNED BY: BR
 DRAWN BY: BR
 CHECKED BY: BR
 SHEET: 1 OF 7
 CONTRACT NO.: 2015-00001
FIGURE 3

NEWFIELD APPALACHIA PA LLC.
 WAYNE COUNTY, PENNSYLVANIA

WOODLAND MANAGEMENT PARTNERS WELL PAD
 EROSION & SEDIMENT CONTROL PLAN

| MARK | DATE | DESCRIPTION | BY |
|------|------|-------------|----|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

TETRA TECH
 www.tetra-tech.com
 681 ANDERSON DRIVE, SUITE 1000
 PITTSBURGH, PA 15220
 P: (412) 251-2990 F: (412) 251-0440

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APPENDIX C
TABLES

TABLE 1

LIST OF MATERIALS & WASTES

CONSTRUCTION

| POLLUTIONAL MATERIAL | VOLUME OR QUANTITY | LOCATION ONSITE | SPILL CONTAINMENT MATERIALS ONSITE/LOCATION |
|-----------------------------|---------------------------|------------------------|--|
| Diesel Fuel | 250 gallons | Well Pad | Sorbent pads; shovels/Gang box |
| Lubricants | 180 gallons | Well Pad | Sorbent pads; shovels/Gang box |
| OIL ABSORBANT | 2,500 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Trash & Debris | 2,000 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| | | | |

DRILLING

| POLLUTIONAL MATERIAL | VOLUME OR QUANTITY | LOCATION ONSITE | SPILL CONTAINMENT MATERIALS ONSITE/LOCATION |
|--|---------------------------|------------------------|--|
| Diesel Fuel | 2000 gallons | Well Pad | Sorbent pads; shovels/Gang box |
| Lubricants | 320 gallons | Well Pad | Sorbent pads; shovels/Gang box |
| DURATONE HT | 2,500 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| GELTONE V | 2,500 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Lime | 7,500 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| OIL ABSORBANT | 2,500 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Base Fluid | 300 bbl | Well Pad | Sorbent pads; shovels/Gang box |
| Rig Wash | 2,000 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Calcium Chloride (CaCl ₂) | 4,000 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| RHEMOD L | 1,770 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| LE SUPERMUL | 8,500 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| BARACARB 25, 50 (2 pallets each) | 12,600 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| WALNUT | 2,400 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| DRILTREAT | 1,900 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Liquid Mud | 1,500 bbl | Well Pad | Sorbent pads; shovels/Gang box |
| BAROID REGULAR / **BAROID BULK (barite) | 125,000 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Trash & Debris | 2,000 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Drill Cuttings | 100,000 lbs | Air Pit | Sorbent pads; shovels/Gang box |
| Cement | 130,000 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| | | | |

TABLE 2

INSPECTION AND MONITORING ACTIVITIES

| Activity | Frequency |
|---|--|
| Erosion and Sedimentation Control Measures | Weekly or after a significant rain event |
| Aboveground Storage Tanks | Daily |
| Drum Storage Areas | Daily |
| Best Management Practices (BMPs) | Per BMP requirements |
| Dust Control Measures | Daily |
| Preparedness, Prevention, and Contingency (PPC) Plan Compliance Evaluation Inspections and Update of PPC Plan, as Appropriate | Annually |

**TABLE 3
AGENCY NOTIFICATION LIST**

The following agencies are to be contacted, as appropriate, in the event of an emergency, accident, or chemical release.

| <u>Agency</u> | <u>Telephone No.</u> |
|---|----------------------|
| PADEP Northeast Regional Office | 570-826-2511 |
| PADEP Southcentral Office (Harrisburg) | 877-333-1904 |
| Pennsylvania Emergency Management Agency | 717-651-2001 |
| Police Department | 9-1-1 |
| Volunteer Fire Department | 9-1-1 |
| U.S. Environmental Protection Agency | 215-814-5700 |
| U.S. Coast Guard National Response Center | 800-424-8802 |
| U.S. Coast Guard (local) | 570-421-1191 |
| Pennsylvania Fish and Boat Commission | 814-445-8974 |
| Chemical Transportation Emergency Center: * Chemical Exposure Information | 800-424-9300 |

LOCAL EMERGENCY RESPONSE:

| | |
|---|--------------|
| Fire Department – Callicoon Fire District in Callicoon, New York, Protection Engine Co No. 3 in Honesdale, Pennsylvania Narrowsburg Fire Department, in Narrowsburg, New York. | 9-1-1 |
| Police Department – Honesdale Police Department, Honesdale, Pennsylvania Waymart Police Department, Honesdale Pennsylvania | 9-1-1 |
| Hospitals-Wayne County Memorial Hospital, Honesdale, Pennsylvania | 570-251-6672 |
| Catskill Regional Medical Hospital in Callicoon, New York | 845-887-5530 |
| Local Emergency Management Wayne County EMA | 570-253-1622 |

TABLE 4

On-Site Emergency Response Equipment

| On-Site Emergency Response Equipment |
|---|
| Fire Extinguishers |
| Tyvek Suits |
| Nitrile Gloves |
| Hearing Protection |
| Particulate Adsorbent |
| Absorbent Pads |
| Shovels |
| Earth Moving Equipment |
| Decontamination Equipment |

**TABLE 5
CHAIN OF COMMAND**

Primary Emergency Coordinator

Don Sleeth
Drilling Manager
Office: 281-674-2501
Cell: 281-974-0051

Secondary Emergency Coordinator

Jack Cochran
Production Manager
Office: 814-437-2344
Cell: 814-671-1557

Construction Manager

Burl Eakle
Cell: 918-448-1296

Offsite Emergency Response Contractors

Company: Minuteman Spill Response, Inc.
Telephone Number: 800-905-7788

**APPENDIX D
REPORTING FORM**

Spill Response Notification Form

| | | | |
|--|---------------|---|-------------------------|
| GENERAL REPORTING INFORMATION | | | |
| Prepared _____ | | | |
| (First) | (M.I.) | (Last) | (Position) |
| Daytime phone: (xxx) xxx-xxxx | | Evening phone: (xxx) xxx-xxxx | |
| Newfield Appalachia PA LLC | | | |
| (Company) | (Address) | (City) | (State) (Zip) |
| Calling for responsible party? Yes | | Were materials discharged? Yes Confidential? No | |
| Meeting Federal obligations to report: Yes | | | |
| INCIDENT DESCRIPTION | | | |
| Source and/or cause: | | | |
| Date of Incident: Time of Incident: | | | |
| Incident Location/Address | | | |
| Nearest City: XXXX, PA XXXXX (XXXXXXXX County) | | | |
| Distance from City: In city limits | | Direction from City: In city limits | |
| Facility Oil Storage Capacity: XXXXXX gallons | | | |
| Container Type: Container Capacity: | | (gals) | |
| Facility Latitude: xx° xx' xx" Longitude xx° xx' xx" | | | |
| MATERIAL | | | |
| Name (or CHRIS Code): | | | |
| Discharged Quantity (Units): | | Discharged to Water (Units): | |
| RESPONSE ACTION | | | |
| Actions taken to correct, control or mitigate incident: | | | |
| IMPACT | | | |
| No. of Injuries: | | No. of Deaths: | Other: |
| Evacuation (Y/N): | Damage (Y/N): | Amount (\$): | |
| Medium Affected: | Description: | | Additional Information: |
| AGENCY NOTIFIED | | | |
| NRC 800-424-8802 | Date: | Time: | Contact: |
| PADEP (570) 826-2511 | Date: | Time: | Contact: |
| USCG | Date: | Time: | Contact: |
| Other | Date: | Time: | Contact: |
| ADDITIONAL INFORMATION: | | | |

APPENDIX E
MSDS SHEETS



MATERIAL SAFETY DATA SHEET

Diesel Fuel (All Types)

MSDS No. 9909

EMERGENCY OVERVIEW

CAUTION!

OSHA/NFPA COMBUSTIBLE LIQUID - SLIGHT TO MODERATE IRRITANT
EFFECTS CENTRAL NERVOUS SYSTEM
HARMFUL OR FATAL IF SWALLOWED

Moderate fire hazard. Avoid breathing vapors or mists. May cause dizziness and drowsiness. May cause moderate eye irritation and skin irritation (rash). Long-term, repeated exposure may cause skin cancer. If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs).



NFPA 704 (Section 16)

1. CHEMICAL PRODUCT AND COMPANY INFORMATION

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

EMERGENCY TELEPHONE NUMBER (24 hrs): CHEMTREC (800) 424-9300
COMPANY CONTACT (business hours): Corporate Safety (732) 750-6000
MSDS INTERNET WEBSITE: www.hess.com (See Environment, Health, Safety & Social Responsibility)

SYNONYMS: Ultra Low Sulfur Diesel (ULSD); Low Sulfur Diesel; Motor Vehicle Diesel Fuel; Diesel Fuel #2; Dyed Diesel Fuel; Non-Road, Locomotive and Marine Diesel Fuel; Tax-exempt Diesel Fuel

See Section 16 for abbreviations and acronyms.

2. COMPOSITION and CHEMICAL INFORMATION ON INGREDIENTS

| INGREDIENT NAME (CAS No.) | CONCENTRATION PERCENT BY WEIGHT |
|---------------------------|---------------------------------|
| Diesel Fuel (68476-34-6) | 100 |
| Naphthalene (91-20-3) | Typically < 0.01 |

A complex mixture of hydrocarbons with carbon numbers in the range C9 and higher. Diesel fuel may be dyed (red) for tax purposes. May contain a multifunctional additive.

3. HAZARDS IDENTIFICATION

EYES

Contact with liquid or vapor may cause mild irritation.

SKIN

May cause skin irritation with prolonged or repeated contact. Practically non-toxic if absorbed following acute (single) exposure. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.

INGESTION

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.



MATERIAL SAFETY DATA SHEET

Diesel Fuel (All Types)

MSDS No. 9909

INHALATION

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

CHRONIC EFFECTS and CARCINOGENICITY

Similar products produced skin cancer and systemic toxicity in laboratory animals following repeated applications. The significance of these results to human exposures has not been determined - see Section 11 Toxicological Information.

IARC classifies whole diesel fuel exhaust particulates as probably carcinogenic to humans (Group 2A). NIOSH regards whole diesel fuel exhaust particulates as a potential cause of occupational lung cancer based on animal studies and limited evidence in humans.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash).

4. FIRST AID MEASURES

EYES

In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

SKIN

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

INGESTION

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

INHALATION

Remove person to fresh air. If person is not breathing provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES:

| | |
|-------------------------------|---------------------------------|
| FLASH POINT: | > 125 °F (> 52 °C) minimum PMCC |
| AUTOIGNITION POINT: | 494 °F (257 °C) |
| OSHA/NFPA FLAMMABILITY CLASS: | 2 (COMBUSTIBLE) |
| LOWER EXPLOSIVE LIMIT (%): | 0.6 |
| UPPER EXPLOSIVE LIMIT (%): | 7.5 |

FIRE AND EXPLOSION HAZARDS

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

EXTINGUISHING MEDIA

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO₂, water spray, fire fighting foam, or Halon.



MATERIAL SAFETY DATA SHEET

Diesel Fuel (All Types)

MSDS No. 9909

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

FIRE FIGHTING INSTRUCTIONS

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

6. ACCIDENTAL RELEASE MEASURES

ACTIVATE FACILITY'S SPILL CONTINGENCY OR EMERGENCY RESPONSE PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

7. HANDLING and STORAGE

HANDLING PRECAUTIONS

Handle as a combustible liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Diesel fuel, and in particular low and ultra low sulfur diesel fuel, has the capability of accumulating a static electrical charge of sufficient energy to cause a fire/explosion in the presence of lower flashpoint products such as gasoline. The accumulation of such a static charge occurs as the diesel flows through pipelines, filters, nozzles and various work tasks such as tank/container filling, splash loading, tank cleaning; product sampling; tank gauging; cleaning, mixing, vacuum truck operations, switch loading, and product agitation. There is a greater potential for static charge accumulation in cold temperature, low humidity conditions.

Documents such as 29 CFR OSHA 1910.106 "Flammable and Combustible Liquids, NFPA 77 Recommended Practice on Static Electricity, API 2003 "Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents and ASTM D4865 "Standard Guide for Generation and Dissipation of Static



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Electricity in Petroleum Fuel Systems" address special precautions and design requirements involving loading rates, grounding, bonding, filter installation, conductivity additives and especially the hazards associated with "switch loading." ["Switch Loading" is when a higher flash point product (such as diesel) is loaded into tanks previously containing a low flash point product (such as gasoline) and the electrical charge generated during loading of the diesel results in a static ignition of the vapor from the previous cargo (gasoline).]

Note: When conductivity additives are used or are necessary the product should achieve 25 picosiemens/meter or greater at the handling temperature.

STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

8. EXPOSURE CONTROLS and PERSONAL PROTECTION

EXPOSURE LIMITS

| Components (CAS No.) | Source | Exposure Limits | |
|---------------------------|--------|--|----------|
| | | TWA/STEL | Note |
| Diesel Fuel: (68476-34-6) | OSHA | 5 mg/m, as mineral oil mist | |
| | ACGIH | 100 mg/m ³ (as totally hydrocarbon vapor) TWA | A3, skin |
| Naphthalene (91-20-3) | OSHA | 10 ppm TWA | |
| | ACGIH | 10 ppm TWA / 15 ppm STEL | A4, Skin |

ENGINEERING CONTROLS

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

EYE/FACE PROTECTION

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

SKIN PROTECTION

Gloves constructed of nitrile, neoprene, or PVC are recommended. Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.



MATERIAL SAFETY DATA SHEET

Diesel Fuel (All Types)

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RESPIRATORY PROTECTION

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

9. PHYSICAL and CHEMICAL PROPERTIES

APPEARANCE

Clear, straw-yellow liquid. Dyed fuel oil will be red or reddish-colored.

ODOR

Mild, petroleum distillate odor

BASIC PHYSICAL PROPERTIES

BOILING RANGE: 320 to 690 oF (160 to 366 °C)
VAPOR PRESSURE: 0.009 psia @ 70 °F (21 °C)
VAPOR DENSITY (air = 1): > 1.0
SPECIFIC GRAVITY (H₂O = 1): 0.83 to 0.88 @ 60 °F (16 °C)
PERCENT VOLATILES: 100 %
EVAPORATION RATE: Slow; varies with conditions
SOLUBILITY (H₂O): Negligible

10. STABILITY and REACTIVITY

STABILITY: Stable. Hazardous polymerization will not occur.

CONDITIONS TO AVOID and INCOMPATIBLE MATERIALS

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Keep away from strong oxidizers; Viton ®; Fluorel ®

HAZARDOUS DECOMPOSITION PRODUCTS

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

11. TOXICOLOGICAL PROPERTIES

ACUTE TOXICITY

Acute dermal LD50 (rabbits): > 5 ml/kg Acute oral LD50 (rats): 9 ml/kg
Primary dermal irritation: extremely irritating (rabbits) Draize eye irritation: non-irritating (rabbits)
Guinea pig sensitization: negative

CHRONIC EFFECTS AND CARCINOGENICITY

Carcinogenic: OSHA: NO IARC: NO NTP: NO ACGIH: A3

Studies have shown that similar products produce skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation.

MUTAGENICITY (genetic effects)

This material has been positive in a mutagenicity study.



MATERIAL SAFETY DATA SHEET

Diesel Fuel (All Types) **MSDS No. 9909**


12. ECOLOGICAL INFORMATION

Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

13. DISPOSAL CONSIDERATIONS

Consult federal, state and local waste regulations to determine appropriate disposal options.

14. TRANSPORTATION INFORMATION

| | | |
|---------------------------------|-------------------------|---|
| PROPER SHIPPING NAME: | Diesel Fuel | Placard (International Only): |
| HAZARD CLASS and PACKING GROUP: | 3, PG III |  |
| DOT IDENTIFICATION NUMBER: | NA 1993 (Domestic) | |
| | UN 1202 (International) | |
| DOT SHIPPING LABEL: | None | |

Use Combustible Placard if shipping in bulk domestically

15. REGULATORY INFORMATION

U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION

This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other regulations at the state and/or local level. Consult those regulations applicable to your facility/operation.

CLEAN WATER ACT (OIL SPILLS)

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

SARA SECTION 311/312 - HAZARD CLASSES

| <u>ACUTE HEALTH</u> | <u>CHRONIC HEALTH</u> | <u>FIRE</u> | <u>SUDDEN RELEASE OF PRESSURE</u> | <u>REACTIVE</u> |
|---------------------|-----------------------|-------------|-----------------------------------|-----------------|
| X | X | X | -- | -- |

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product may contain listed chemicals below the *de minimis* levels which therefore are not subject to the supplier notification requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372. If you may be required to report releases of chemicals listed in 40 CFR 372.28, you may contact Hess Corporate Safety if you require additional information regarding this product.

CALIFORNIA PROPOSITION 65 LIST OF CHEMICALS

This product contains the following chemicals that are included on the Proposition 65 "List of Chemicals" required by the California Safe Drinking Water and Toxic Enforcement Act of 1986:

| <u>INGREDIENT NAME (CAS NUMBER)</u> | <u>Date Listed</u> |
|--|--------------------|
| Diesel Engine Exhaust (no CAS Number listed) | 10/01/1990 |

CANADIAN REGULATORY INFORMATION (WHMIS)

Class B, Division 3 (Combustible Liquid) and Class D, Division 2, Subdivision B (Toxic by other means)



| |
|--|
| MATERIAL SAFETY DATA SHEET |
| Diesel Fuel (All Types) MSDS No. 9909 |

| |
|------------------------------|
| 16. OTHER INFORMATION |
|------------------------------|

NFPA® HAZARD RATING HEALTH: 0
FIRE: 2
REACTIVITY: 0

Refer to NFPA 704 "Identification of the Fire Hazards of Materials" for further information

HMIS® HAZARD RATING HEALTH: 1 * * Chronic
FIRE: 2
PHYSICAL: 0

SUPERSEDES MSDS DATED: 02/28/2001

ABBREVIATIONS:

AP = Approximately < = Less than > = Greater than
N/A = Not Applicable N/D = Not Determined ppm = parts per million

ACRONYMS:

| | | | |
|--------|---|-------|--|
| ACGIH | American Conference of Governmental Industrial Hygienists | NTP | National Toxicology Program |
| AIHA | American Industrial Hygiene Association | OPA | Oil Pollution Act of 1990 |
| ANSI | American National Standards Institute (212) 642-4900 | OSHA | U.S. Occupational Safety & Health Administration |
| API | American Petroleum Institute (202) 682-8000 | PEL | Permissible Exposure Limit (OSHA) |
| CERCLA | Comprehensive Emergency Response, Compensation, and Liability Act | RCRA | Resource Conservation and Recovery Act |
| DOT | U.S. Department of Transportation [General info: (800) 467-4922] | REL | Recommended Exposure Limit (NIOSH) |
| EPA | U.S. Environmental Protection Agency | SARA | Superfund Amendments and Reauthorization Act of 1986 Title III |
| HMIS | Hazardous Materials Information System | SCBA | Self-Contained Breathing Apparatus |
| IARC | International Agency For Research On Cancer | SPCC | Spill Prevention, Control, and Countermeasures |
| MSHA | Mine Safety and Health Administration | STEL | Short-Term Exposure Limit (generally 15 minutes) |
| NFPA | National Fire Protection Association (617)770-3000 | TLV | Threshold Limit Value (ACGIH) |
| NIOSH | National Institute of Occupational Safety and Health | TSCA | Toxic Substances Control Act |
| NOIC | Notice of Intended Change (proposed change to ACGIH TLV) | TWA | Time Weighted Average (8 hr.) |
| | | WEEL | Workplace Environmental Exposure Level (AIHA) |
| | | WHMIS | Canadian Workplace Hazardous Materials Information System |

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

MATERIAL SAFETY DATA SHEET

Review Date: 04/23/2007

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT: PENNZOIL™ LONG-LIFE™ Motor Oil (All Grades)

MSDS NUMBER: 614348LU - 1

PRODUCT CODE(S): 5071324, 5071325, 5071326, 5071369, 5071371

MANUFACTURER

SOPUS Products

P.O. Box 4427

Houston, TX. 77210-4427

TELEPHONE NUMBERS

Spill Information: (877) 242-7400

Health Information: (877) 504-9351

MSDS Assistance Number: (877) 276-7285

SECTION 2 PRODUCT/INGREDIENTS

| INGREDIENTS | CAS# | CONCENTRATION |
|-------------------------------|------------|-----------------|
| Heavy Duty Motor Oil | | |
| Highly refined petroleum oils | Mixture | 90 - 99 %volume |
| Zinc Dialkyldithiophosphate | 68649-42-3 | 1 - 5 %volume |
| Proprietary additives | Mixture | 1 - 5 %volume |

SECTION 3 HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Appearance & Odor: Bright and clear liquid. Mild odor.

Health Hazards: No known immediate health hazards.

Physical Hazards: No known physical hazards.

NFPA Rating (Health, Fire, Reactivity): 0, 1, 0

Hazard Rating: Least - 0 Slight - 1 Moderate - 2 High - 3 Extreme - 4

Inhalation:

Inhalation of vapors (generated at high temperatures only) or oil mist may cause mild irritation of the nose, throat, and respiratory tract.

Eye Irritation:

Lubricating oils are generally considered no more than minimally irritating to the eyes.

Skin Contact:

May cause slight irritation of the skin. If irritation occurs, a temporary burning sensation and minor redness and/or swelling may result.

Ingestion:

Lubricating oils are generally no more than slightly toxic if swallowed.

Other Health Effects:

The International Agency for Research on Cancer (IARC) has determined there is sufficient evidence for the carcinogenicity in experimental animals of used gasoline motor oils. Handling procedures and safety precautions in the MSDS should be followed to minimize exposure to the used product.

Signs and Symptoms:

Irritation as noted above.

Aggravated Medical Conditions:

Pre-existing eye, skin and respiratory disorders may be aggravated by exposure to this product.

For additional health information, refer to section 11.

SECTION 4 FIRST AID MEASURES

Inhalation:

Remove victim to fresh air and provide oxygen if breathing is difficult. Get medical attention. If the victim has difficulty breathing or tightness of the chest, is dizzy, vomiting or unresponsive, give 100% oxygen with rescue breathing or CPR as required and transport to the nearest medical facility.

Skin:

Remove contaminated clothing and shoes and wipe excess from skin. Flush skin with water, then wash with soap and water. If irritation occurs, get medical attention. Do not reuse clothing until cleaned. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.

Eye:

Flush with water. If irritation occurs, get medical attention.

Ingestion:

Do not induce vomiting. In general, no treatment is necessary unless large quantities of product are ingested. However, get medical attention.

Note to Physician:

In general, emesis induction is unnecessary in high viscosity, low volatility products such as oils and greases.

SECTION 5 FIRE FIGHTING MEASURES

Flash Point [Method]: >400 °F/>204.44 °C [Pensky-Martens Closed Cup]

Extinguishing Media:

Material will float and can be re-ignited on surface of water. Use water fog, foam, dry chemical or carbon dioxide (CO₂) to extinguish flames. Do not use a direct stream of water.

Fire Fighting Instructions:

Do not enter confined fire space without full bunker gear (helmet with face shield, bunker coats, gloves and rubber boots), including a positive pressure, NIOSH approved, self-contained breathing apparatus. This material is non-flammable.

Unusual Fire Hazards:

Material may ignite when preheated.

SECTION 6**ACCIDENTAL RELEASE MEASURES****Protective Measures:**

May burn although not readily ignitable.

Wear appropriate personal protective equipment when cleaning up spills. Refer to Section 8.

Spill Management:

FOR LARGE SPILLS: Remove with vacuum truck or pump to storage/salvage vessels.

FOR SMALL SPILLS: Soak up residue with an absorbent such as clay, sand or other suitable material. Place in non-leaking container and seal tightly for proper disposal.

Place in container for proper disposal. Remove contaminated soil to remove contaminated trace residues. Dispose of in same manner as material.

Reporting:

CERCLA: Product is covered by EPA's Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) petroleum exclusion. Releases to air, land, or water are not reportable under CERCLA (Superfund).

CWA: This product is an oil as defined under Section 311 of EPA's Clean Water Act (CWA). Spills into or leading to surface waters that cause a sheen must be reported to the National Response Center, 1-800-424-8802.

SECTION 7**HANDLING AND STORAGE****Precautionary Measures:**

Wash with soap and water before eating, drinking, smoking, applying cosmetics, or using toilet. Launder contaminated clothing before reuse. Properly dispose of contaminated leather articles such as shoes or belts that cannot be decontaminated. Avoid heat, open flames, including pilot lights, and strong oxidizing agents. Use explosion-proof ventilation to prevent vapor accumulation. Ground all handling equipment to prevent sparking.

Storage:

Do not store in open or unlabeled containers. Store in a cool, dry place with adequate ventilation. Keep away from open flames and high temperatures.

Container Warnings:

Keep containers closed when not in use. Containers, even those that have been emptied, can contain explosive vapors. Do not cut, drill, grind, weld or perform similar operations on or near containers.

SECTION 8**EXPOSURE CONTROLS/PERSONAL PROTECTION**

| Chemical | Limit | TWA | STEL | Ceiling | Notation |
|-------------------|-----------|---------------------|----------------------|---------|----------|
| Oil mist, mineral | ACGIH TLV | 5 mg/m ³ | 10 mg/m ³ | | |
| Oil mist, mineral | OSHA PEL | 5 mg/m ³ | | | |

Exposure Controls

Provide adequate ventilation to control airborne concentrations below the exposure guidelines/limits.

Personal Protection

Personal protective equipment (PPE) selections vary based on potential exposure conditions such as handling practices, concentration and ventilation. Information on the selection of eye, skin and respiratory protection for use with this material is provided below.

Eye Protection:

Chemical Goggles, or Safety glasses with side shields

Skin Protection:

Use protective clothing which is chemically resistant to this material. Selection of protective clothing depends on potential exposure conditions and may include gloves, boots, suits and other items. The selection(s) should take into account such factors as job task, type of exposure and durability requirements.

Published literature, test data and/or glove and clothing manufacturers indicate the best protection is provided by:
Neoprene, or Nitrile Rubber

Respiratory Protection:

If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, an approved respirator must be worn. Respirator selection, use and maintenance should be in accordance with the requirements of the OSHA Respiratory Protection Standard, 29 CFR 1910.134.

Types of respirator(s) to be considered in the selection process include:

For Mist: Air Purifying, R or P style NIOSH approved respirator.

For Vapors: Air Purifying, R or P style prefilter & organic cartridge, NIOSH approved respirator. Self-contained breathing apparatus for use in environments with unknown concentrations or emergency situations.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance & Odor: Bright and clear liquid. Mild odor.

Substance Chemical Family: Petroleum Hydrocarbon

| | | | |
|------------------------------|---|-------------------------|-----------------|
| Flash Point | > 400 °F [Pensky-Martens Closed Cup] | Pour Point | -20 °F |
| Solubility (in Water) | Insoluble | Specific Gravity | 0.88 - 0.89 |
| Stability | Stable | Viscosity | 103 cSt @ 40 °C |

SECTION 10 REACTIVITY AND STABILITY

Stability:

Material is stable under normal conditions.

Conditions to Avoid:

Avoid heat and open flames.

Materials to Avoid:

Avoid contact with strong oxidizing agents.

Hazardous Decomposition Products:

Thermal decomposition products are highly dependent on combustion conditions. A complex mixture of airborne solids, liquids and gases will evolve when this material undergoes pyrolysis or combustion. Aldehydes, Carbon Monoxide, Carbon Dioxide, Hydrogen Sulfide, Ketones, Nitrogen Oxides and other unidentified organic compounds may be formed upon combustion.

SECTION 11 TOXICOLOGICAL INFORMATION

Acute Toxicity

| TEST | Result | OSHA Classification | Material Tested |
|-------------|-------------------|---------------------|------------------------|
| Dermal LD50 | >5.0 g/kg(Rabbit) | Non-Toxic | Based on components(s) |
| Oral LD50 | >5.0 g/kg(Rat) | Non-Toxic | Based on components(s) |

Carcinogenicity Classification

| Chemical Name | NTP | IARC | ACGIH | OSHA |
|----------------------|-----|----------------------|--------------|------|
| Heavy Duty Motor Oil | No | Not Reviewed by IARC | Not Reviewed | No |

SECTION 12 ECOLOGICAL INFORMATION

Environmental Impact Summary:

There is no ecological data available for this product. However, this product is an oil. It is persistent and does not readily biodegrade. However, it does not bioaccumulate.

SECTION 13 DISPOSAL CONSIDERATIONS

RCRA Information:

Under RCRA, it is the responsibility of the user of the material to determine, at the time of the disposal, whether the material meets RCRA criteria for hazardous waste. This is because material uses, transformations, mixtures, processes, etc. may affect the classification. Refer to the latest EPA, state and local regulations regarding proper disposal.

SECTION 14 TRANSPORT INFORMATION

US Department of Transportation Classification

This material is not subject to DOT regulations under 49 CFR Parts 171-180.

Oil: This product is an oil under 49CFR (DOT) Part 130. If shipped by rail or highway in a tank with a capacity of 3500 gallons or more, it is subject to these requirements. Mixtures or solutions containing 10% or more of this product may also be subject to this rule.

International Air Transport Association

Not regulated under IATA rules.

International Maritime Organization Classification
Not regulated under International Maritime Organization rules.

SECTION 15 REGULATORY INFORMATION

Federal Regulatory Status

OSHA Classification:
Under normal conditions of use or in a foreseeable emergency, this product does not meet the definition of a hazardous chemical when evaluated according to the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Ozone Depleting Substances (40 CFR 82 Clean Air Act):
This material does not contain nor was it directly manufactured with any Class I or Class II ozone depleting substances.

Superfund Amendment & Reauthorization Act (SARA) Title III:
There are no components in this product on the SARA 302 list.

SARA Hazard Categories (311/312):

| Immediate Health | Delayed Health | Fire | Pressure | Reactivity |
|------------------|----------------|------|----------|------------|
| NO | NO | NO | NO | NO |

SARA Toxic Release Inventory (TRI) (313):
Zinc compounds

Toxic Substances Control Act (TSCA) Status:
All component(s) of this material is(are) listed on the EPA/TSCA Inventory of Chemical Substances.

Other Chemical Inventories:
Component(s) of this material is (are) listed on the Australian AICS, Canadian DSL, Chinese Inventory, European EINECS, Korean Inventory, Philippines PICCS,

State Regulation

The following chemicals are specifically listed by individual states; other product specific health and safety data in other sections of the MSDS may also be applicable for state requirements. For details on your regulatory requirements you should contact the appropriate agency in your state.

SECTION 16 OTHER INFORMATION

Revision#: 1
Review Date: 04/23/2007
Revision Date: 12/19/2006
Revisions since last change (discussion): This Material Safety Data Sheet (MSDS) has been reviewed to fully comply with the guidance contained in the ANSI MSDS standard (ANSI Z400.1-2003). We encourage you to take the opportunity to read the MSDS and review the information contained therein.

SECTION 17 LABEL INFORMATION

READ AND UNDERSTAND MATERIAL SAFETY DATA SHEET BEFORE HANDLING OR DISPOSING OF PRODUCT. THIS LABEL COMPLIES WITH THE REQUIREMENTS OF THE OSHA HAZARD COMMUNICATION STANDARD (29 CFR 1910.1200) FOR USE IN THE WORKPLACE. THIS LABEL IS NOT INTENDED TO BE USED WITH PACKAGING INTENDED FOR SALE TO CONSUMERS AND MAY NOT CONFORM WITH THE REQUIREMENTS OF THE CONSUMER PRODUCT SAFETY ACT OR OTHER RELATED REGULATORY REQUIREMENTS.

PRODUCT CODE(S): 5071324, 5071325, 5071326, 5071369, 5071371

PENNZOIL™ LONG-LIFE™ Motor Oil (All Grades)

ATTENTION!

PROLONGED OR REPEATED SKIN CONTACT MAY CAUSE OIL ACNE OR DERMATITIS. USED GASOLINE ENGINE OIL HAS BEEN SHOWN TO CAUSE CANCER IN LABORATORY ANIMALS.

Precautionary Measures:

Avoid prolonged or repeated contact with eyes, skin and clothing. Avoid breathing of vapors, fumes, or mist. Use only with adequate ventilation. Wash thoroughly after handling.

FIRST AID

Inhalation: If the victim has difficulty breathing or tightness of the chest, is dizzy, vomiting or unresponsive, give 100% oxygen with rescue breathing or CPR as required and transport to the nearest medical facility.

Skin Contact: Remove contaminated clothing and shoes and wipe excess from skin. Flush skin with water, then wash with soap and water. If irritation occurs, get medical attention. Do not reuse clothing until cleaned. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.

Eye Contact: Flush with water. If irritation occurs, get medical attention.

Ingestion: Do not induce vomiting. In general, no treatment is necessary unless large quantities of product are ingested. However, get medical attention.

FIRE

In case of fire, Use water fog, 'alcohol foam', dry chemical or carbon dioxide (CO₂) to extinguish flames. Do not use a direct stream of water. Material will float and can be re-ignited on surface of water.

SPILL OR LEAK

Dike and contain spill.

FOR LARGE SPILLS: Remove with vacuum truck or pump to storage/salvage vessels.

FOR SMALL SPILLS: Soak up residue with an absorbent such as clay, sand or other suitable material. Place in non-leaking container and seal tightly for proper disposal.

CONTAINS: Highly refined petroleum oils, Mixture; Zinc Dialkyldithiophosphate, 68649-42-3; Proprietary additives; Mixture

NFPA Rating (Health, Fire, Reactivity): 0, 1, 0

TRANSPORTATION

US Department of Transportation Classification

This material is not subject to DOT regulations under 49 CFR Parts 171-180.

| | |
|-------------------------------|--|
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2A Very Toxic Materials Crystalline silica |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **LE SUPERMUL**

Revision Date: 02-Jan-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: LE SUPERMUL

Synonyms: None

Chemical Family: Blend

Application: Emulsifier

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-----------------------------------|------------|---------|----------------|----------------|
| Diethylene glycol monobutyl ether | 112-34-5 | 1 - 5% | Not applicable | Not applicable |
| Ethylene glycol monobutyl ether | 111-76-2 | 1 - 5% | 20 ppm | 50 ppm |

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye and skin irritation. May cause headache, dizziness, and other central nervous system effects. May be harmful if swallowed.

4. FIRST AID MEASURES

Inhalation If inhaled, remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult give oxygen. Get medical attention.

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention. Remove contaminated clothing and launder before reuse.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion Get medical attention! If vomiting occurs, keep head lower than hips to prevent aspiration.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|-----------------|
| Flash Point/Range (F): | > 200Min: > 200 |
| Flash Point/Range (C): | > 100Min: > 93 |
| Flash Point Method: | PMCC |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Use water spray to cool fire exposed surfaces. Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 2, Flammability 1, Reactivity 0
HMS Ratings: Flammability 1, Reactivity 0, Health 2

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Wash hands after use. Launder contaminated clothing before reuse.

Storage Information Store away from oxidizers. Keep container closed when not in use. Product has a shelf life of 36 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Respiratory Protection Organic vapor respirator.
In high concentrations, supplied air respirator or a self-contained breathing apparatus.

Hand Protection Impervious rubber gloves.

Skin Protection Rubber apron.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Liquid
LE SUPERMUL
Page 2 of 6

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Color: | Amber |
| Odor: | Mild |
| pH: | 2.6 |
| Specific Gravity @ 20 C (Water=1): | 0.924 |
| Density @ 20 C (lbs./gallon): | 7.7 |
| Bulk Density @ 20 C (lbs/ft3): | Not Determined |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | 20 |
| Freezing Point/Range (C): | -6.6 |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | 280-300 |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|---|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None known. |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Oxides of nitrogen. Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness. |
| Skin Contact | May cause skin irritation. |
| Eye Contact | May cause eye irritation. |
| Ingestion | May cause abdominal pain, vomiting, nausea, and diarrhea. May cause headache, dizziness, nausea, vomiting, gastrointestinal irritation and central nervous system depression. |
| Aggravated Medical Conditions | Lung disorders. Skin disorders. |
| Chronic Effects/Carcinogenicity | Prolonged or repeated exposure may cause reproductive system damage. Repeated overexposure may cause liver and kidney effects. |

Other Information None known.

Toxicity Tests

Oral Toxicity: Not determined

Dermal Toxicity: Not determined

Inhalation Toxicity: Not determined

Primary Irritation Effect: Not determined

Carcinogenicity Not determined

Genotoxicity: Not determined

**Reproductive /
Developmental Toxicity:** Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined

Persistence/Degradability Not determined

Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined

Acute Crustaceans Toxicity: Not determined

Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|--|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity For This Product | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2B Toxic Materials |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BAROID® OIL ABSORBENT**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BAROID® OIL ABSORBENT
Synonyms: None
Chemical Family: Mineral
Application: Suspending Agent

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------|------------|-----------|-------------------------|---|
| Magnesium silicate | 1343-90-4 | 60 - 100% | Not applicable | Not applicable |
| Crystalline silica, quartz | 14808-60-7 | 2-6 | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD

May cause eye and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD

Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|---|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists. |
| Ingestion | Under normal conditions, first aid procedures are not required. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|--|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

NFPA Ratings: Health 1, Flammability 0, Reactivity 0
HMIS Ratings: Flammability 0, Reactivity 0, Health 1*

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2. |
| Respiratory Protection | Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. |
| Hand Protection | Normal work gloves. |
| Skin Protection | Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing. |
| Eye Protection | Wear safety glasses or goggles to protect against exposure. |
| Other Precautions | None known. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Physical State: | Granules |
| Color: | Gray to tan |
| Odor: | Odorless |
| pH: | Not Determined |
| Specific Gravity @ 20 C (Water=1): | 2.6 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 32-38 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Hydrofluoric acid. |
| Hazardous Decomposition Products | Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | None known. |
| Eye Contact | May cause eye irritation. |
| Ingestion | May be harmful if swallowed. |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |
| Chronic Effects/Carcinogenicity | <p>Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.</p> <p>Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).</p> <p>There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.</p> |
| Other Information | For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997). |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

| | |
|---|---|
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997). |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|----------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Not applicable |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|----------------|
| Acute Fish Toxicity: | Not determined |
| Acute Crustaceans Toxicity: | Not determined |
| Acute Algae Toxicity: | Not determined |

| | |
|----------------------------------|----------------|
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Bury in a licensed landfill according to federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard Chronic Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |

Canadian Regulations

| | |
|------------------------|--|
| Canadian DSL Inventory | Product contains one or more components not listed on inventory. |
| WHMIS Hazard Class | D2A Very Toxic Materials Crystalline silica |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **RHEMOD L**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: RHEMOD L
Synonyms: None
Chemical Family: Tall oil fatty acid
Application: Viscosifier

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-----------------------------------|------------|----------|----------------|----------------|
| Fatty acids, C18-unsatd., trimers | 68937-90-6 | 10 - 30% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye and skin irritation. May be harmful if swallowed.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | 518 |
| Flash Point/Range (C): | 270 |
| Flash Point Method: | COC |
| Autoignition Temperature (F): | > 425 |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 1, Reactivity 0
HMS Ratings: Flammability 0, Reactivity 0, Health 1

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Wash hands after use.

Storage Information Store in a cool, dry location. Product has a shelf life of 36 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Organic vapor respirator.

Hand Protection Impervious rubber gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|-----------------|----------------|
| Physical State: | Liquid |
| Color: | Dark |
| Odor: | Fatty acid |
| pH: | Not Determined |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Specific Gravity @ 20 C (Water=1): | 0.96 |
| Density @ 20 C (lbs./gallon): | 8 |
| Bulk Density @ 20 C (lbs/ft3): | 57.30 |
| Boiling Point/Range (F): | > 572 |
| Boiling Point/Range (C): | > 300 |
| Freezing Point/Range (F): | < -4 |
| Freezing Point/Range (C): | < 25 |
| Vapor Pressure @ 20 C (mmHg): | < 0.001 |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | 0 |
| Evaporation Rate (Butyl Acetate=1): | 0 |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | 1849 @ 25C |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|-------------------------------------|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None known. |
| Incompatibility (Materials to Avoid) | None known. |
| Hazardous Decomposition Products | Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|---|
| Principle Route of Exposure | Eye and skin contact. |
| Inhalation | May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness. |
| Skin Contact | May cause skin irritation. |
| Eye Contact | May cause mild eye irritation. |
| Ingestion | Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal. |
| Aggravated Medical Conditions | Skin disorders. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |

Dermal Toxicity: Not determined
Inhalation Toxicity: Not determined
Primary Irritation Effect: Not determined
Carcinogenicity Not determined
Genotoxicity: Not determined
Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Not determined
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: Not determined
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | Does not apply. |

Canadian Regulations

| | |
|------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BAROID® RIG WASH**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BAROID® RIG WASH
Synonyms: None
Chemical Family: Blend
Application: Surfactant
Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-------------|------------|---------|---------------|--------------|
| Isopropanol | 67-63-0 | 1 - 5% | 200 ppm | 400 ppm |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye, skin, and respiratory irritation.

4. FIRST AID MEASURES

Inhalation If inhaled, remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult give oxygen. Get medical attention.

Skin Wash with soap and water. Get medical attention if irritation persists. Remove contaminated clothing and launder before reuse.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion If swallowed dilute with 1-2 glasses of milk or water and then induce vomiting.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

| | | |
|---|----------------|------------|
| Flash Point/Range (F): | Not Determined | Min: > 220 |
| Flash Point/Range (C): | Not Determined | Min: > 104 |
| Flash Point Method: | COC | |
| Autoignition Temperature (F): | Not Determined | |
| Autoignition Temperature (C): | Not Determined | |
| Flammability Limits in Air - Lower (%): | Not Determined | |
| Flammability Limits in Air - Upper (%): | Not Determined | |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 0, Reactivity 0

HMS Ratings: Flammability 0, Reactivity 0, Health 1

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid breathing vapors.

Storage Information Store away from oxidizers. Keep container closed when not in use. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Respiratory Protection Organic vapor respirator.

Hand Protection Impervious rubber gloves.

Skin Protection Rubber apron.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|-----------------|----------------|
| Physical State: | Liquid |
| Color: | Clear blue |
| Odor: | Slight Alcohol |
| pH: | 9.5 |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Specific Gravity @ 20 C (Water=1): | 1.025 |
| Density @ 20 C (lbs./gallon): | 8.5 |
| Bulk Density @ 20 C (lbs/ft ³): | 63.6 |
| Boiling Point/Range (F): | > 212 |
| Boiling Point/Range (C): | > 100 |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Soluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|---|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None known. |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Oxides of sulfur. Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause respiratory irritation. May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness. |
| Skin Contact | May cause skin irritation. |
| Eye Contact | May cause eye irritation. |
| Ingestion | May cause headache, dizziness, nausea, vomiting, gastrointestinal irritation and central nervous system depression. |
| Aggravated Medical Conditions | Skin disorders. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |

| | |
|---|----------------|
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Not determined |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|----------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Not determined |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|----------------|
| Acute Fish Toxicity: | Not determined |
| Acute Crustaceans Toxicity: | Not determined |
| Acute Algae Toxicity: | Not determined |

| | |
|----------------------------------|----------------|
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Disposal should be made in accordance with federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard |
| EPA SARA (313) Chemicals | This product contains toxic chemical(s) listed below which is(are) subject to the reporting requirements of Section 313 of Title III of SARA and 40 CFR Part 372: Glycol Ethers//34398-01-1 Isopropanol//67-63-0 |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2B Toxic Materials |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: FWCA CEMENT ADDITIVE

Revision Date: 04-Jan-2010

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: FWCA CEMENT ADDITIVE
Synonyms: None
Chemical Family: Polysaccharide
Application: Free Water Control Additive
Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000
Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------|------------|-----------|----------------------|----------------------|
| Cellulose derivative | | 60 - 100% | 10 mg/m ³ | 15 mg/m ³ |

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye and respiratory irritation. Airborne dust may be explosive.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | 770 |
| Autoignition Temperature (C): | 410 |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0
HMIS Ratings: Health 0, Flammability 0, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid creating or inhaling dust.

Storage information Store away from oxidizers. Store in a cool, dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|-----------------|----------------|
| Physical State: | Solid |
| Color: | White |
| Odor: | Characteristic |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| pH: | 6.5 |
| Specific Gravity @ 20 C (Water=1): | 1.39 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft ³): | 32 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | <5 |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Forms gel |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | >600 |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Aldehydes. Carboxylic acids. Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause mild respiratory irritation. |
| Skin Contact | None known. |
| Eye Contact | May cause mild eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |

| | |
|---|----------------|
| Inhalation Toxicity: | Not determined |
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Not determined |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|-----------------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Readily biodegradable |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|----------------|
| Acute Fish Toxicity: | Not determined |
| Acute Crustaceans Toxicity: | Not determined |
| Acute Algae Toxicity: | Not determined |
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Bury in a licensed landfill according to federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory or are exempt. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | Does not apply. |
| PA Right-to-Know Law | Does not apply. |

Canadian Regulations

| | |
|------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: HALAD® 322 CEMENT ADDITIVE

Revision Date: 04-Jan-2010

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: HALAD® 322 CEMENT ADDITIVE

Synonyms: None

Chemical Family: Blend

Application: Cement Additive

Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------|------------|----------|----------------------|----------------------|
| Sodium formate | 141-53-7 | 1 - 5% | Not applicable | Not applicable |
| Cellulose derivative | | 10 - 30% | 10 mg/m ³ | 15 mg/m ³ |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye, skin, and respiratory irritation. Airborne dust may be explosive.

4. FIRST AID MEASURES

Inhalation: If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin: Wash with soap and water. Get medical attention if irritation persists.

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion: Under normal conditions, first aid procedures are not required.

Notes to Physician: Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0
HMIS Ratings: Health 0, Flammability 0, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid creating or inhaling dust.

Storage Information Store in a cool, dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|-----------------|----------|
| Physical State: | Solid |
| Color: | Red |
| Odor: | Odorless |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|-------------------|
| pH: | Not Determined |
| Specific Gravity @ 20 C (Water=1): | 1.28 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 35.2 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Partially soluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | >600 |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|---|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Oxides of sulfur. Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause mild respiratory irritation. |
| Skin Contact | None known. |
| Eye Contact | May cause eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |

Inhalation Toxicity: Not determined
Primary Irritation Effect: Not determined
Carcinogenicity Not determined
Genotoxicity: Not determined
Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Readily biodegradable
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: Not determined
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory or are exempt. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |

Canadian Regulations

| | |
|------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

| | |
|-------------------------------|--|
| Additional Information | For additional information on the use of this product, contact your local Halliburton representative. For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335. |
|-------------------------------|--|

| | |
|-----------------------------|---|
| Disclaimer Statement | This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user. |
|-----------------------------|---|

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **HALAD® 344 CEMENT ADDITIVE**

Revision Date: 04-Jan-2010

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: HALAD® 344 CEMENT ADDITIVE
Synonyms: None
Chemical Family: Polymer
Application: Fluid Loss Additive

Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-------------------------------|------------|-----------|----------------|----------------|
| Modified acrylamide copolymer | | 60 - 100% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye and respiratory irritation.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes Immediately flush eyes with large amounts of water for at least 15 minutes. Get immediate medical attention.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water spray, dry chemical, or foam.

Special Exposure Hazards Decomposition in fire may produce toxic gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 0, Flammability 1, Reactivity 0
HMIS Ratings: Health 1, Flammability 1, Physical Hazard 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid creating or inhaling dust. Do not swallow. Avoid contact with eyes, skin, or clothing.

Storage Information Store in a cool, dry location. Store away from oxidizers. Keep container closed when not in use.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Dust/mist respirator. (95%)

Hand Protection Nitrile gloves. Polyvinylchloride gloves. Neoprene gloves. Rubber gloves. Butyl rubber gloves. Cloth gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Powder

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|--------------------|
| Color: | White to off white |
| Odor: | Odorless |
| pH: | Not Determined |
| Specific Gravity @ 20 C (Water=1): | 1.37 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 25-35 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | 18 |
| Freezing Point/Range (C): | -8 |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | <5 |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Soluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | >600 |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|---|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | None known. |
| Hazardous Decomposition Products | Oxides of nitrogen. Carbon monoxide and carbon dioxide. Oxides of sulfur. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause respiratory irritation. |
| Skin Contact | Prolonged or repeated contact may cause skin irritation. |
| Eye Contact | May cause eye irritation. |
| Ingestion | No adverse health effects are expected from swallowing. |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |

| | |
|---|----------------|
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Not determined |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|------------------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | BOD(28 Day): 3% of COD |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|--|
| Acute Fish Toxicity: | TLM48: 2000 mg/l (Arcatia tonsa) |
| Acute Crustaceans Toxicity: | TLM48: > 1000 mg/l (Daphnia magna) |
| Acute Algae Toxicity: | EC50: 3300 mg/l (Skeletonema costatum) |

| | |
|----------------------------------|----------------|
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Bury in a licensed landfill according to federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG

Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION**US Regulations**

| | |
|--|--|
| US TSCA Inventory | All components listed on inventory or are exempt. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |

Canadian Regulations

| | |
|-------------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION**The following sections have been revised since the last issue of this MSDS**

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **HR-5**

Revision Date: 04-Jan-2010

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: HR-5
Synonyms: None
Chemical Family: Lignosulfonate
Application: Cement Retarder

Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-------------------------|------------|-----------|----------------|----------------|
| Modified lignosulfonate | | 60 - 100% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye and respiratory irritation.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 0, Reactivity 0
HMIS Ratings: Health 1, Flammability 0, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.

Storage Information Store in a cool, dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|------------------------------------|----------|
| Physical State: | Solid |
| Color: | Black |
| Odor: | Molasses |
| pH: | 9.5-10.3 |
| Specific Gravity @ 20 C (Water=1): | 1.32 |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 29.8 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | 25 |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|-------------------|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Oxides of sulfur. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause mild respiratory irritation. |
| Skin Contact | None known. |
| Eye Contact | May cause mechanical irritation to eye. |
| Ingestion | None known |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

Primary Irritation Effect: Not determined
Carcinogenicity Not determined
Genotoxicity: Not determined
Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Readily biodegradable
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: TLM96: > 1000 ppm (Crangon crangon)
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory or are exempt. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | Does not apply. |
| PA Right-to-Know Law | Does not apply. |

Canadian Regulations

| | |
|------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **HR-601**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: HR-601
Synonyms: None
Chemical Family: Lignosulfonate
Application: Cement Retarder

Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-------------------------|------------|-----------|----------------|----------------|
| Modified lignosulfonate | | 60 - 100% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye and respiratory irritation.

4. FIRST AID MEASURES

Inhalation: If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin: Wash with soap and water. Get medical attention if irritation persists.

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion: Under normal conditions, first aid procedures are not required.

Notes to Physician: Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|--|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Lower (oz./ft ³): | 0.2 |
| Flammability Limits in Air - Upper (%): | Not Determined |
| Flammability Limits in Air - Upper (oz./ft ³): | 3.5 |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 1, Reactivity 0
HMIS Ratings: Health 1, Flammability 1, Physical Hazard 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.

Storage Information Store away from oxidizers. Store in a cool, dry location. Product has a shelf life of 24 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Physical State: | Solid |
| Color: | Brown |
| Odor: | Woody |
| pH: | 7.8 |
| Specific Gravity @ 20 C (Water=1): | 1.08 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 30.5 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Soluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|---|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Oxides of sulfur. Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause mild respiratory irritation. |
| Skin Contact | None known. |
| Eye Contact | May cause mechanical irritation to eye. |
| Ingestion | None known |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |

| | |
|---|--------------------------|
| Oral Toxicity: | LD50: > 5000 mg/kg (Rat) |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Not determined |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|-----------------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Readily biodegradable |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|------------------------------------|
| Acute Fish Toxicity: | Not determined |
| Acute Crustaceans Toxicity: | TLM48: > 1000 mg/l (Daphnia magna) |
| Acute Algae Toxicity: | Not determined |
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Bury in a licensed landfill according to federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | Does not apply. |
| PA Right-to-Know Law | Does not apply. |

Canadian Regulations

| | |
|------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **KCL POTASSIUM CHLORIDE**

Revision Date: 04-Jan-2010

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: KCL POTASSIUM CHLORIDE
Synonyms: None
Chemical Family: Inorganic Salt
Application: Additive
Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000
Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|--------------------|------------|-----------|----------------|----------------|
| Potassium chloride | 7447-40-7 | 60 - 100% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye, skin, and respiratory irritation.

4. FIRST AID MEASURES

Inhalation: If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin: Wash with soap and water. Get medical attention if irritation persists.

Eyes: In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion: Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician: Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 0, Reactivity 0
HMIS Ratings: Health 1, Flammability 0, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Avoid breathing vapors.

Storage Information Store in a cool, dry location. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Dust proof goggles.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Physical State: | Solid |
| Color: | White to gray |
| Odor: | Odorless |
| pH: | 9.2 |
| Specific Gravity @ 20 C (Water=1): | 1.99 |
| Density @ 20 C (lbs./gallon): | Not Determined |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Bulk Density @ 20 C (lbs/ft ³): | 72.8 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | 25.5 |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | 74.55 |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|------------------|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | None known. |
| Hazardous Decomposition Products | None known. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause respiratory irritation. |
| Skin Contact | May cause moderate skin irritation. |
| Eye Contact | May cause severe eye irritation. |
| Ingestion | Irritation of the mouth, throat, and stomach. May cause abdominal pain, vomiting, nausea, and diarrhea. |
| Aggravated Medical Conditions | Skin disorders. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | LD50: > 5000 mg/kg (Rat) |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

Primary Irritation Effect: Not determined
Carcinogenicity Not determined
Genotoxicity: Not determined
**Reproductive /
Developmental Toxicity:** Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Not determined
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: TLM96: 100-330 ppm (Crangon crangon)

Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory or are exempt. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | Does not apply. |
| PA Right-to-Know Law | Does not apply. |

Canadian Regulations

| | |
|------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2B Toxic Materials |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **POZ STANDARD CEMENT 50/50**

Revision Date: 05-Jan-2009

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: POZ STANDARD CEMENT 50/50
Synonyms: None
Chemical Family: Cement
Application: Cement

Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------|------------|----------|-------------------------|---|
| Fly ash | 68131-74-8 | 30 - 60% | Not applicable | Not applicable |
| Bentonite | 1302-78-9 | 1 - 5% | Not applicable | Not applicable |
| Portland cement | 65997-15-1 | 30 - 60% | 10 mg/m ³ | 15 mg/m ³ |
| Crystalline silica, quartz | 14808-60-7 | 1 - 5% | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD
May cause eye, skin, and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|---|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing. |
| Ingestion | Under normal conditions, first aid procedures are not required. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|--|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media None - does not burn.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

NFPA Ratings: Health 1, Flammability 0, Reactivity 0
HMIS Ratings: Health 1*, Flammability 0, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Product has a shelf life of 24 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2. |
| Respiratory Protection | Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. |
| Hand Protection | Normal work gloves. |
| Skin Protection | Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing. |
| Eye Protection | Wear safety glasses or goggles to protect against exposure. |
| Other Precautions | Eyewash fountains and safety showers must be easily accessible. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Physical State: | Solid |
| Color: | Gray |
| Odor: | Odorless |
| pH: | 12.4 |
| Specific Gravity @ 20 C (Water=1): | Not Determined |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft³): | Not Determined |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Not Determined |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Hydrofluoric acid. |
| Hazardous Decomposition Products | Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | Can dry skin. May cause an allergic skin reaction. May cause alkali burns with confined contact. |
| Eye Contact | May cause severe eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |
| Chronic Effects/Carcinogenicity | <p>Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.</p> <p>Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, <u>Silica, Some Silicates and Organic Fibres</u> (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).</p> <p>There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.</p> |
| Other Information | For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997). |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

| | |
|---|---|
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997). |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|----------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Not applicable |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|----------------|
| Acute Fish Toxicity: | Not determined |
| Acute Crustaceans Toxicity: | Not determined |
| Acute Algae Toxicity: | Not determined |
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Bury in a licensed landfill according to federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|--|--|
| US TSCA Inventory | All components listed on inventory or are exempt. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard Chronic Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |

Canadian Regulations

| | |
|-------------------------------|--|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | E Corrosive Material D2A Very Toxic Materials Crystalline silica |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **CEMENT - CLASS H - PREMIUM**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: CEMENT - CLASS H - PREMIUM
Synonyms: None
Chemical Family: Cement
Application: Cement

Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------|------------|-----------|-------------------------|---|
| Portland cement | 65997-15-1 | 60 - 100% | 10 mg/m ³ | 15 mg/m ³ |
| Crystalline silica, quartz | 14808-60-7 | <3 | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD
May cause eye, skin, and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|---|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing. |
| Ingestion | Under normal conditions, first aid procedures are not required. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|---|---|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |
| Fire Extinguishing Media | None - does not burn. |
| Special Exposure Hazards | Not applicable. |
| Special Protective Equipment for Fire-Fighters | Not applicable. |
| NFPA Ratings: | Health 1, Flammability 0, Reactivity 0 |
| HMIS Ratings: | Flammability 0, Reactivity 0, Health 1* |

6. ACCIDENTAL RELEASE MEASURES

| | |
|---|---|
| Personal Precautionary Measures | Use appropriate protective equipment. Avoid creating and breathing dust. |
| Environmental Precautionary Measures | None known. |
| Procedure for Cleaning / Absorption | Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal. |

7. HANDLING AND STORAGE

| | |
|-----------------------------|--|
| Handling Precautions | Avoid contact with eyes, skin, or clothing. This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet. |
| Storage Information | Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Product has a shelf life of 24 months. |

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2. |
| Respiratory Protection | Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. |
| Hand Protection | Normal work gloves. |
| Skin Protection | Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing. |
| Eye Protection | Wear safety glasses or goggles to protect against exposure. |
| Other Precautions | Eyewash fountains and safety showers must be easily accessible. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Physical State: | Solid |
| Color: | Gray |
| Odor: | Odorless |
| pH: | 12.4 |
| Specific Gravity @ 20 C (Water=1): | 3.15 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 94 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | 0 |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | 0.5 |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | Keep away from any contact with water. |
| Incompatibility (Materials to Avoid) | Hydrofluoric acid. |
| Hazardous Decomposition Products | Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | Can dry skin. May cause an allergic skin reaction. May cause alkali burns with confined contact. |
| Eye Contact | May cause severe eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |
| Chronic Effects/Carcinogenicity | <p>Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.</p> <p>Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).</p> <p>There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.</p> |
| Other Information | For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997). |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

| | |
|---|---|
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997). |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|----------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Not applicable |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|----------------|
| Acute Fish Toxicity: | Not determined |
| Acute Crustaceans Toxicity: | Not determined |
| Acute Algae Toxicity: | Not determined |

| | |
|----------------------------------|----------------|
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Bury in a licensed landfill according to federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|--|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard Chronic Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |

Canadian Regulations

| | |
|-------------------------------|--|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | E Corrosive Material D2A Very Toxic Materials Crystalline silica |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BARACARB® 25**

Revision Date: 02-Jan-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BARACARB® 25
Synonyms: None
Chemical Family: Mineral
Application: Bridging Agent

Manufacturer/Supplier: Baroid Drilling Fluids
a Product Service Line of Halliburton Energy Services, Inc.
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------|------------|-----------|-------------------------|---|
| Crystalline silica, quartz | 14808-60-7 | 0 - 1% | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |
| Limestone | 1317-65-3 | 60 - 100% | 10 mg/m ³ | 15 mg/m ³ |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD
May cause eye, skin, and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|---|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists. |
| Ingestion | Under normal conditions, first aid procedures are not required. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|--|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0
HMIS Ratings: Flammability 0, Reactivity 0, Health 1*

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information Store away from acids. Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use in a well ventilated area. Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2. |
| Respiratory Protection | Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. |
| Hand Protection | Normal work gloves. |
| Skin Protection | Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing. |
| Eye Protection | Wear safety glasses or goggles to protect against exposure. |
| Other Precautions | None known. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Physical State: | Solid Powder |
| Color: | White |
| Odor: | Odorless |
| pH: | 8-9 |
| Specific Gravity @ 20 C (Water=1): | 2.7 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft³): | 168 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong acids. |
| Hazardous Decomposition Products | Carbon monoxide and carbon dioxide. Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | May cause skin irritation. |
| Eye Contact | May cause eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |
| Chronic Effects/Carcinogenicity | <p>Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.</p> <p>Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).</p> <p>There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.</p> |
| Other Information | For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997). |
| Toxicity Tests | |
| Oral Toxicity: | LD50: > 5000 mg/kg (Rat) |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

| | |
|---|---|
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997). |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|----------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Not determined |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|--|
| Acute Fish Toxicity: | Not determined |
| Acute Crustaceans Toxicity: | TLM96: >1,000,000 ppm (Mysidopsis bahia) SPP @ 178.5 ppb |
| Acute Algae Toxicity: | Not determined |

| | |
|----------------------------------|----------------|
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Bury in a licensed landfill according to federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|--|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard Chronic Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity For This Product | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2A Very Toxic Materials Crystalline silica |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BARACARB® 50**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BARACARB® 50
Synonyms: None
Chemical Family: Mineral
Application: Bridging Agent

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------|------------|-----------|-------------------------|---|
| Limestone | 1317-65-3 | 60 - 100% | 10 mg/m ³ | 15 mg/m ³ |
| Crystalline silica, quartz | 14808-60-7 | 0 - 1% | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD

May cause eye, skin, and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD

Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|---|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists. |
| Ingestion | Under normal conditions, first aid procedures are not required. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|--|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0
HMS Ratings: Flammability 0, Reactivity 0, Health 1*

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information Store away from acids. Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use in a well ventilated area. Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2. |
| Respiratory Protection | Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. |
| Hand Protection | Normal work gloves. |
| Skin Protection | Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing. |
| Eye Protection | Wear safety glasses or goggles to protect against exposure. |
| Other Precautions | None known. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Physical State: | Solid Powder |
| Color: | White |
| Odor: | Odorless |
| pH: | 8-9 |
| Specific Gravity @ 20 C (Water=1): | 2.7 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 72-112 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong acids. |
| Hazardous Decomposition Products | Carbon monoxide and carbon dioxide. Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | May cause skin irritation. |
| Eye Contact | May cause eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |
| Chronic Effects/Carcinogenicity | <p>Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.</p> <p>Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).</p> <p>There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.</p> |
| Other Information | For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997). |
| Toxicity Tests | |
| Oral Toxicity: | LD50: > 5000 mg/kg (Rat) |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

| | |
|---|--|
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997)</u> . |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|----------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Not determined |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|--|
| Acute Fish Toxicity: | Not determined |
| Acute Crustaceans Toxicity: | TLM96: >1,000,000 ppm (Mysidopsis bahia) SPP @ 178.5 ppb |
| Acute Algae Toxicity: | Not determined |

| | |
|----------------------------------|----------------|
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Bury in a licensed landfill according to federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard Chronic Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2A Very Toxic Materials Crystalline silica |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BAROID®**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BAROID®
Synonyms: None
Chemical Family: Mineral
Application: Weight Additive

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------|------------|-----------|-------------------------|---|
| Barium sulfate | 7727-43-7 | 60 - 100% | 10 mg/m ³ | 15 mg/m ³ |
| Crystalline silica, quartz | 14808-60-7 | 1 - 5% | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD

May cause eye, skin, and respiratory irritation. May be harmful if swallowed.

DANGER! - CHRONIC HEALTH HAZARD

Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|--|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists. |
| Ingestion | Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|--|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

| | |
|---|---|
| Fire Extinguishing Media | All standard firefighting media. |
| Special Exposure Hazards | Not applicable. |
| Special Protective Equipment for Fire-Fighters | Not applicable. |
| NFPA Ratings: | Health 1, Flammability 0, Reactivity 0 |
| HMS Ratings: | Flammability 0, Reactivity 0, Health 1* |

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2. |
| Respiratory Protection | Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. |
| Hand Protection | Normal work gloves. |
| Skin Protection | Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing. |
| Eye Protection | Wear safety glasses or goggles to protect against exposure. |
| Other Precautions | None known. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|---------------------|
| Physical State: | Solid |
| Color: | Pink to tan to gray |
| Odor: | Odorless |
| pH: | 8-9- |
| Specific Gravity @ 20 C (Water=1): | 4.2 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 100- 155 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | 233.4 |

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | None known. |
| Hazardous Decomposition Products | Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | None known. |
| Eye Contact | May cause mild eye irritation. |
| Ingestion | May produce nervous system effects such as feeling of weakness, unsteady walk, and dilation of blood vessels. May affect the heart and cardiovascular system. |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |
| Chronic Effects/Carcinogenicity | <p>Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.</p> <p>Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).</p> <p>There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.</p> |
| Other Information | For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997). |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

| | |
|---|---|
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997). |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|----------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Not applicable |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|---|
| Acute Fish Toxicity: | TLM96: 7500 ppm (Oncorhynchus mykiss) |
| Acute Crustaceans Toxicity: | TLM96: > 1,000,000 ppm (Mysidopsis bahia) SPP @ 132.6 ppb |
| Acute Algae Toxicity: | Not determined |

| | |
|----------------------------------|----------------|
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Bury in a licensed landfill according to federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard Chronic Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |

Canadian Regulations

| | |
|------------------------|--|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2A Very Toxic Materials Crystalline silica |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **LIME**

Revision Date: 02-Jan-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: LIME
Synonyms: None
Chemical Family: Inorganic
Application: pH Control

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-------------------|------------|-----------|---------------------|----------------------|
| Calcium hydroxide | 1305-62-0 | 60 - 100% | 5 mg/m ³ | 15 mg/m ³ |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye and skin burns. May cause respiratory irritation. May be harmful if swallowed.

4. FIRST AID MEASURES

Inhalation: If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin: Wash with soap and water. Get medical attention if irritation persists. Remove contaminated clothing and launder before reuse.

Eyes: In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion: Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician: Not Applicable

5. FIRE FIGHTING MEASURES

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not Determined

NFPA Ratings: Health 1, Flammability 0, Reactivity 0
HMS Ratings: Flammability 0, Reactivity 0, Health 1

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.

Storage Information Store away from acids. Store in a cool, dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Dust/mist respirator. (95%)

Hand Protection Impervious rubber gloves.

Skin Protection Rubber apron.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Physical State: | Solid |
| Color: | White |
| Odor: | Odorless |
| pH: | 12.2 |
| Specific Gravity @ 20 C (Water=1): | 2.24 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 75 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | 0.2 |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | 74.1 |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|------------------|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong acids. |
| Hazardous Decomposition Products | None known. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause respiratory irritation. |
| Skin Contact | Causes severe skin irritation. May cause skin burns on prolonged contact. |
| Eye Contact | Causes severe eye irritation May cause eye burns. |
| Ingestion | Irritation of the mouth, throat, and stomach. |
| Aggravated Medical Conditions | Skin disorders. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | LD50: 7340 mg/kg (Rat) |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Not determined |

Genotoxicity: Not determined
Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Not determined
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: TLM96: 100-500 ppm (Oncorhynchus mykiss)
Acute Crustaceans Toxicity: TLM96: 478,520 ppm (Mysidopsis bahia) SPP @ 8 ppb
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Empty container completely. Transport with all closures in place. Return for reuse or dispose in a sanitary landfill according to national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

15. REGULATORY INFORMATION

US Regulations

| | |
|--|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity For This Product | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2B Toxic Materials |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: WALNUT HULLS

Revision Date: 02-Jan-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: WALNUT HULLS
Synonyms: None
Chemical Family: Nut Hulls
Application: Loss Circulation Material

Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|--------------|------------|-----------|----------------|----------------|
| Walnut hulls | Mixture | 60 - 100% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye irritation.

4. FIRST AID MEASURES

Inhalation: Under normal conditions, first aid procedures are not required.

Skin: Under normal conditions, first aid procedures are not required.

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion: Under normal conditions, first aid procedures are not required.

Notes to Physician: Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|--|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Lower (oz./ft ³): | 0.07 |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0
HMIS Ratings: Flammability 0, Reactivity 0, Health 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid creating or inhaling dust.

Storage Information Store away from oxidizers. Store in a dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Safety glasses.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Solid
Color: Brown
Odor: Characteristic

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| pH: | Not Determined |
| Specific Gravity @ 20 C (Water=1): | 1.1 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | Not Determined |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|-------------------|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None known. |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | None known. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause mild respiratory irritation. |
| Skin Contact | None known. |
| Eye Contact | May cause mild eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |

Inhalation Toxicity: Not determined
Primary Irritation Effect: Not determined
Carcinogenicity Not determined
Genotoxicity: Not determined
**Reproductive /
Developmental Toxicity:** Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined

Persistence/Degradability Biodegradable

Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined

Acute Crustaceans Toxicity: TLM96: > 1,000,000 ppm (Mysidopsis bahia) SPP @ 10 ppb

Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity For This Product | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | Does not apply. |
| PA Right-to-Know Law | Does not apply. |

Canadian Regulations

| | |
|------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

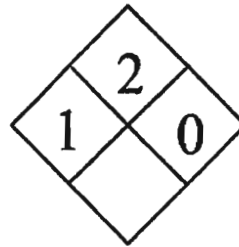
Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS



MATERIAL SAFETY DATA SHEET

SECTION I - MANUFACTURER

Integrity Industries, Inc.
2710 E. Corral St.
Kingsville, Texas 78363
Emergency Phone: (361) 595-5561

Revised Date: 06/05/2008
Supercedes: new

THIS DOCUMENT IS PREPARED PURSUANT TO THE OSHA HAZARDOUS COMMUNICATION STANDARD (29 CFR 1910.1200). ALSO, OTHER SUBSTANCE NOT DEEMED "HAZARDOUS" PER THIS MSDS MAY BE LISTED.

SECTION II - MATERIAL IDENTIFICATION

Trade Name: **SYNVERT Base Oil**
Synonyms/Other Designations: Synthetic Drilling Fluid / Polymer Suspension Base
Placard: Not Applicable
Hazard(s): non-hazardous

| <u>Component</u> | <u>CAS Number</u> | <u>Weight</u> |
|-----------------------|-------------------|---------------|
| Paraffin/Olefin blend | Mixture | 100% |

SECTION III - PHYSICAL & CHEMICAL DATA

| | |
|---------------------------------|---------------------------------------|
| Boiling Point: IBP > 300 °F | Pour Point: ND |
| Specific Gravity (H2O=1): 0.766 | Vapor Pressure (mm Hg @ 68 °F): 0.135 |
| Vapor Density (Air=1): n/a | Solubility in H2O: Insoluble |
| Appearance: Clear, oily liquid | Viscosity (cSt @104 °F): 1.4 |

SECTION IV - REACTIVITY

Stability: Stable
Incompatibility: Heat, sparks, open flame. May react with strong acids/strong oxidizing agents, chlorates, nitrates, peroxides.
Hazardous Decomposition Products: Oxides of carbon. Hazardous Polymerizations: will not occur

SECTION V - FIRE & EXPLOSION DATA

Flash Point (ASTM D-93): > 200 °F
Autoignition: n/a
Extinguishing Media: Water spray, Dry Chemical, Foam, CO2
Special Fire Fighting Procedures: Respirators/eye protection and full firefighting protective gear.
Unusual Fire Hazards: Remove containers from source of heat.

SECTION VI - EMERGENCY & FIRST AID DATA

Inhalation: Move to well ventilated area; if breathing difficulties persist after 15 minutes seek medical assistance.

Eye Contact: Wash eye thoroughly for 15 minutes; if irritation persists seek medical assistance.

Skin Contact: Wash affected area with soap & water for 15 minutes; if irritation persists seek medical assistance.

Ingestion: Do not induce vomiting and seek medical advice.

SECTION VII - HEALTH HAZARDS DATA

Acute: May irritate eyes, skin, respiratory, & gastrointestinal tract. **Chronic:** Repeated/prolonged skin contact may irritate/redden skin, progressing to dermatitis.

SECTION VIII - SPILL & DISPOSAL DATA

Accidental Spill Procedures: Absorb in inert material and dispose of according to local, state & federal regulations. Spill into water should be contained to avoid runoff into waterways.

Handling & Storage: Keep container closed and store in cool dry place. Emptied container still contains material which may ignite with explosive violence if exposed to open flame.

SECTION IX - SPECIAL PROTECTION DATA

Respiratory Protection: Respirator in confined areas.

Ventilation: Desired **Exhaust:** Mechanical

Protective Gloves: Solvent/chemical resistant gloves

Eye Protection: Safety glasses, goggles.

Other Protection: As required to avoid skin contact.

SECTION X - TRANSPORT INFORMATION

The following may not apply to all shipping situations. Consult 49 CFR for more mode-specific or quantity-specific data.

DOT Proper Shipping Name: Not regulated

DOT Hazard Class or Division: Not regulated

DOT Identification Number: N/A

DOT Packaging Group: III

Type Label(s) Required: none

Placard: Not applicable

***For Limited Quantity requirements see DOT regulation 49 CFR.**

SECTION XI - DISCLAIMERS

*** SOME INFORMATION PROVIDED HEREIN WAS DRAWN FROM SOURCES OTHER THAN INTEGRITY INDUSTRIES.**

THE INFORMATION PROVIDED HEREIN IS BELIEVED BY INTEGRITY INDUSTRIES, INC. TO BE CORRECT & RELIABLE; NO EXPRESSED OR IMPLIED WARRANTY IS PROVIDED HOWEVER.

*** INTEGRITY INDUSTRIES, INC. ASSUMES NO RESPONSIBILITY AND DENIES ALL LIABILITY FOR ANY LOSS, DAMAGE, OR EXPENSE CONNECTED WITH CUSTOMERS' METHOD OF HANDLING, STORAGE, USE, AND DISPOSAL OF THIS PRODUCT.**

*** THE MSDS INFORMATION PROVIDED HEREIN IS APPLICABLE ONLY TO THIS PRODUCT.**

**TABLE 3
AGENCY NOTIFICATION LIST**

The following agencies are to be contacted, as appropriate, in the event of an emergency, accident, or chemical release.

| <u>Agency</u> | <u>Telephone No.</u> |
|---|----------------------|
| PADEP Northeast Regional Office | 570-826-2511 |
| PADEP Southcentral Office (Harrisburg) | 877-333-1904 |
| Pennsylvania Emergency Management Agency | 717-651-2001 |
| Police Department | 9-1-1 |
| Volunteer Fire Department | 9-1-1 |
| U.S. Environmental Protection Agency | 215-814-5700 |
| U.S. Coast Guard National Response Center | 800-424-8802 |
| U.S. Coast Guard (local) | 570-421-1191 |
| Pennsylvania Fish and Boat Commission | 814-445-8974 |
| Chemical Transportation Emergency Center: | |
| * Chemical Exposure Information | 800-424-9300 |

LOCAL EMERGENCY RESPONSE:

| | |
|---|--------------|
| Fire Department – | 9-1-1 |
| Wayne County Company #3, 13, 21, 28, 43, and 65 | |
| Police Department – | 9-1-1 |
| PSP, Honesdale, Pennsylvania | |
| Hospitals/Ambulances- | |
| Damascus Township Ambulance, Pennsylvania | 9-1-1 |
| MT Pleasant Ambulance | |
| Northern Wayne Ambulance | |
| Mobile 504 | |
| Wayne County Memorial Hospital, Honesdale, Pennsylvania | 570-251-6672 |
| CMC – Trauma Center, Scranton, Pennsylvania | 570-969-8128 |
| Catskill Regional Medical Hospital in Callicoon, New York | 845-887-5530 |
| Local Emergency Management | |
| Wayne County EMA | 570-253-1622 |

Air Quality Concerns at Woodland Management Gas Drilling Site, Damascus, PA

15 September 2010

Greg Swartz and Tannis Kowalchuk

The drilling of the Woodland Management Gas well was completed about 2 weeks ago and the drilling rig has been moved to the Crum site in Milanville, PA. Our farm and home are located 0.3 miles from the Woodland site. This past Sunday September 5, we smelled a very strong chemical sulfuric odor. We were busy picking and packing vegetables for a farmers market and we did not do anything about the odor. Monday morning the odor was again present. Here is a summary of events:

| | | |
|---------------------------|---------|--|
| <u>September 5</u> | 7am | Smelled chemical sulfuric odor. Lessened by afternoon. |
| <u>September 6</u> | 9am | Smelled chemical sulfuric odor |
| | 9:38am | Telephoned the DEP Emergency Response Line. Call was answered by an answering service who indicated that they would page DEP personnel. We received no call back from the DEP. |
| | 10:20am | Called 911 to report the odor |
| | 10:30am | Equinunk Volunteer Fire Department responded. They confirmed the odor. The Chief immediately went to the Woodland well site and inspected the pad and waste pond. Chemical odor was evident. He spoke with security personnel there who indicated that the waste water pond was to be pumped on Tuesday (9-7). Fire Department indicated that they were not concerned about the air quality and they left. |
| <u>September 7</u> | 10am | Smelled chemical sulfuric odor. Heavy tanker truck activity- ostensibly emptying the waste pond. |
| | 12:58pm | Called DEP Northeast Regional Office. They had no record of our call and referred me to Northcentral office who handles oil and gas issues. |

12:59 Called DEP Northcentral Regional Office and left a message with the person I was directed to. We called without leaving a message several more times throughout the afternoon- no one answered.

4:15pm Called DEP Northcentral office again and left a message. We have still not received a call back.

September 8

9:00am Chemical sulfuric odor not present. Called DEP Northcentral Regional Director, Nels Taber. His assistant connected us with Jennifer Means, DEP Northcentral Oil and Gas Program Manager. We related the events of the past 3 days. She had no record of our initial emergency call and indicated that normally she receives the emergency calls. She indicated that she would research what went wrong and that she would be back in touch with us. We requested that an inspection be done of the well site.

4:10pm We received a call from Denise Brinley (DEP Deputy Secretary) and Kerry Leib (DEP Emergency Management Coordinator) who were asking for further information. They said:

1) the answering service had no record of our call and they don't know why the communication breakdown occurred.

2) Northcentral staff person who I spoke with should have handled my call on Tuesday differently because they do in fact have inspection staff in Scranton

3) They issued an order to send an inspector to the site this morning at 11am. They weren't sure when s/he would arrive.

4) They will be back in touch to respond to the lack of response from the DEP and with a report from the inspector.

September 9

4:30pm Kelly Hefner, DEP Deputy Secretary for Field Operations left a phone a message.

| | | |
|---------------------|---------|---|
| September 10 | 9:00am | Spoke with Kelly Hefner. She offered her “sincere apology” for the troubles we have had with DEP. She confirmed that they have no record of our call. She said that an inspector was on site on Tuesday and Wednesday. We asked for: Air quality tests, water tests, soil tests, location of waste water treatment. We also asked what chemicals used in the drilling process would cause the sulfur odor. She promised results by Monday. |
| September 13 | 12:30pm | Left message for Heffner |
| | 5:30pm | Heffner left message for us |
| September 14 | 10:00am | Left message for Heffner |
| | 1:47pm | Left message for Heffner |
| | 5:15pm | Heffner left a message for us saying she was in meetings and too busy to call earlier. |

We are deeply concerned about the environmental and health impacts of drilling, in particular for the health of our 2 year old son. This specific case of air quality is troubling. What is even more troubling is the DEP’s lack of response to our call. We don’t know exactly what has been flying in the air. It may or may not be acutely toxic. It was a significant enough event that the DEP should have investigated immediately. This event highlights that the DEP is not prepared to handle the environmental risks which are part and parcel of gas drilling. We are still waiting for an official response and explanation from the DEP. We can’t help but wonder what will happen when there is a catastrophic gas drilling emergency and how long it will take DEP to respond? Our volunteer fire department was here almost immediately and professionally handled the situation. However, they are not trained in air quality monitoring or any of the other potential fallout from gas drilling.

Greg Swartz and Tannis Kowlachuk
 25 Stone House Rd, Damascus, PA
 570-224-8013
greg@willowwisporganic.com, tannis@nacl.org

9-16-10 Email Correspondence from PADEP Acting Deputy Secretary Kelly Hefner concerning my outstanding questions about odor at the Woodland site. Attached to this correspondence were the 2 inspection reports and water test from 8-10-10 (see below).

Good Afternoon Mr. Swartz:

As we have discussed the phone side of the matter and you have taken my word that it has been addressed (thank you), I will simply add I am sorry the call was mishandled, but we have been able to make some changes that will prevent this in the future.

As we have further discussed your concerns, I have attempted to address the questions you posed when we talked on Friday and to answer the questions you posed in your Thursday morning email. I apologize that we keep missing each other.

Attached please find the answers to the questions posed at the end of last week re: the pit on the Woodland Management Site, Operated by Newfield

1. Yes, the wastewater from the pit was sampled and those results are attached.
2. The water in the pit and tanks was hauled offsite by Koberlein Environmental. They are a DEP approved waste hauler. The water went to the waste disposal facilities of Eureka Resources LLC (Williamsport, Pa.) and Waste Treatment Corporation in Warren, Pa. Manifests are on file for every load of this water hauled and disposed of.
3. Air monitoring for hydrogen sulfide (H₂S) gas was not conducted. There was no air quality monitoring by DEP or the Fire Department.
4. DEP has investigated these type of pits turning septic (anaerobic digestion which generates H₂S) in other parts of the Commonwealth. As of now, there is not certainty about what the food source is for the bacteria, but we suspect that it might be from drilling fluids. Some companies have added sulfide scavengers to the pits to prevent the bacterial action.

It is fairly common for H₂S to be released into the environment from natural decomposition and our staff encounters it fairly regularly. Similar to what occurs at a wetland, the sludge at the bottom of an impoundment can undergo anaerobic digestion and release H₂S gas. Because H₂S gas has a low odor threshold, humans smell it at very low concentrations. High concentrations are highly unusual in an outdoor, well-ventilated area.

DEP was not able to have air tests done prior to the removal of the fluids on the Tuesday after Labor Day. There are limited mobile units and they are deployed in other locations in the Northern Tier doing testing but were not there on Labor day or September 7th. The odor developed in just a few days (3) due to bacteria in the pit. The H2S indeed smells bad, and is certainly irritating, but it is very, unlikely to have caused any health impacts in this circumstance. Removing the water expeditiously was the correct response.

Inspection Summary (field report attached)

NEWFIELD APPALACHIA PA LLC
WOODLAND MGMT PARTNERS 1 1
Permit 127-20017
Spud date (initiation of drilling activities) was 06/25/2010
Damascus Township, Wayne County

In response to a complaint by Mr. Greg Swartz of sulphur odors emanating from the above referenced well site, on September 8, 2010, Oil & Gas Inspector Steve Watson inspected the site and documented the following. The service contractor on-site, H&K Construction, was in the process of dewatering the reserve pit. As they pump the fluid to the frac tanks and then to the tanker trucks for transport and disposal, odors from the pit are emitted through vents on the tanks. Also, stirring up the fluid in the pit allowed odors to release to the atmosphere as well. At the time of the inspection, 95% of the fluid had already been removed from the pit. They were planning on solidifying the pit and then folding over the liner to prepare for encapsulation on Thursday, September 9, 2010. The Department intends to complete an additional inspection of the site today Friday, September 10, 2010. At the time of this e-mail, the findings of this Friday inspection have not yet been reported back to the regional office.

The Department also inspected this site on Thursday September 2, 2010, prior to the initial complaint received on either Monday or Tuesday, September 6 or 7, 2010. During this inspection it was noted that the service contractor was the only party on site. Trucks were hauling off the last pieces of the drilling rig to be moved to the next planned drilling site. Two workers were observed skimming off an oil sheen on the pit fluids, the liner was inspected showing no holes or tears. Several frac tanks are located on site for temporary storage of the fluids being removed. The only odors detected during this visit were those that would be associated with drilling fluids and/or cuttings.

Text from Thursday 9/16 email

Good Morning Ms. Heffner,

Thank you for taking the time to send the pit water test results from 8-10-10. These results are of interest to me yet they do not represent pit contents after 8-10-10. I believe that drilling activities continued past that date. You will recall from our conversation on 9-10-10 that I requested the report and test results from your inspector's visit to the Woodland site the week of 9-6. I was told that you sent an inspector on 9-7 and 9-8. I respectfully again request the following information:

- 1) Inspector's full reports from 9-7 and 9-8. [These are attached.](#)
- 2) Pit water test results from that day(s). [There is no additional water test data.](#)
- 3) Air quality test results from that day(s) [There is no site specific air quality data.](#) DEP's MAU (Mobile Analytical Unit) is doing multi-area samplings across the Northern Tier over the next 4 weeks. As this information is synthesized, DEP will make it available.

4) Explanation of what chemical used in the drilling process would create the odor that we and 911 responders observed

At this time DEP is still unsure of the specific “chemical” that triggers the sulfide reaction. As I mentioned previously, DEP has seen this problem in other areas of the state.

5) Health implications of said odors

H₂S is primarily an eye irritant. The H₂S was very smelly; it was being released in a well ventilated area and there is limited

6) Destination of waste water which has been trucked off site. See number 2 above.

I have to leave the office early today, but will be in tomorrow

Kelly Heffner

Kelly Jean Heffner | Acting Deputy Secretary
Office of Field Operations
Department of Environmental Protection
Rachel Carson State Office Building
400 Market Street | Harrisburg, PA 17101
Phone: 717.787.5028 | Fax: 717.772.3314
www.depweb.state.pa.us



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

Table with 2 columns and 2 rows: DEP USE ONLY, Inspection Record #, Complaint Record #, Enforcement Record #

INSPECTION REPORT

Form containing DEP Office (Scranton), Address (101 Penn Ave), Oper Name (Newfield Appalachia), and other details like Permit or Reg. # (127-20017)

Inspection Code section with checkboxes for BDREL, CEI, COMPL, DRALT, FLWUP, PLUG, RDSPR, RESTR, RTNC

Other section with checkboxes for Permit Expired, Alt/Meth., Annulus Open, Cement Returns, Recommend Bond Release

Main data table with columns: Location, Insp., Violation, Driller's Log Information, Depth, Drilling-Plugging, Casing & Tubing, Waste Mgmt., Compliance Assistance, Inspection Results

Remarks: Responded to complaint of "Sulphur" odor coming from well site. At time of inspection construction crew on site sucking down fluid in pit. Fluid being pumped to frac tanks on site and then transported off site by tanker trucks.

Signature section with Sample No., Location / Description, DEP Rep. (Stephen Watson), Date (9/8/10), Time (14:15)



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

| | |
|--------------------|----------------------|
| DEP USE ONLY | Inspection Record # |
| | Enforcement Record # |
| Complaint Record # | |

INSPECTION REPORT

| | | | | | |
|------------|--|-------|--------------|--------------------|-------------------------|
| DEP Office | Swanton | Phone | 570 346 5541 | Permit or Reg. # | 127-20017 |
| Address | 101 Penn Ave Swanton PA 18503 | | | Project # | |
| Oper Name | Newfield Appalachia | | | Farm Name & Well # | Woodland Mgt Partners I |
| Address | 119 Lincoln Street Honesdale PA 18431 | | | County | Wayne |
| | | | | Municipality | Damascus |
| | | | | Latitude: | 0 ' " N |
| | | | | Longitude: | 0 ' " W |

Inspection Code:

| | | |
|---|---|---|
| <input type="checkbox"/> BDREL - Bond Release | <input type="checkbox"/> DRALT - Drilling or Alteration | <input type="checkbox"/> RDSPR - Road Spreading |
| <input type="checkbox"/> CEI - Compliance Evaluation | <input checked="" type="checkbox"/> FLWUP - Follow-up | <input type="checkbox"/> RESTR - Site Restoration |
| <input type="checkbox"/> COMPL - Complaint Inspection | <input type="checkbox"/> PLUG - Plugging | <input type="checkbox"/> RTNC - Routine |

Other: Permit Expired Alt/Meth. Annulus Open Cement Returns Recommend Bond Release

Fold Line

| Location | Insp. | Violation | Driller's Log Information | | | Depth: | |
|---------------------|-------|-----------|----------------------------|---------------------------|---------------------------|--|-------|
| | | | Fresh Water Amt / Depth | Salt Water Amt / Depth | Coal Thickness / Depth | Formations Oil / Depth Gas / Depth | |
| Site ID Sign | X | | | | | | |
| Well Tag | | | | | | | |
| Distance Restrict | | | | | | | |
| E/S Plan on Site | | | | | | | |
| E/S Controls | | | | | | | |
| Encroachments | | | | | | | |
| Site Restoration | | | | | | | |
| Drilling / Plugging | | | | | | | |
| Drilling-Plugging | | | Filling Material & Plugs | | | Casing & Tubing | |
| Notification | | | From | To | Size | Pulled | Left |
| B.O.P. | | | | | | | |
| Casing | | | | | | | |
| Monument | | | | | | | |
| Waste Mgmt. | | | | | | | |
| Top Hole Water | | | | | | | |
| Fluids Mgmt. | X | | | | | | |
| Impoundment/pit | X | | | | | | |
| Pollution Prevent | X | | | | | | |
| Residual Waste | | | | | | | |
| | | | Compliance Assistance | Code | Code | Inspection Results | Code |
| | | | | | | | NOU10 |

Remarks: Follow up inspection to determine activity on well. At time of inspection, trucks hauling off last few pieces of rig to next site (CRUM). H-K contracting on site. Two workers skinning off oily sheen from reserve pit. I inspected lines - no tears were observed. Several fract tanks on site are to be used to temporarily store fluid from pit as they pump it down. Plan to solidify and encapsulate next week sometime.

| | | | |
|------------|------------------------|----------------------------|------------|
| Sample No. | Location / Description | DEP Rep: | Date: |
| | | (signature) Stephen Watson | 9/2/10 |
| | | (print name) Steve WATSON | Time: 1:30 |

ANALYTICAL REPORT

DRBC Well Smp, Wayne County PA

Lot #: COH110479

Steve Moyer

Tetra Tech NUS, Inc
116 N. Washington Avenue
Office 1G
Scranton, PA 18503

TESTAMERICA LABORATORIES, INC.



Veronica Bortot
Project Manager

August 18, 2010

NELAC REPORTING:

At the time of analysis the laboratory was in compliance with the current NELAC standards and held accreditation for all analyses performed unless noted by a qualifier. The labs accreditation numbers are listed below. The format and contents of the report meets all applicable NELAC standards except as noted in the narrative and shall not be reproduced except in full, without the written approval of the laboratory. The table below presents a summary of the certifications held by TestAmerica Pittsburgh. Our primary accreditation authority for the Non-potable water and Solid & Hazardous waste programs is Pennsylvania DEP. A more detailed parameter list is available upon request. Please ask your project manager for this information when required.

| Certifying State/Program | Certificate # | Program Types | TestAmerica |
|------------------------------------|--------------------------------|----------------------------|-------------|
| DoD ELAP | ADE-1442 | WW HW | X |
| US Dept of Agriculture Arkansas | (#P330-10-00139) (#88-0690) | Foreign Soil Import Permit | X |
| California - NELAC | 04224CA | WW HW | X X |
| Connecticut | (#PH-0688) | WW HW | X X |
| Florida - NELAC | (#E871008) | WW HW | X X |
| Illinois - NELAC | (#002319) | WW HW | X X |
| Kansas - NELAC | (#E-10350) | WW HW | X X |
| Louisiana - NELAC | (#04041) | WW HW | X X |
| New Hampshire - NELAC | (#203010) | WW - | X - |
| New Jersey - NELAC | (PA-005) | WW HW | X X |
| New York - NELAC | (#11182) | WW HW | X X |
| North Carolina | (#434) | WW HW | X X |
| Pennsylvania - NELAC | (#02-00416) | WW HW | X X |
| South Carolina | (#89014002) | WW HW | X X |
| Utah - NELAC | (STLP) | WW HW | X X |
| West Virginia | (#142) | WW HW | X X |
| Wisconsin | 998027800 | WW HW | X X |

The codes utilized for program types are described below:

- HW Hazardous Waste certification
- WW Non-potable Water and/or Wastewater certification
- X Laboratory has some form of certification under the specific program. Many states certify laboratories for specific parameters or tests within a category. The information in the table indicates the lab is certified in a general category of testing. Please contact the laboratory if parameter specific certification information is required.

Updated: 05/19/10 N:\Reporting\NELAC NARRATIVE Pitsburgh_Updated 051910.doc

**CASE NARRATIVE
TETRA TECH**

Lot #: C0H110479

Sample Receiving:

TestAmerica's Pittsburgh laboratory received one sample on August 11, 2010. The cooler was received within the proper temperature range.

If project specific QC was not required for samples contained in this report, when batch QC was completed on these samples, anomalous results will be discussed below.

GC/MS Volatiles:

All non-CCC compounds that have >15% RSD were evaluated to see if a better curve could be drawn using a quadratic curve. All compounds <30% RSD will use an average response factor curve if no visible improvement is accomplished using a quadratic curve. A quadratic curve will be used for a compound where it is determined to be the "best-fit" evaluation.

Metals:

The sample and associated matrix spikes were over the instrument's linear range for sodium and strontium and was analyzed at a dilution.

The method blanks had analytes detected at concentrations between the MDL and the reporting limit. The results were flagged with a "B" qualifier. Any sample associated with a method blank that had the same analyte detected had the result flagged with a "J" qualifier.

For the matrix spike and matrix spike duplicate, potassium, sodium and strontium recoveries were not calculated due to the concentration of analyte in the sample being >4 times the concentration of spike added.

The matrix spikes recovered outside control limits for aluminum.

General Chemistry:

The test for pH is a field parameter. The laboratory pH analysis was completed at the request of the client.

Chain of Custody Record

TestAmerica Laboratory location: DW NPDES RCRA Other

| | | | |
|--|---|-----------------------------------|--|
| Client Contact Tetra Tech NUS 116 W Washington Ave Scranton, PA, 18503 717-344-1148 255C well sampling Tophole 717-344-5836 | Client Project Manager: Veronica Bortot | Lab Contact: [Redacted] | Lab Address: [Redacted] |
| Sample Identification WSP-Tophole 001010 | Sample Date 8/16/10 | Sample Time 1345 | Analysis: Add Vol 100 ml 100 ml 100 ml |
| Possible Hazard Identification: <input type="checkbox"/> Non-Hazard <input type="checkbox"/> Flammable <input type="checkbox"/> Skin Irritant <input type="checkbox"/> Unknown <input type="checkbox"/> Poison B | | | |
| Special Instructions/OC Requirements & Comments: * 1 Liter Sample being tested for CN is not preserved. Short hold. | | | |
| Relinquished by: [Signature] | Received by: Tetra Tech [Signature] | Company: Tetra Tech | Date/Time: 8/19/10, 1745 |
| Relinquished by: [Signature] | Received by: [Signature] | Company: TA-Pick | Date/Time: 8/19/10 |

METHODS SUMMARY

COH110479

| <u>PARAMETER</u> | <u>ANALYTICAL METHOD</u> | <u>PREPARATION METHOD</u> |
|--|------------------------------|-------------------------------|
| pH (Electrometric) | SM20 4500-H+B | SM20 4500-H B |
| Biochemical Oxygen Demand 5210B | SM20 5210B | SM20 5210B |
| Mercury (Manual Cold Vapor Technique) | MCAWW 245.1 | MCAWW 245.1 |
| N-Hexane Ext. Material, Silica Gel Treated-1664A | CFR136A 1664A S | EPA 1664A |
| Total Cyanide | MCAWW 335.4 | MCAWW 335.4 |
| Total Suspended Solids SM 2540 D | SM20 2540D | SM20 2540D |
| Trace Inductively Coupled Plasma (ICP) Metals | MCAWW 200.7 | MCAWW 200.7 |
| Volatile Organics by GC/MS | SW846 8260B | SW846 5030B |

References:

- CFR136A "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater", 40CFR, Part 136, Appendix A, October 26, 1984 and subsequent revisions.
- MCAWW "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, March 1983 and subsequent revisions.
- SM20 "STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER", 20TH EDITION."
- SW846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 and its updates.

SAMPLE SUMMARY

C0H110479

| <u>WO #</u> | <u>SAMPLE#</u> | <u>CLIENT SAMPLE ID</u> | <u>SAMPLED DATE</u> | <u>SAMP TIME</u> |
|-------------|----------------|-------------------------|---------------------|------------------|
| L5EXN | 001 | WMP-TOPHOLE 081010 | 08/10/10 | 13:45 |

NOTE(S) :

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filler test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

Tetra Tech NUS, Inc

Client Sample ID: WMP-TOPHOLE 081010

GC/MS Volatiles

Lot-Sample #...: C0H110479-001 Work Order #...: L5EXN1A4 Matrix.....: WATER
Date Sampled...: 08/10/10 Date Received..: 08/11/10 MS Run #.....: 0228124
Prep Date.....: 08/16/10 Analysis Date..: 08/16/10
Prep Batch #...: 0228193 Analysis Time..: 09:28
Dilution Factor: 1
Method.....: SW846 8260B

| <u>PARAMETER</u> | <u>RESULT</u> | <u>REPORTING</u> | |
|------------------|---------------|------------------|--------------|
| | | <u>LIMIT</u> | <u>UNITS</u> |
| Benzene | ND | 5.0 | ug/L |
| Ethylbenzene | ND | 5.0 | ug/L |
| Toluene | ND | 5.0 | ug/L |
| Xylenes (total) | ND | 15 | ug/L |

| <u>SURROGATE</u> | <u>PERCENT RECOVERY</u> | <u>RECOVERY LIMITS</u> |
|-----------------------|-------------------------|------------------------|
| 1,2-Dichloroethane-d4 | 107 | (62 - 123) |
| Toluene-d8 | 96 | (80 - 120) |
| 4-Bromofluorobenzene | 92 | (75 - 120) |
| Dibromofluoromethane | 104 | (80 - 120) |

METHOD BLANK REPORT

GC/MS Volatiles

Client Lot #...: C0H110479
MB Lot-Sample #: C0H160000-193
Analysis Date...: 08/16/10
Dilution Factor: 1

Work Order #...: L5L921AA
Prep Date.....: 08/16/10
Prep Batch #...: 0228193

Matrix.....: WATER
Analysis Time...: 07:06

| <u>PARAMETER</u> | <u>RESULT</u> | <u>REPORTING</u> | | <u>METHOD</u> |
|------------------|---------------|------------------|--------------|---------------|
| | | <u>LIMIT</u> | <u>UNITS</u> | |
| Benzene | ND | 5.0 | ug/L | SW846 8260B |
| Ethylbenzene | ND | 5.0 | ug/L | SW846 8260B |
| Toluene | ND | 5.0 | ug/L | SW846 8260B |
| Xylenes (total) | ND | 15 | ug/L | SW846 8260B |

| <u>SURROGATE</u> | <u>PERCENT RECOVERY</u> | <u>RECOVERY LIMITS</u> |
|-----------------------|-------------------------|------------------------|
| 1,2-Dichloroethane-d4 | 117 | (62 - 123) |
| Toluene-d8 | 94 | (80 - 120) |
| 4-Bromofluorobenzene | 101 | (75 - 120) |
| Dibromofluoromethane | 97 | (80 - 120) |

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

LABORATORY CONTROL SAMPLE EVALUATION REPORT

GC/MS Volatiles

Client Lot #...: C0H110479 Work Order #...: L5L921AC Matrix.....: WATER
 LCS Lot-Sample#: C0H160000-193
 Prep Date.....: 08/16/10 Analysis Date...: 08/16/10
 Prep Batch #...: 0228193 Analysis Time...: 07:43
 Dilution Factor: 1

| <u>PARAMETER</u> | PERCENT <u>RECOVERY</u> | RECOVERY <u>LIMITS</u> | <u>METHOD</u> |
|--------------------|----------------------------|---------------------------|---------------|
| 1,1-Dichloroethene | 82 | (69 - 127) | SW846 8260B |
| Trichloroethene | 98 | (80 - 120) | SW846 8260B |
| Chlorobenzene | 89 | (83 - 120) | SW846 8260B |
| Benzene | 95 | (80 - 120) | SW846 8260B |
| Toluene | 83 | (80 - 124) | SW846 8260B |

| <u>SURROGATE</u> | PERCENT <u>RECOVERY</u> | RECOVERY <u>LIMITS</u> |
|-----------------------|----------------------------|---------------------------|
| 1,2-Dichloroethane-d4 | 112 | (62 - 123) |
| Toluene-d8 | 95 | (80 - 120) |
| 4-Bromofluorobenzene | 97 | (75 - 120) |
| Dibromofluoromethane | 108 | (80 - 120) |

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

Bold print denotes control parameters

MATRIX SPIKE SAMPLE EVALUATION REPORT

GC/MS Volatiles

Client Lot #...: C0H110479 Work Order #...: L5E0M1C7-MS Matrix.....: WATER
 MS Lot-Sample #: C0H110483-001 L5E0M1C8-MSD
 Date Sampled...: 08/10/10 Date Received...: 08/11/10 MS Run #.....: 0228124
 Prep Date.....: 08/16/10 Analysis Date...: 08/16/10
 Prep Batch #...: 0228193 Analysis Time...: 08:07
 Dilution Factor: 1

| PARAMETER | PERCENT | RECOVERY | RPD | | METHOD |
|--------------------|----------|------------|------|--------|-------------|
| | RECOVERY | LIMITS | RPD | LIMITS | |
| 1,1-Dichloroethene | 86 | (69 - 127) | | | SW846 8260B |
| | 93 | (69 - 127) | 8.4 | (0-20) | SW846 8260B |
| Trichloroethene | 98 | (80 - 120) | | | SW846 8260B |
| | 110 | (80 - 120) | 11 | (0-20) | SW846 8260B |
| Chlorobenzene | 99 | (83 - 120) | | | SW846 8260B |
| | 98 | (83 - 120) | 1.2 | (0-20) | SW846 8260B |
| Benzene | 105 | (80 - 120) | | | SW846 8260B |
| | 105 | (80 - 120) | 0.0 | (0-20) | SW846 8260B |
| Toluene | 90 | (80 - 124) | | | SW846 8260B |
| | 89 | (80 - 124) | 0.22 | (0-20) | SW846 8260B |

| SURROGATE | PERCENT | RECOVERY |
|-----------------------|----------|------------|
| | RECOVERY | LIMITS |
| 1,2-Dichloroethane-d4 | 115 | (62 - 123) |
| | 117 | (62 - 123) |
| Toluene-d8 | 95 | (80 - 120) |
| | 94 | (80 - 120) |
| 4-Bromofluorobenzene | 94 | (75 - 120) |
| | 94 | (75 - 120) |
| Dibromofluoromethane | 108 | (80 - 120) |
| | 115 | (80 - 120) |

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

Bold print denotes control parameters

Tetra Tech NUS, Inc

Client Sample ID: WMP-TOPHOLE 081010

TOTAL Metals

Lot-Sample #...: C0H110479-001
Date Sampled...: 08/10/10

Date Received...: 08/11/10

Matrix.....: WATER

| PARAMETER | RESULT | REPORTING | | | METHOD | PREPARATION- | WORK |
|--------------------------|----------|--------------------|-------|------------------------|--------|------------------------|----------|
| | | LIMIT | UNITS | | | ANALYSIS DATE | ORDER # |
| Prep Batch #...: 0224387 | | | | | | | |
| Silver | ND | 5.0 | ug/L | MCAWW 200.7 | | 08/12-08/13/10 | L5EXN1AA |
| | | Dilution Factor: 1 | | Analysis Time..: 13:43 | | MS Run #.....: 0224231 | |
| Aluminum | 2420 J | 200 | ug/L | MCAWW 200.7 | | 08/12-08/13/10 | L5EXN1AH |
| | | Dilution Factor: 1 | | Analysis Time..: 13:43 | | MS Run #.....: 0224231 | |
| Arsenic | 11.4 | 10.0 | ug/L | MCAWW 200.7 | | 08/12-08/13/10 | L5EXN1AJ |
| | | Dilution Factor: 1 | | Analysis Time..: 13:43 | | MS Run #.....: 0224231 | |
| Barium | 1830 | 200 | ug/L | MCAWW 200.7 | | 08/12-08/13/10 | L5EXN1AK |
| | | Dilution Factor: 1 | | Analysis Time..: 13:43 | | MS Run #.....: 0224231 | |
| Beryllium | ND | 4.0 | ug/L | MCAWW 200.7 | | 08/12-08/13/10 | L5EXN1AL |
| | | Dilution Factor: 1 | | Analysis Time..: 13:43 | | MS Run #.....: 0224231 | |
| Boron | 249 | 200 | ug/L | MCAWW 200.7 | | 08/12-08/13/10 | L5EXN1AM |
| | | Dilution Factor: 1 | | Analysis Time..: 13:43 | | MS Run #.....: 0224231 | |
| Calcium | 108000 J | 5000 | ug/L | MCAWW 200.7 | | 08/12-08/13/10 | L5EXN1AN |
| | | Dilution Factor: 1 | | Analysis Time..: 13:43 | | MS Run #.....: 0224231 | |
| Cadmium | ND | 5.0 | ug/L | MCAWW 200.7 | | 08/12-08/13/10 | L5EXN1AP |
| | | Dilution Factor: 1 | | Analysis Time..: 13:43 | | MS Run #.....: 0224231 | |
| Cobalt | 1.6 B | 50.0 | ug/L | MCAWW 200.7 | | 08/12-08/13/10 | L5EXN1AQ |
| | | Dilution Factor: 1 | | Analysis Time..: 13:43 | | MS Run #.....: 0224231 | |
| Chromium | 9.6 | 5.0 | ug/L | MCAWW 200.7 | | 08/12-08/13/10 | L5EXN1AR |
| | | Dilution Factor: 1 | | Analysis Time..: 13:43 | | MS Run #.....: 0224231 | |
| Copper | 10 B | 25.0 | ug/L | MCAWW 200.7 | | 08/12-08/13/10 | L5EXN1AC |
| | | Dilution Factor: 1 | | Analysis Time..: 13:43 | | MS Run #.....: 0224231 | |
| Iron | 3010 | 100 | ug/L | MCAWW 200.7 | | 08/12-08/13/10 | L5EXN1AD |
| | | Dilution Factor: 1 | | Analysis Time..: 16:34 | | MS Run #.....: 0224231 | |

(Continued on next page)

Tetra Tech NUS, Inc

Client Sample ID: WMP-TOPHOLE 081010

TOTAL Metals

Lot-Sample #...: C0H110479-001

Matrix.....: WATER

| PARAMETER | RESULT | REPORTING | | METHOD | PREPARATION- | WORK |
|--------------------------|----------|--------------------|-------|------------------------|------------------------|----------|
| | | LIMIT | UNITS | | ANALYSIS DATE | ORDER # |
| Potassium | 249000 | 5000 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1AE |
| | | Dilution Factor: 1 | | Analysis Time..: 13:43 | MS Run #.....: 0224231 | |
| Lithium | 3190 | 50.0 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1AF |
| | | Dilution Factor: 1 | | Analysis Time..: 13:43 | MS Run #.....: 0224231 | |
| Magnesium | 2730 B,J | 5000 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1AG |
| | | Dilution Factor: 1 | | Analysis Time..: 13:43 | MS Run #.....: 0224231 | |
| Manganese | 101 | 15.0 | ug/L | MCAWW 200.7 | 08/12-08/16/10 | L5EXN1AT |
| | | Dilution Factor: 1 | | Analysis Time..: 12:07 | MS Run #.....: 0224231 | |
| Molybdenum | 89.9 | 40.0 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1AU |
| | | Dilution Factor: 1 | | Analysis Time..: 13:43 | MS Run #.....: 0224231 | |
| Sodium | 801000 | 25000 | ug/L | MCAWW 200.7 | 08/12-08/16/10 | L5EXN1AV |
| | | Dilution Factor: 5 | | Analysis Time..: 12:26 | MS Run #.....: 0224231 | |
| Nickel | 7.6 B | 40.0 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1AW |
| | | Dilution Factor: 1 | | Analysis Time..: 13:43 | MS Run #.....: 0224231 | |
| Lead | 22.6 | 3.0 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1AX |
| | | Dilution Factor: 1 | | Analysis Time..: 13:43 | MS Run #.....: 0224231 | |
| Selenium | 5.5 | 5.0 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1A0 |
| | | Dilution Factor: 1 | | Analysis Time..: 13:43 | MS Run #.....: 0224231 | |
| Strontium | 10800 J | 250 | ug/L | MCAWW 200.7 | 08/12-08/16/10 | L5EXN1A1 |
| | | Dilution Factor: 5 | | Analysis Time..: 12:26 | MS Run #.....: 0224231 | |
| Zinc | 21.3 | 20.0 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1A2 |
| | | Dilution Factor: 1 | | Analysis Time..: 13:43 | MS Run #.....: 0224231 | |
| Prep Batch #...: 0230021 | | | | | | |
| Mercury | 0.35 | 0.20 | ug/L | MCAWW 245.1 | 08/18/10 | L5EXN1A3 |
| | | Dilution Factor: 1 | | Analysis Time..: 07:59 | MS Run #.....: 0230010 | |

NOTE(S):

J Method blank contamination. The associated method blank contains the target analyte at a reportable level.

B Estimated result. Result is less than RL.

METHOD BLANK REPORT

TOTAL Metals

Client Lot #...: C0H110479

Matrix.....: WATER

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION- ANALYSIS DATE | WORK ORDER # |
|---|--------|--|-------|-------------|-------------------------------|-----------------|
| MB Lot-Sample #: C0H120000-387 Prep Batch #...: 0224387 | | | | | | |
| Aluminum | 67.6 B | 200 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1AH |
| | | Dilution Factor: 1 Analysis Time..: 13:26 | | | | |
| Arsenic | ND | 10.0 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1AJ |
| | | Dilution Factor: 1 Analysis Time..: 13:26 | | | | |
| Barium | ND | 200 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1AK |
| | | Dilution Factor: 1 Analysis Time..: 13:26 | | | | |
| Beryllium | 0.31 B | 4.0 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1AL |
| | | Dilution Factor: 1 Analysis Time..: 13:26 | | | | |
| Boron | ND | 200 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1AM |
| | | Dilution Factor: 1 Analysis Time..: 13:26 | | | | |
| Cadmium | ND | 5.0 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1AP |
| | | Dilution Factor: 1 Analysis Time..: 13:26 | | | | |
| Calcium | 87.9 B | 5000 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1AN |
| | | Dilution Factor: 1 Analysis Time..: 13:26 | | | | |
| Chromium | ND | 5.0 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1AR |
| | | Dilution Factor: 1 Analysis Time..: 13:26 | | | | |
| Cobalt | ND | 50.0 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1AQ |
| | | Dilution Factor: 1 Analysis Time..: 13:26 | | | | |
| Copper | ND | 25.0 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1AC |
| | | Dilution Factor: 1 Analysis Time..: 13:26 | | | | |
| Iron | ND | 100 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1AD |
| | | Dilution Factor: 1 Analysis Time..: 16:12 | | | | |

(Continued on next page)

METHOD BLANK REPORT

TOTAL Metals

Client Lot #...: C0H110479

Matrix.....: WATER

| <u>PARAMETER</u> | <u>RESULT</u> | <u>REPORTING</u> | | <u>METHOD</u> | <u>PREPARATION-</u> | <u>WORK</u> |
|------------------|---------------|------------------------|--------------|--------------------|-----------------------|-----------------|
| | | <u>LIMIT</u> | <u>UNITS</u> | | <u>ANALYSIS DATE</u> | <u>ORDER #</u> |
| Lead | ND | 3.0 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1AX |
| | | Dilution Factor: 1 | | | | |
| | | Analysis Time..: 13:26 | | | | |
| Lithium | ND | 50.0 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1AF |
| | | Dilution Factor: 1 | | | | |
| | | Analysis Time..: 13:26 | | | | |
| Magnesium | 54.5 B | 5000 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1AG |
| | | Dilution Factor: 1 | | | | |
| | | Analysis Time..: 13:26 | | | | |
| Manganese | ND | 15.0 | ug/L | MCAWW 200.7 | 08/12-08/16/10 | L5HKP1AT |
| | | Dilution Factor: 1 | | | | |
| | | Analysis Time..: 11:55 | | | | |
| Molybdenum | ND | 40.0 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1AU |
| | | Dilution Factor: 1 | | | | |
| | | Analysis Time..: 13:26 | | | | |
| Nickel | ND | 40.0 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1AW |
| | | Dilution Factor: 1 | | | | |
| | | Analysis Time..: 13:26 | | | | |
| Potassium | ND | 5000 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1AE |
| | | Dilution Factor: 1 | | | | |
| | | Analysis Time..: 13:26 | | | | |
| Selenium | ND | 5.0 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1A0 |
| | | Dilution Factor: 1 | | | | |
| | | Analysis Time..: 13:26 | | | | |
| Silver | ND | 5.0 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1AA |
| | | Dilution Factor: 1 | | | | |
| | | Analysis Time..: 13:26 | | | | |
| Sodium | ND | 5000 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1AV |
| | | Dilution Factor: 1 | | | | |
| | | Analysis Time..: 13:26 | | | | |
| Strontium | 0.44 B | 50.0 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1A1 |
| | | Dilution Factor: 1 | | | | |
| | | Analysis Time..: 13:26 | | | | |
| Zinc | ND | 20.0 | ug/L | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1A2 |
| | | Dilution Factor: 1 | | | | |
| | | Analysis Time..: 13:26 | | | | |

(Continued on next page)

METHOD BLANK REPORT

TOTAL Metals

Client Lot #...: C0H110479

Matrix.....: WATER

| <u>PARAMETER</u> | <u>RESULT</u> | <u>REPORTING</u> <u>LIMIT</u> | <u>UNITS</u> | <u>METHOD</u> | <u>PREPARATION-</u> <u>ANALYSIS DATE</u> | <u>WORK</u> <u>ORDER #</u> |
|------------------|---------------|----------------------------------|--------------|---------------|---|-------------------------------|
| MB Lot-Sample #: | C0H180000-021 | Prep Batch #...: | 0230021 | | | |
| Mercury | ND | 0.20 | ug/L | MCAWW 245.1 | 08/18/10 | L5P4D1AA |
| | | Dilution Factor: | 1 | | | |
| | | Analysis Time..: | 07:56 | | | |

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

B Estimated result. Result is less than RL.

LABORATORY CONTROL SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: C0H110479

Matrix.....: WATER

| <u>PARAMETER</u> | <u>PERCENT RECOVERY</u> | <u>RECOVERY LIMITS</u> | <u>METHOD</u> | <u>PREPARATION- ANALYSIS DATE</u> | <u>WORK ORDER #</u> |
|---|-------------------------|------------------------|------------------------|-----------------------------------|---------------------|
| LCS Lot-Sample#: C0H120000-387 Prep Batch #...: 0224387 | | | | | |
| Silver | 92 | (85 - 115) | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1A3 |
| | | Dilution Factor: 1 | Analysis Time..: 13:30 | | |
| Copper | 95 | (85 - 115) | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1A4 |
| | | Dilution Factor: 1 | Analysis Time..: 13:30 | | |
| Iron | 89 | (85 - 115) | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1A5 |
| | | Dilution Factor: 1 | Analysis Time..: 16:17 | | |
| Potassium | 98 | (85 - 115) | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1A6 |
| | | Dilution Factor: 1 | Analysis Time..: 13:30 | | |
| Lithium | 96 | (85 - 115) | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1A7 |
| | | Dilution Factor: 1 | Analysis Time..: 13:30 | | |
| Magnesium | 97 | (85 - 115) | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1A8 |
| | | Dilution Factor: 1 | Analysis Time..: 13:30 | | |
| Aluminum | 100 | (85 - 115) | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1A9 |
| | | Dilution Factor: 1 | Analysis Time..: 13:30 | | |
| Arsenic | 101 | (85 - 115) | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1CA |
| | | Dilution Factor: 1 | Analysis Time..: 13:30 | | |
| Barium | 96 | (85 - 115) | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1CC |
| | | Dilution Factor: 1 | Analysis Time..: 13:30 | | |
| Beryllium | 96 | (85 - 115) | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1CD |
| | | Dilution Factor: 1 | Analysis Time..: 13:30 | | |
| Boron | 101 | (85 - 115) | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1CE |
| | | Dilution Factor: 1 | Analysis Time..: 13:30 | | |
| Calcium | 99 | (85 - 115) | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1CF |
| | | Dilution Factor: 1 | Analysis Time..: 13:30 | | |
| Cadmium | 95 | (85 - 115) | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1CG |
| | | Dilution Factor: 1 | Analysis Time..: 13:30 | | |
| Cobalt | 99 | (85 - 115) | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1CH |
| | | Dilution Factor: 1 | Analysis Time..: 13:30 | | |

(Continued on next page)

LABORATORY CONTROL SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: C0H110479

Matrix.....: WATER

| <u>PARAMETER</u> | <u>PERCENT RECOVERY</u> | <u>RECOVERY LIMITS</u> | <u>METHOD</u> | <u>PREPARATION- ANALYSIS DATE</u> | <u>WORK ORDER #</u> |
|-------------------------|-------------------------|------------------------|------------------------|-----------------------------------|---------------------|
| Chromium | 95 | (85 - 115) | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1CJ |
| | | Dilution Factor: 1 | Analysis Time..: 13:30 | | |
| Manganese | 95 | (85 - 115) | MCAWW 200.7 | 08/12-08/16/10 | L5HKP1CK |
| | | Dilution Factor: 1 | Analysis Time..: 11:59 | | |
| Molybdenum | 95 | (85 - 115) | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1CL |
| | | Dilution Factor: 1 | Analysis Time..: 13:30 | | |
| Sodium | 97 | (85 - 115) | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1CM |
| | | Dilution Factor: 1 | Analysis Time..: 13:30 | | |
| Nickel | 98 | (85 - 115) | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1CN |
| | | Dilution Factor: 1 | Analysis Time..: 13:30 | | |
| Lead | 98 | (85 - 115) | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1CP |
| | | Dilution Factor: 1 | Analysis Time..: 13:30 | | |
| Selenium | 104 | (85 - 115) | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1CQ |
| | | Dilution Factor: 1 | Analysis Time..: 13:30 | | |
| Strontium | 96 | (85 - 115) | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1CR |
| | | Dilution Factor: 1 | Analysis Time..: 13:30 | | |
| Zinc | 96 | (85 - 115) | MCAWW 200.7 | 08/12-08/13/10 | L5HKP1CT |
| | | Dilution Factor: 1 | Analysis Time..: 13:30 | | |
| LCS Lot-Sample#: | C0H180000-021 | Prep Batch #... | 0230021 | | |
| Mercury | 100 | (85 - 115) | MCAWW 245.1 | 08/18/10 | L5P4D1AC |
| | | Dilution Factor: 1 | Analysis Time..: 07:57 | | |

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: C0H110479

Matrix.....: WATER

Date Sampled...: 08/10/10

Date Received...: 08/11/10

| <u>PARAMETER</u> | <u>PERCENT RECOVERY</u> | <u>RECOVERY LIMITS</u> | <u>RPD</u> | <u>RPD LIMITS</u> | <u>METHOD</u> | <u>PREPARATION- ANALYSIS DATE</u> | <u>WORK ORDER #</u> |
|--|-------------------------|------------------------|-------------------------|-------------------|---------------|-----------------------------------|---------------------|
| MS Lot-Sample #: C0H110479-001 Prep Batch #...: 0224387 | | | | | | | |
| Aluminum | 153 N | (70 - 130) | | | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1CQ |
| | 147 N | (70 - 130) | 2.3 | (0-20) | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1CR |
| | | | Dilution Factor: 1 | | | | |
| | | | Analysis Time...: 13:52 | | | | |
| | | | MS Run #.....: 0224231 | | | | |
| Arsenic | 114 | (70 - 130) | | | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1CT |
| | 111 | (70 - 130) | 2.0 | (0-20) | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1CU |
| | | | Dilution Factor: 1 | | | | |
| | | | Analysis Time...: 13:52 | | | | |
| | | | MS Run #.....: 0224231 | | | | |
| Barium | 106 | (70 - 130) | | | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1CV |
| | 102 | (70 - 130) | 2.1 | (0-20) | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1CW |
| | | | Dilution Factor: 1 | | | | |
| | | | Analysis Time...: 13:52 | | | | |
| | | | MS Run #.....: 0224231 | | | | |
| Beryllium | 101 | (70 - 130) | | | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1CX |
| | 97 | (70 - 130) | 3.8 | (0-20) | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1C0 |
| | | | Dilution Factor: 1 | | | | |
| | | | Analysis Time...: 13:52 | | | | |
| | | | MS Run #.....: 0224231 | | | | |
| Boron | 101 | (70 - 130) | | | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1C1 |
| | 99 | (70 - 130) | 2.0 | (0-20) | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1C2 |
| | | | Dilution Factor: 1 | | | | |
| | | | Analysis Time...: 13:52 | | | | |
| | | | MS Run #.....: 0224231 | | | | |
| Cadmium | 98 | (70 - 130) | | | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1C5 |
| | 95 | (70 - 130) | 3.4 | (0-20) | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1C6 |
| | | | Dilution Factor: 1 | | | | |
| | | | Analysis Time...: 13:52 | | | | |
| | | | MS Run #.....: 0224231 | | | | |
| Calcium | 101 | (70 - 130) | | | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1C3 |
| | 94 | (70 - 130) | 2.1 | (0-20) | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1C4 |
| | | | Dilution Factor: 1 | | | | |
| | | | Analysis Time...: 13:52 | | | | |
| | | | MS Run #.....: 0224231 | | | | |

(Continued on next page)

MATRIX SPIKE SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: C0H110479

Matrix.....: WATER

Date Sampled...: 08/10/10

Date Received...: 08/11/10

| <u>PARAMETER</u> | <u>PERCENT RECOVERY</u> | <u>RECOVERY LIMITS</u> | <u>RPD</u> | <u>RPD LIMITS</u> | <u>METHOD</u> | <u>PREPARATION- ANALYSIS DATE</u> | <u>WORK ORDER #</u> |
|-------------------------|-------------------------|------------------------|------------|-------------------|---------------|-----------------------------------|---------------------|
| Chromium | 100 | (70 - 130) | | | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1C9 |
| | 98 | (70 - 130) | 2.0 | (0-20) | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1DA |
| Dilution Factor: 1 | | | | | | | |
| Analysis Time...: 13:52 | | | | | | | |
| MS Run #.....: 0224231 | | | | | | | |
| Cobalt | 111 | (70 - 130) | | | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1C7 |
| | 107 | (70 - 130) | 3.5 | (0-20) | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1C8 |
| Dilution Factor: 1 | | | | | | | |
| Analysis Time...: 13:52 | | | | | | | |
| MS Run #.....: 0224231 | | | | | | | |
| Copper | 103 | (70 - 130) | | | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1CE |
| | 99 | (70 - 130) | 3.6 | (0-20) | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1CF |
| Dilution Factor: 1 | | | | | | | |
| Analysis Time...: 13:52 | | | | | | | |
| MS Run #.....: 0224231 | | | | | | | |
| Iron | 116 | (70 - 130) | | | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1CG |
| | 117 | (70 - 130) | 0.33 | (0-20) | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1CH |
| Dilution Factor: 1 | | | | | | | |
| Analysis Time...: 16:45 | | | | | | | |
| MS Run #.....: 0224231 | | | | | | | |
| Lead | 105 | (70 - 130) | | | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1DL |
| | 101 | (70 - 130) | 3.2 | (0-20) | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1DM |
| Dilution Factor: 1 | | | | | | | |
| Analysis Time...: 13:52 | | | | | | | |
| MS Run #.....: 0224231 | | | | | | | |
| Lithium | 111 | (70 - 130) | | | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1CL |
| | 104 | (70 - 130) | 1.6 | (0-20) | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1CM |
| Dilution Factor: 1 | | | | | | | |
| Analysis Time...: 13:52 | | | | | | | |
| MS Run #.....: 0224231 | | | | | | | |
| Magnesium | 100 | (70 - 130) | | | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1CN |
| | 96 | (70 - 130) | 3.7 | (0-20) | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1CP |
| Dilution Factor: 1 | | | | | | | |
| Analysis Time...: 13:52 | | | | | | | |
| MS Run #.....: 0224231 | | | | | | | |

(Continued on next page)

MATRIX SPIKE SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: C0H110479

Matrix.....: WATER

Date Sampled...: 08/10/10

Date Received...: 08/11/10

| <u>PARAMETER</u> | <u>PERCENT RECOVERY</u> | <u>RECOVERY LIMITS</u> | <u>RPD</u> | <u>RPD LIMITS</u> | <u>METHOD</u> | <u>PREPARATION- ANALYSIS DATE</u> | <u>WORK ORDER #</u> |
|------------------|-------------------------|------------------------|-------------------------|-------------------|---------------|-----------------------------------|---------------------|
| Manganese | 101 | (70 - 130) | | | MCAWW 200.7 | 08/12-08/16/10 | L5EXN1DC |
| | 99 | (70 - 130) | 1.8 | (0-20) | MCAWW 200.7 | 08/12-08/16/10 | L5EXN1DD |
| | | | Dilution Factor: 1 | | | | |
| | | | Analysis Time...: 12:16 | | | | |
| | | | MS Run #.....: 0224231 | | | | |
| Molybdenum | 100 | (70 - 130) | | | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1DE |
| | 97 | (70 - 130) | 2.4 | (0-20) | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1DF |
| | | | Dilution Factor: 1 | | | | |
| | | | Analysis Time...: 13:52 | | | | |
| | | | MS Run #.....: 0224231 | | | | |
| Nickel | 109 | (70 - 130) | | | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1DJ |
| | 105 | (70 - 130) | 3.3 | (0-20) | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1DK |
| | | | Dilution Factor: 1 | | | | |
| | | | Analysis Time...: 13:52 | | | | |
| | | | MS Run #.....: 0224231 | | | | |
| Potassium | NC | (70 - 130) | | | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1CJ |
| | NC | (70 - 130) | | (0-20) | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1CK |
| | | | Dilution Factor: 1 | | | | |
| | | | Analysis Time...: 13:52 | | | | |
| | | | MS Run #.....: 0224231 | | | | |
| Selenium | 115 | (70 - 130) | | | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1DN |
| | 111 | (70 - 130) | 3.6 | (0-20) | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1DP |
| | | | Dilution Factor: 1 | | | | |
| | | | Analysis Time...: 13:52 | | | | |
| | | | MS Run #.....: 0224231 | | | | |
| Silver | 102 | (70 - 130) | | | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1CC |
| | 100 | (70 - 130) | 2.2 | (0-20) | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1CD |
| | | | Dilution Factor: 1 | | | | |
| | | | Analysis Time...: 13:52 | | | | |
| | | | MS Run #.....: 0224231 | | | | |
| Sodium | NC | (70 - 130) | | | MCAWW 200.7 | 08/12-08/16/10 | L5EXN1DG |
| | NC | (70 - 130) | | (0-20) | MCAWW 200.7 | 08/12-08/16/10 | L5EXN1DH |
| | | | Dilution Factor: 5 | | | | |
| | | | Analysis Time...: 12:35 | | | | |
| | | | MS Run #.....: 0224231 | | | | |

(Continued on next page)

MATRIX SPIKE SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: C0H110479

Matrix.....: WATER

Date Sampled...: 08/10/10

Date Received...: 08/11/10

| <u>PARAMETER</u> | <u>PERCENT RECOVERY</u> | <u>RECOVERY LIMITS</u> | <u>RPD</u> | <u>RPD LIMITS</u> | <u>METHOD</u> | <u>PREPARATION- ANALYSIS DATE</u> | <u>WORK ORDER #</u> |
|-------------------------|-------------------------|------------------------|------------|-------------------|---------------|-----------------------------------|---------------------|
| Strontium | NC | (70 - 130) | | | MCAWW 200.7 | 08/12-08/16/10 | L5EXN1DQ |
| | NC | (70 - 130) | | (0-20) | MCAWW 200.7 | 08/12-08/16/10 | L5EXN1DR |
| Dilution Factor: 5 | | | | | | | |
| Analysis Time...: 12:35 | | | | | | | |
| MS Run #.....: 0224231 | | | | | | | |
| Zinc | 100 | (70 - 130) | | | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1DT |
| | 98 | (70 - 130) | 2.2 | (0-20) | MCAWW 200.7 | 08/12-08/13/10 | L5EXN1DU |
| Dilution Factor: 1 | | | | | | | |
| Analysis Time...: 13:52 | | | | | | | |
| MS Run #.....: 0224231 | | | | | | | |

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

N Spiked analyte recovery is outside stated control limits.

NC The recovery and/or RPD were not calculated.

MATRIX SPIKE SAMPLE EVALUATION REPORT

TOTAL Metals

Client Lot #...: C0H110479

Matrix.....: WATER

Date Sampled...: 08/10/10

Date Received...: 08/11/10

| <u>PARAMETER</u> | <u>PERCENT RECOVERY</u> | <u>RECOVERY LIMITS</u> | <u>RPD</u> | <u>RPD LIMITS</u> | <u>METHOD</u> | <u>PREPARATION- ANALYSIS DATE</u> | <u>WORK ORDER #</u> |
|------------------|-------------------------|------------------------|------------|-------------------|---------------|-----------------------------------|---------------------|
|------------------|-------------------------|------------------------|------------|-------------------|---------------|-----------------------------------|---------------------|

MS Lot-Sample #: C0H110483-001 Prep Batch #...: 0230021

| | | | | | | | |
|---------|----|------------|-----|--------|-------------|----------|----------|
| Mercury | 95 | (70 - 130) | | | MCAWW 245.1 | 08/18/10 | L5E0M1DG |
| | 87 | (70 - 130) | 7.6 | (0-20) | MCAWW 245.1 | 08/18/10 | L5E0M1DH |

Dilution Factor: 1

Analysis Time...: 08:02

MS Run #.....: 0230010

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

Tetra Tech NUS, Inc

Client Sample ID: WMP-TOPHOLE 081010

General Chemistry

Lot-Sample #...: C0H110479-001 Work Order #...: L5EXN Matrix.....: WATER
 Date Sampled...: 08/10/10 Date Received...: 08/11/10

| <u>PARAMETER</u> | <u>RESULT</u> | <u>RL</u> | <u>UNITS</u> | <u>METHOD</u> | <u>PREPARATION- ANALYSIS DATE</u> | <u>PREP BATCH #</u> |
|---------------------------------|---------------|-----------------------|--------------|------------------------|---------------------------------------|-------------------------|
| pH | 8.2 | -- | -- | SM20 4500-H+B | 08/16/10 | 0228263 |
| | | Dilution Factor: 1 | | Analysis Time..: 14:06 | MS Run #.....: 0228171 | |
| Biochemical Oxygen Demand (BOD) | 436 | 2.0 | mg/L | SM20 5210B | 08/12-08/17/10 | 0224155 |
| | | Dilution Factor: 1 | | Analysis Time..: 12:25 | MS Run #.....: 0224080 | |
| Total Cyanide | ND | 0.010 | mg/L | MCAWW 335.4 | 08/13/10 | 0225143 |
| | | Dilution Factor: 1 | | Analysis Time..: 10:56 | MS Run #.....: 0225056 | |
| Total Suspended Solids | 238 | 4.0 | mg/L | SM20 2540D | 08/16-08/17/10 | 0228259 |
| | | Dilution Factor: 1 | | Analysis Time..: 07:30 | MS Run #.....: 0228163 | |
| TPH (SGT-HEM) | ND | 5.8 | mg/L | CFR136A 1664A SGT | 08/12/10 | 0224136 |
| | | Dilution Factor: 1.15 | | Analysis Time..: 09:01 | MS Run #.....: | |

METHOD BLANK REPORT

General Chemistry

Client Lot #...: C0H110479

Matrix.....: WATER

| <u>PARAMETER</u> | <u>RESULT</u> | <u>REPORTING</u> | | <u>METHOD</u> | <u>PREPARATION-</u> | <u>PREP</u> |
|---------------------------------|---------------|---|--------------|-------------------|----------------------|----------------|
| | | <u>LIMIT</u> | <u>UNITS</u> | | <u>ANALYSIS DATE</u> | <u>BATCH #</u> |
| Biochemical Oxygen Demand (BOD) | ND | 2.0 | mg/L | SM20 5210B | 08/12-08/17/10 | 0224155 |
| | | Work Order #: L5GAD1AA MB Lot-Sample #: C0H120000-155 | | | | |
| | | Dilution Factor: 1 | | | | |
| | | Analysis Time..: 12:25 | | | | |
| Total Cyanide | ND | 0.010 | mg/L | MCAWW 335.4 | 08/13/10 | 0225143 |
| | | Work Order #: L5H171AA MB Lot-Sample #: C0H130000-143 | | | | |
| | | Dilution Factor: 1 | | | | |
| | | Analysis Time..: 10:56 | | | | |
| Total Suspended Solids | ND | 4.0 | mg/L | SM20 2540D | 08/16-08/17/10 | 0228259 |
| | | Work Order #: L5MFX1AA MB Lot-Sample #: C0H160000-259 | | | | |
| | | Dilution Factor: 1 | | | | |
| | | Analysis Time..: 07:30 | | | | |
| TPH (SGT-HEM) | ND | 5.0 | mg/L | CFR136A 1664A SGT | 08/12/10 | 0224136 |
| | | Work Order #: L5F871AA MB Lot-Sample #: C0H120000-136 | | | | |
| | | Dilution Factor: 1 | | | | |
| | | Analysis Time..: 09:01 | | | | |

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

LABORATORY CONTROL SAMPLE EVALUATION REPORT

General Chemistry

Lot-Sample #...: C0H110479

Matrix.....: WATER

| <u>PARAMETER</u> | <u>PERCENT RECOVERY</u> | <u>RECOVERY LIMITS</u> | <u>RPD</u> | <u>RPD LIMITS</u> | <u>METHOD</u> | <u>PREPARATION- ANALYSIS DATE</u> | <u>PREP BATCH #</u> |
|---------------------------------|-------------------------|--------------------------------|------------|-------------------|--------------------------------|-----------------------------------|---------------------|
| Biochemical Oxygen Demand (BOD) | | WO#:L5GAD1AC-LCS/L5GAD1AD-LCSD | | | LCS Lot-Sample#: C0H120000-155 | | |
| | 92 | (85 - 115) | | | SM20 5210B | 08/12-08/17/10 | 0224155 |
| | 91 | (85 - 115) | 0.55 | (0-20) | SM20 5210B | 08/12-08/17/10 | 0224155 |
| | | Dilution Factor: 1 | | | Analysis Time..: 12:25 | | |

| | | | | | | | |
|---------------|----|--------------------------------|-----|--------|--------------------------------|----------|---------|
| TPH (SGT-HEM) | | WO#:L5F871AC-LCS/L5F871AD-LCSD | | | LCS Lot-Sample#: C0H120000-136 | | |
| | 89 | (64 - 132) | | | CFR136A 1664A SGT | 08/12/10 | 0224136 |
| | 86 | (64 - 132) | 2.8 | (0-34) | CFR136A 1664A SGT | 08/12/10 | 0224136 |
| | | Dilution Factor: 1 | | | Analysis Time..: 09:01 | | |

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

LABORATORY CONTROL SAMPLE EVALUATION REPORT

General Chemistry

Client Lot #...: C0H110479

Matrix.....: WATER

| <u>PARAMETER</u> | <u>PERCENT RECOVERY</u> | <u>RECOVERY LIMITS</u> | <u>METHOD</u> | <u>PREPARATION- ANALYSIS DATE</u> | <u>PREP BATCH #</u> |
|------------------------|-------------------------|------------------------|---|---|---------------------|
| pH | 100 | (99 - 101) | Work Order #: L5MG11AA SM20 4500-H+B Dilution Factor: 1 | LCS Lot-Sample#: C0H160000-263 08/16/10 Analysis Time.: 14:04 | 0228263 |
| Total Cyanide | 103 | (90 - 110) | Work Order #: L5H171AC MCAWW 335.4 Dilution Factor: 1 | LCS Lot-Sample#: C0H130000-143 08/13/10 Analysis Time.: 10:56 | 0225143 |
| Total Suspended Solids | 83 | (80 - 120) | Work Order #: L5MFX1AC SM20 2540D Dilution Factor: 1 | LCS Lot-Sample#: C0H160000-259 08/16-08/17/10 Analysis Time.: 07:30 | 0228259 |

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

MATRIX SPIKE SAMPLE EVALUATION REPORT

General Chemistry

Client Lot #...: C0H110479

Matrix.....: WATER

Date Sampled...: 08/10/10

Date Received...: 08/11/10

| <u>PARAMETER</u> | <u>PERCENT RECOVERY</u> | <u>RECOVERY LIMITS</u> | <u>RPD</u> | <u>RPD LIMITS</u> | <u>METHOD</u> | <u>PREPARATION- ANALYSIS DATE</u> | <u>PREP BATCH #</u> |
|------------------|-------------------------|------------------------|-------------------------------|-------------------|---------------|-----------------------------------|---------------------|
| Total Cyanide | | | WO#: L5EXN1DV-MS/L5EXN1DW-MSD | | | MS Lot-Sample #: C0H110479-001 | |
| | 105 | (90 - 110) | | | MCAWW 335.4 | 08/13/10 | 0225143 |
| | 100 | (90 - 110) | 4.6 | (0-20) | MCAWW 335.4 | 08/13/10 | 0225143 |
| | | | Dilution Factor: 1 | | | | |
| | | | Analysis Time...: 10:56 | | | | |
| | | | MS Run #.....: 0225056 | | | | |

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

SAMPLE DUPLICATE EVALUATION REPORT

General Chemistry

Client Lot #...: C0H110479

Work Order #...: L5EKJ-SMP
L5EKJ-DUP

Matrix.....: WATER

Date Sampled...: 08/10/10

Date Received..: 08/11/10

| <u>PARAM</u> | <u>RESULT</u> | <u>DUPLICATE</u> <u>RESULT</u> | <u>UNITS</u> | <u>RPD</u> | <u>RPD</u> <u>LIMIT</u> | <u>METHOD</u> | <u>PREPARATION-</u> <u>ANALYSIS DATE</u> | <u>PREP</u> <u>BATCH #</u> |
|------------------------|---------------|-----------------------------------|--------------------|------------|----------------------------|-----------------------|---|-------------------------------|
| Total Suspended Solids | 75.0 | 73.0 | mg/L | 2.7 | (0-20) | SM20 2540D | 08/16-08/17/10 | 0228259 |
| | | | Dilution Factor: 1 | | | Analysis Time.: 07:30 | MS Run Number.: 0228163 | |
| | | | | | | | SD Lot-Sample #: C0H110430-001 | |

SAMPLE DUPLICATE EVALUATION REPORT

General Chemistry

Client Lot #...: C0H110479

Work Order #...: L5EXN-SMP
L5EXN-DUP

Matrix.....: WATER

Date Sampled...: 08/10/10

Date Received..: 08/11/10

| <u>PARAM</u> | <u>RESULT</u> | <u>DUPLICATE RESULT</u> | <u>UNITS</u> | <u>RPD</u> | <u>RPD LIMIT</u> | <u>METHOD</u> | <u>PREPARATION- ANALYSIS DATE</u> | <u>PREP BATCH #</u> |
|---------------------------------|---------------|-----------------------------|--------------------|------------|----------------------|------------------------|---------------------------------------|-------------------------|
| pH | 8.2 | 8.2 | -- | 0.12 | (0-2.0) | SM20 4500-H+B | 08/16/10 | 0228263 |
| | | | Dilution Factor: 1 | | | Analysis Time..: 14:06 | MS Run Number..: 0228171 | |
| Biochemical Oxygen Demand (BOD) | 436 | 490 | mg/L | 12 | (0-20) | SM20 5210B | 08/12-08/17/10 | 0224155 |
| | | | Dilution Factor: 1 | | | Analysis Time..: 12:25 | MS Run Number..: 0224080 | |

**Chemical and Biological Hazards Posed by Drilling Exploratory Shale Gas Wells
in Pennsylvania's Delaware River Basin
Report for the Delaware River Basin Commission Exploratory Well Hearing**

**to
Delaware Riverkeeper Network
and
Damascus Citizens for Sustainability**

November 16, 2010

Ronald E. Bishop, Ph.D., CHO

s/ Ronald E. Bishop

Ronald E. Bishop

Summary:

Over the last decade, operators in the natural gas industry have developed highly sophisticated methods and materials for the exploration and production of methane from black shale. In spite of the technological advances made to date, these activities carried out on any scale pose significant chemical and biological hazards to human health and ecosystem stability. In brief:

- The probability that shale gas well projects will impact local groundwater ranges from 4.0 to 5.7% over the short term, *i.e.* while the wells are in development.
- The probability that shale gas wells will degrade local water quality over the long term (50 years) exceeds 16%; a project scope of as few as ten wells practically guarantees long-term groundwater contamination.
- Some chemicals in ubiquitous use for shale gas well drilling constitute human health and environmental hazards even where they are extremely diluted. For example, the biocide DBNPA is lethal to Chesapeake Bay oysters at parts-per-trillion concentrations, below its chemical detection limit.
- Some constituents of flowback fluids from shale gas wells are hazardous to human health at extreme dilutions; potential exposure effects include tissue poisoning and cancer.
- The risks of exposing workers and neighbors to toxic chemicals and harmful bacteria are exacerbated by certain common practices in Pennsylvania, such as air-lubricated drilling and the use of impoundments for flowback fluids; these are not regarded as best practices from a national perspective.

Overall, proceeding with any shale gas projects in the Delaware River Basin by current practices is highly likely to degrade surface water and groundwater quality, to harm humans, and to negatively impact aquatic ecosystems.

Background:

Natural gas production from hydrocarbon-rich shale formations is probably the most rapidly developing trend in onshore oil and gas exploration and production today. “In some areas, this has included bringing drilling and production to regions of the country

that have seen little or no activity in the past. New oil and gas developments bring changes to the environmental and socio-economic landscape, particularly in those areas where gas development is a new activity. With these changes have come questions about the nature of shale gas development, the potential environmental impacts, and the ability of the current regulatory structure to deal with this development.” (1)

The major features of shale gas development, which distinguish it from conventional gas extraction activity, are the use of horizontal drilling and high-volume hydraulic fracturing. While these technologies certainly lead to well projects which are larger than traditional gas wells by fifty-fold or more, and enable energy development companies to pursue projects in places which historically weren't commercially viable (such as the Delaware River Basin), gas exploration and production have never been free of risk. Toxics Targeting, Inc., using data compiled by the New York State Department of Environmental Conservation (NYS DEC), brought to light 270 gas drilling-related contamination incidents which had occurred in New York State since 1979 (2). This value, compared with a total of 6,680 active gas wells (3), points to a serious incident rate of 4.0%. These were in addition to incidents which were not reported to the DEC, such as the “wildcat” operation by which the U.S. Gypsum Company of Batavia, NY contaminated its own water well while drilling for natural gas on company property (4).

Data from Colorado indicated that 1549 spill incidents related to natural gas extraction activities occurred in the period from January 2003 to March 2008; the Congressional Sportsmen's Foundation estimated that 20% of these (310) impacted groundwater (5). The New Mexico Oil Conservation Division recorded 705 groundwater-contaminating incidents caused between 1990 and 2005 by the oil and gas industry (6). And the Pennsylvania Land Trust reported 1610 DEP violations in the Commonwealth between January 2008 and late August 2010, 1052 of them likely to impact the environment (7). Compared with totals of 25,716, 40,157 and 55,631 producing gas wells in Colorado, New Mexico and Pennsylvania, respectively (3), these data suggest that natural gas development in a region degrades groundwater quality at a rate of 1.2 to 1.9 incidents per 100 gas wells. However, not all producing gas wells pose equal risk; new construction

accounts for most spills and other mishaps. Interpreted in the context of new gas (and only gas) wells, (18,554 in Pennsylvania for the period January 2008 through August 2010 – mostly non-Marcellus projects) (8), the data suggest that we may reasonably anticipate a violations rate of 8.7% (one citation for every 11 – 12 gas wells) and a groundwater contamination rate of 5.7% (one incident for every 17 – 18 wells).

Short-term collateral damage from gas well development is only part of this industry's hazard profile. In 1992, the US Environmental Protection Agency (EPA) estimated that of 1.2 million abandoned oil and gas wells in the U.S., 200,000 were leaking (9). This represents a 16.7% failure rate; one of every six abandoned wells is releasing its contents to the surrounding area, including the surface. A Canadian research team investigated the mechanisms for these failures, and determined that concrete shrinkage which leads to well casing fissures is essentially inevitable in a fifty-year time frame. They found that this cracking was especially severe at maximum depth, and exposure of steel casings to the hot (140 – 180 °F) brines there accelerated their breakdown, permitting subterranean gases and other fluids to re-pressurize the deteriorating wells (10). Wells in regions containing mobile geological faults (such as eastern Pennsylvania) are also subject to casing deformation and shear (11). Therefore, we may reasonably expect higher percentages of gas well casings to fail over time, especially longer than fifty years. The probability that a project scope of as few as ten gas wells will impact ground water within a century approaches 100%; ground water will be contaminated.

In view of the risks, summarized above, for gas wells to engender spills and leaks, a discussion of the chemicals involved with these projects is in order.

Drilling Additives:

Many chemical products are used in the development of a gas well. Some examples, along with their most common applications, are shown in **Table 1**. Individual additives are typically used in multiple stages of the drilling process ; most hydraulic fracturing additives are also used in drilling fluids (or “muds”) (12). Two rare exceptions are bentonite and barium sulfate, which are used almost exclusively in drilling muds and packer slurries, and hemicellulase enzyme, used solely in post-fracturing fluids. Even the chemicals used for post-production purification may also be used as solvents in drilling muds.

The majority of chemical products used by the gas industry have not been fully tested for human or environmental toxicity (13, 14). Of those which have, a minority (*e.g.*, bentonite, guar gum, hemicellulase, citric acid, acetic acid, potassium carbonate, sodium chloride, limonene, polyethylene glycol and mineral oil) pose no significant hazards to humans or other organisms as utilized in gas extraction processes.

Table 1: Additive Functions in Shale Gas Extraction

| <u>Additive Type</u> | <u>Examples</u> | <u>Purpose</u> | <u>Used In</u> |
|-----------------------------|---|--|---------------------------------------|
| Friction Reducer | heavy naphtha, polymer microemulsion | lubricate drill head, penetrate fissures | drilling muds, fracturing fluids |
| Biocide | glutaraldehyde, DBNPA, dibromoacetonitrile | prevent biofilm formation | drilling muds, fracturing fluids |
| Scale Inhibitor | ethylene glycol, EDTA, citric acid | prevent scale buildup | drilling muds, fracturing fluids |
| Corrosion Inhibitor | propargyl alcohol, <i>N,N</i> -dimethylformamide | prevent corrosion of metal parts | drilling muds, fracturing fluids |
| Clay Stabilizer | tetramethylammonium chloride | prevent clay swelling | drilling muds, fracturing fluids |
| Gelling Agent | bentonite, guar gum, "gemini quat" amine | prevent slumping of solids | drilling muds, fracturing fluids |
| Conditioner | ammonium chloride, potassium carbonate, isopropyl alcohol | adjust pH, adjust additive solubility | drilling muds, fracturing fluids |
| Surfactant | 2-butoxyethanol, ethoxylated octylphenol | promote fracture penetration | drilling fluids, fracturing fluids |
| Cross-Linker | sodium perborate, acetic anhydride | promote gelling | fracturing fluids |
| Breaker | hemicellulase, ammonium persulfate, quebracho | "breaks" gel to promote flow-back of fluid | post-fracturing fluids |
| Cleaner | hydrochloric acid | dissolve debris | stimulation fluid, pre-fracture fluid |
| Processor | ethylene glycol, propylene glycol | strip impurities from produced gas | post-production processing fluids |

Several other additive chemicals, including ammonia, methanol, ethanol, 2-propanol, 1-butanol, thioglycolic acid, acetophenone, sodium perborate tetrahydrate, diammonium peroxydisulfate and hydrochloric acid, are moderately or acutely toxic to humans or aquatic organisms when encountered in concentrated forms (15 – 24), but as used by the natural gas industry, they end up greatly diluted, and so impose relatively modest hazards (13). More significant issues with these chemicals would be anticipated from storage sites, trucking accidents while they are being transported to remote well sites via rural roads, and staging at well sites.

However, a few chemical products in widespread use, including in exploratory wells, pose significant hazards to humans or other organisms, because they remain dangerous even at concentrations near or below their chemical detection limits. These include the biocides glutaraldehyde, 2,2-dibromo-3-nitrilopropionamide (DBNPA) and 2,2-dibromoacetonitrile (DBAN), the corrosion inhibitor propargyl alcohol, the surfactant 2-butoxyethanol (2-BE), and lubricants containing heavy naphtha. (Note: CAS No. refers to a unique identifier assigned to every known substance by the Chemical Abstracts Service Registry.)

Glutaraldehyde:

Glutaraldehyde (CAS No. 111-30-8) is a biocide used widely in drilling and fracturing fluids. Along with its antimicrobial effects, it is a potent respiratory toxin effective at parts-per-billion (ppb) concentrations (24); a sensitizer in susceptible people, it has induced occupational asthma and/or contact dermatitis in workers exposed to it, and is a known mutagen (i.e., a substance that may induce or increase the frequency of genetic mutations) (25, 26). It is readily inhaled or absorbed through the skin. In the environment, algae, zooplankton and steelhead trout were found to be dramatically harmed by glutaraldehyde at very low (1 – 5 ppb) concentrations (27).

DBNPA:

2,2-Dibromo-3-nitrilopropionamide (DBNPA) (CAS No. 10222-01-2) is a biocide finding increasing use in drilling and fracturing fluids. It is a sensitizer, respiratory and skin toxin, and is especially corrosive to the eyes (28). In the environment, it is very toxic to a wide variety of freshwater, estuarine and marine organisms, where it induces developmental defects throughout the life cycle. In particular, it is lethal to “water fleas” (*Daphnia magna*), rainbow trout and mysid shrimp at low (40 to 50 ppb) concentrations, and is especially dangerous to Eastern oysters (29). Chesapeake Bay oysters are killed by extremely low (parts-per-trillion, ppt) concentrations of DBNPA, well below the limit at which this chemical can be detected.

DBAN:

Dibromoacetonitrile (DBAN) (CAS No. 3252-43-5) is a biocide often used in combination with DBNPA, from which it is a metabolic product (with the release of cyanide). Its human and environmental toxicity profiles are similar to that of DBNPA, except that DBAN is also carcinogenic (30). DBNPA and DBAN appear to work synergistically. In combination, the doses at which these biocides become toxic are significantly lower than when they are used separately. In other words, it takes much less of these chemicals to exert toxic effects when they are used together.

Propargyl Alcohol:

Propargyl alcohol (CAS No. 107-19-7) is a corrosion inhibitor that is very commonly used in gas well construction and completion. This chemical causes burns to tissues in skin, eyes, nose, mouth, esophagus and stomach; in humans it is selectively toxic to the liver and kidneys (31). Propargyl alcohol is a sensitizer in susceptible individuals, who may experience chronic effects months to years after exposure, including rare multi-organ failure (32). It is harmful to a variety of aquatic organisms, especially fathead minnows, which are killed by doses near 1 ppm (33).

2-BE:

2-Butoxyethanol (2-BE), also known as ethylene glycol monobutyl ether (EGBE) (CAS No. 111-76-2), is a surfactant used in many phases of gas exploration and extraction. It comprises a considerable percentage of Airfoam HD, which Newfield is using to drill some of the wells grandfathered by the SEDD (34). Easily absorbed through the skin, this chemical has long been known to be selectively toxic to red blood cells; it causes them to rupture, leading to hemorrhaging (35). More recently, the ability of EGBE at extremely low levels (ppt) to cause endocrine disruption, with effects on ovaries and adrenal glands, is emerging in the medical literature (36). This chemical is only moderately toxic to aquatic organisms, with harm to algae and test fish observed with doses over 500 ppm (35).

Heavy Naphtha:

Heavy naphtha (CAS No. 64741-68-0) refers to a mixture of petroleum products composed of, among other compounds, the aromatic molecules benzene, toluene, xylene, 1,2,4-trimethylbenzene and polycyclic aromatic hydrocarbons including naphthalene. It is

used by the gas industry as a lubricant, especially in drilling muds. This material is hazardous to a host of microbes, plants and animals (37). Several of the mixture's components are known to cause or promote cancer. If released to soil or groundwater, several components are toxic to terrestrial and aquatic organisms, especially amphibians, in which it impedes air transport through the skin.

Flowback Fluids:

Irrespective of chemical additives used for drilling, Marcellus shale contains several toxic substances which can be mobilized by drilling. These include lead, arsenic, barium, chromium, uranium, radium, radon and benzene, along with high levels of sodium chloride (38). These components make flowback fluids hazardous without any added chemicals, and are often among the analytes most easily measured by potential waste fluid treatment plant operators (**Figure 1**).

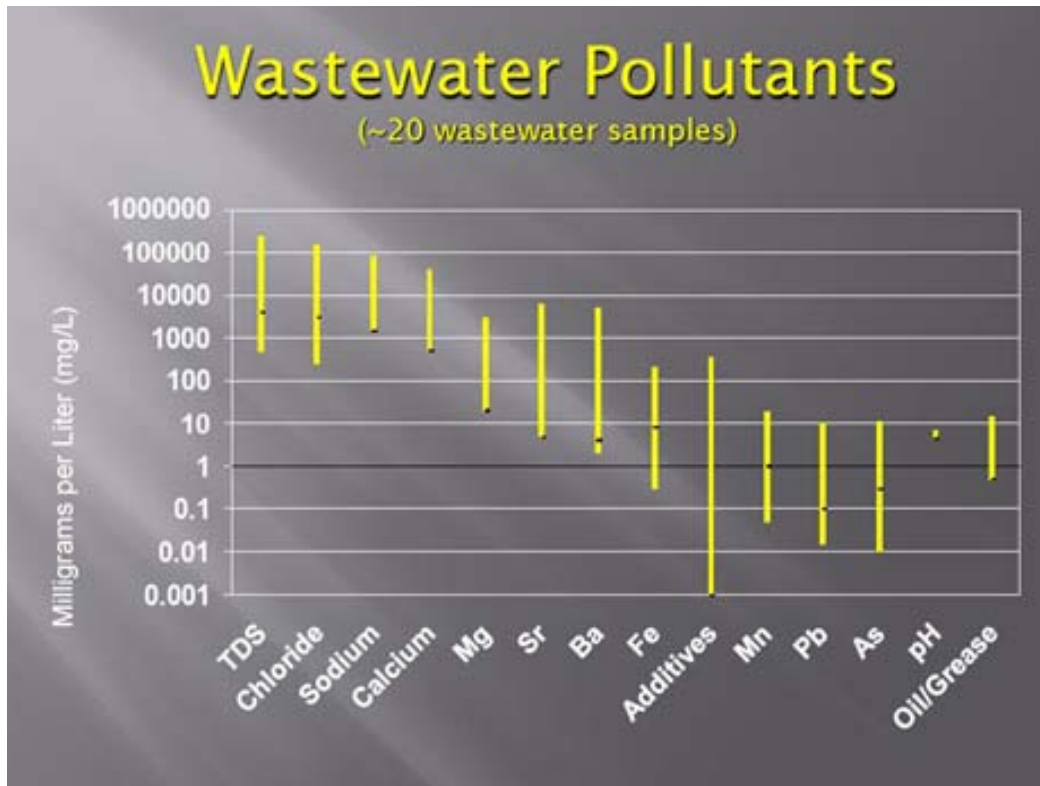


Figure 1: Wastewater Pollutants (39)

Because of their significant toxicity at low (ppb) concentrations, and the fact that drill cuttings are often not removed, but rather are buried on-site, several of these flowback fluid and cuttings components (40) are discussed below, including barium, lead, arsenic, chromium and benzene:

Barium (Ba):

Barium is a toxic heavy metal commonly found in Marcellus shale well flowback fluids (39). Exposure to soluble salts (not the sulfate), which may occur by ingestion, absorption or inhalation, may induce drops in tissue potassium levels, and by this mechanism it is selectively toxic to the heart and kidneys (41). Further, barite (barium sulfate), used as a weighting agent in drilling muds, reacts with radium salts in shale, forming radioactive scale on metal parts (such as the drill “string”) which then are subsequently brought to the surface (13); in these reactions, barite is converted to more soluble (i.e. more toxic) barium salts.

Lead (Pb):

The poisonous nature of lead has been known for centuries, but its ability to impair neurological development in children at very low (1 ppb) concentrations makes it a toxicant of special concern. The most sensitive targets for lead toxicity are the developing nervous system, the blood and cardiovascular systems, and the kidney. However, due to the multiple modes of action of lead in biological systems, and its tendency to bio-accumulate, it could potentially affect any system or organs in the body. It has also been associated with high blood pressure (42).

Arsenic (As):

Arsenic, another component of black shale (38), has also been known as a poison for hundreds if not thousands of years. The most sensitive target tissue appears to be skin, but arsenic produces adverse effects in every tissue against which it has been tested, especially

brain, heart, lung, the peripheral vascular system, and kidney (43). Arsenic is harmful below one part per trillion (ppt) in water, and is a confirmed carcinogen.

Chromium (Cr):

Chromium, also found in Marcellus shale (44), may be an essential nutrient required in extremely small doses (μg per day), but the biological system it supports is not currently known. Exposure to elevated doses by inhalation, ingestion, skin or eye contact may lead to respiratory, gastrointestinal, reproductive, developmental and neurological symptoms (45). Sensitization-induced asthma and allergy have also been reported. However, at very low concentrations, particularly of potassium dichromate or strontium chromate (the hexavalent form, as found in shale rock) (46), the major hazard posed by chromium is as a carcinogen, especially in stomach and lung tissues (45).

Benzene:

Benzene, a known shale constituent (38), was briefly considered above as a component of heavy naphtha. In ppb concentrations, the primary hazard from this compound is due to its proven ability to cause acute non-lymphocytic leukemia (47).

4-NQO:

In addition to the above shale constituents, one chemical compound was consistently encountered in flowback fluids from Marcellus gas wells in Pennsylvania and West Virginia: 4-nitroquinoline-1-oxide (4-NQO) (48). This is one of the most potent carcinogens known, particularly for inducing cancer of the mouth (49). It is not used as a drilling additive and is not known to occur naturally in black shale; no studies have been published to date with respect to what chemical interactions account for its consistent presence in flowback fluids. However, it is dangerous at parts-per-trillion (ppt) concentrations, well below its levels reported in gas well flowback fluids (48).

Biological Contamination:

Rock strata beneath the earth's surface are populated by bacteria, and the advent of air-lubricated drilling (without biocides) has introduced a risk of contaminating surface (fresh) water zones with bacteria and other microbes from deeper (brine) layers, where they often flourish. Of particular concern are sulfate-reducing bacteria, especially *Desulfovibrio desulfuricans*, an organism that thrives in fresh water where some sulfate (such as is present in pyrite or hematite) is available (50), **(Figure 2)** (51). In fact, these bacteria are especially prevalent and aggressive in oil and gas producing regions, where they avidly form living black, sticky films in water wells and other structures (52). There they produce hydrogen sulfide (H₂S), characterized by a "rotten eggs" smell. Rock strata rich in gas are often also rich in this bacterium, and exposure to hydrogen sulfide along with methane raises significant health concerns –neurological syndromes in humans and, in livestock, elevated birth defect rates and diminished herd health. At high concentrations, hydrogen sulfate is lethal (53).

The now-common use of air-lubrication (without biocides) while drilling the top one- to three thousand feet of gas wells (54) risks contaminating fresh water aquifers with sulfate-reducing bacteria from the deeper strata, but there is no clear evidence that this well-fouling mechanism is recognized by Pennsylvania DEP regulators.



Figure 2: Biofilm of *Desulfovibrio desulfuricans* Growing on a Hematite Surface

Cumulative Effects:

Hazards that accompany the above chemicals and microbes have to this point been considered individually. It is clear that they don't occur individually. No investigations of interactions among these materials have been reported to date. However, the author has been contacted by officials with the National Institute of Safety and Occupational Health, Centers for Disease Control (NIOSH/CDC), who requested any information that might shed light on a group of symptoms presented by clinical patients in southwestern Pennsylvania and the state of West Virginia which is tentatively identified as "downwinder's syndrome" (55). These symptoms, including irritated eyes, sore throat, frequent headaches and nosebleeds, skin rashes, peripheral neuropathy, lethargy, nausea, reduced appetite and mental confusion, were also reported in a Texas gas-field study conducted by Wilma Subra (56). These disparate observations are supported by a literature review of potential human health effects from gas drilling activities (57).

The practice in Pennsylvania of using open impoundments for capture of flowback fluids from gas wells may exacerbate the risk of this syndrome. Although most additives are greatly diluted in the drilling process, organic compounds (with the exceptions of DBNPA and DBAN) tend to be lighter than water; therefore they float to the surface of holding pits, where they concentrate to essentially 100% of the surface. From there they volatilize or aerosolize into the air, from which they may be inhaled by neighbors and on-site industry workers. Partly for this reason, the states of Colorado (58) and New Mexico (59) have prohibited the use of impoundments for flowback fluids.

As a case in point, at 7:00 AM on September 5, 2010, Greg Swartz and Tannis Kowalchuk, who live 0.3 miles from the Woodland Management Partners 11 exploratory gas well in Damascus Township, Wayne County, PA (developed by Newfield Appalachia PA, LLC), smelled a “chemical sulfuric odor”. They put up with this odor for three days before the flowback fluids pit (evidently the source of the chemical smell) was pumped out and the odor subsided. Neither the fire department chief nor the DEP inspector indicated concern about the hydrogen sulfide being generated by bacteria living in the pit. However, Mr. Swartz and Ms. Kowalchuk were concerned, particularly for the health of their 2-year-old son (60).

The DEP inspection summary indicated that on September 2, three days prior to the sulfur odor complaint, workers were observed skimming an “oil sheen” from the pit fluids, and the odors detected then were typical of “drilling fluids and/or cuttings”. On September 8, the hydrogen sulfide exposure grew worse for several hours, because the pit’s contents were stirred as they were pumped out. Finally, the inspector noted that the sub-contractor planned to solidify the residual pit contents, fold them into the plastic liner and bury them in place (60).

Well permit data indicate that 2-butoxyethanol (2-BE) was used in the drilling fluids (61). Results from early (“tophole”) analysis of the pit’s contents (62) indicated the presence of high levels of barium, lead, arsenic and chromium (discussed above). No test

for 4-nitroquinoline-1-oxide (4-NQO) was performed. However, a very high concentration of lithium (more than 600 times the reporting limit) was present. This is significant because lithium is psychoactive in humans at concentrations down to 1 part per billion (ppb) (63).

Therefore, the neighbors to this gas well were subjected to fumes from drilling fluids and cuttings, whether or not they identified those odors as nuisances. Then they were exposed to nuisance (and possibly greater) levels of hydrogen sulfide, which DEP reports to be common with gas drilling operations (60). Now, this family lives less than 600 yards from a buried repository of toxic solid waste, for which no long-term monitoring is planned (54). They were potentially exposed to chemicals known to cause disorders of the skin, eyes, mucous membranes, the gastrointestinal tract, kidneys, heart and brain. Threshold doses for some of these adverse health effects were realistically achievable, given the extreme potency of the agents involved. A slightly elevated risk of cancer for these people cannot be ruled out.

All this was the outcome of just one nearby “exploratory” gas well project where, from developers’ and regulators’ perspectives, nothing unusual happened.

If a spill, pit overflow, seepage from a defective plastic liner, or a tank leak had occurred, this family’s exposures to noxious chemicals would have increased, possibly without their knowledge. Further, harm to sensitive environmental receptors, such as amphibians and aquatic organisms, would also have ensued. As discussed above, such incidents are unavoidable where any gas wells – including exploratory projects – are developed on a broad scale. When allowed to contaminate groundwater, the toxins and/or bacteria discussed above can persist at hazardous levels for years. Therefore, inevitable environmental damage extends to wherever gas well projects are developed, including the Delaware River Basin.

The opinions expressed in this report are stated to a reasonable degree of scientific and professional certainty.

References Cited:

1. *Modern Shale Gas Development in the United States: A Primer*; Groundwater Protection Council and ALL Consulting for the U.S. Department of Energy Office of Fossil Energy and the National Energy Technology Laboratory (April 2009)
2. *Natural Gas Quest: State Files Show 270 Drilling Accidents in Past 30 Years*; Tom Wilber, Binghamton Press-Sun (Nov. 8, 2009)
3. *Distribution of Oil and Gas Wells By State: Number of Producing Gas Wells*; U.S. Energy Information Administration: Independent Statistics and Analysis (2010) http://tonto.eia.doe.gov/dnav/ng/ng_prod_wells_s1_a.htm
4. Private conversation with Sanitarian David Luhicroft, Genesee County Health Department, Environmental Health Division (June 12, 2009)
5. *Economic Impacts of Hunting and Fishing*; Congressional Sportsmen's Foundation Report (2007). Cited in: *Our Public Lands: New Oil and Gas Regulations for Colorado* <http://www.ourpubliclands.org/about/colorado>
6. New Mexico Groundwater Impact Update spreadsheet (2010). Cited in: Earthworks' *Groundwater Contamination*; www.earthworksaction.org/NM_GW_Contamination.cfm
7. *Marcellus Shale Drillers in Pennsylvania Amass 1614 Violations Since 2008: 1056 Identified as Most Likely to Harm the Environment*; Pennsylvania Land Trust Association (October 2010)
8. *2010 Permit and Rig Activity Report*; Pennsylvania Department of Environmental Protection, Bureau of Oil and Gas Management (2010) <http://www.dep.state.pa.us/dep/deputate/minres/oilgas/rig10.htm>
9. *Abandoned Oil and Gas Wells Become Pollution Portals*; Roberto Suro, The New York Times (May 3, 1992)
10. *Why Oilwells Leak: Cement Behavior and Long-Term Consequences*; Maurice B. Dusseault, Malcom N. Gray and Pawel Nawrocki (2000), Society of Petroleum Engineers International Oil and Gas Conference and Exhibition, Beijing, China, November 7 – 10, 2000
11. *Casing Shear: Causes, Cases, Cures*; Maurice B. Dusseault, Michael S. Bruno and John Barrera (June 2001) Society of Petroleum Engineers: Drilling & Completion
12. *Definitions for Products or Functions in Natural Gas Development*; Schlumberger Oilfield Glossary (2010) <http://www.glossary.oilfield.slb.com>

13. *Beyond MSDS: A Review of Hazardous Materials Used by New York's Natural Gas Industry*; Ronald E. Bishop, Sustainable Otsego (2009) <http://www.sustainableotsego.org>

References, Continued:

14. *Cross-Index of Products and Chemicals Used by New York's Natural Gas Industry*; Ronald E. Bishop, Sustainable Otsego (2010) <http://www.sustainableotsego.org>

15. *Material Safety Data Sheet for Ammonia Solution, Strong*; Mallinckrodt Baker (April 22, 2008) <http://www.jtbaker.com/msds/englishhtml/a5472.htm>

16. *Material Safety Data Sheet for Methanol*; Mallinckrodt Baker (September 8, 2008) <http://www.jtbaker.com/msds/englishhtml/m2015.htm>

17. *Material Safety Data Sheet for Ethanol, Absolute*; Fisher Scientific (March 18, 2003) <http://fscimage.fishersci.com/msds/89308.htm>

18. *Material Safety Data Sheet for 2-Propanol*; Mallinckrodt Baker (September 16, 2009) <http://www.jtbaker.com/msds/englishhtml/p6401.htm>

19. *Material Safety Data Sheet for Butyl Alcohol, Normal*; Mallinckrodt Baker (September 15, 2008) <http://www.jtbaker.com/msds/englishhtml/b5860.htm>

20. *Material Safety Data Sheet for Mercaptoacetic Acid*; Mallinckrodt Baker (August 20, 2008) <http://www.jtbaker.com/msds/englishhtml/m1157.htm>

21. *Material Safety Data Sheet for Acetophenone*; Mallinckrodt Baker (February 22, 2006) <http://www.jtbaker.com/msds/englishhtml/a0566.htm>

22. *Material Safety Data Sheet for Sodium Perborate*; Mallinckrodt Baker (August 20, 2008) <http://www.jtbaker.com/msds/englishhtml/s4634.htm>

23. *Material Safety Data Sheet for Ammonium Persulfate*; Mallinckrodt Baker (January 11, 2008) <http://www.jtbaker.com/msds/englishhtml/a6096.htm>

24. *Material Safety Data Sheet for Hydrochloric Acid, 33 – 40%*; Mallinckrodt Baker (November 21, 2008) <http://www.jtbaker.com/msds/englishhtml/h3880.htm>

25. *Toxicology and Carcinogenesis Studies of Glutaraldehyde (CAS NO. 111-30-8) in F344/N Rats and B6C3F1 Mice (Inhalation Studies)*; National Toxicology Program (NTP), (TR-490. September 1999) NIH Publication No. 99-3980. <http://ntp-server.niehs.nih.gov/htdocs/LT-studies/tr490.html>

26. *Effects of Glutaraldehyde Exposure on Human Health*; Tomoko Takigawa and Yoko Endo (2006) *Journal of Occupational Health* **48**: 75 – 87

References, Continued:

27. *Chronic Toxicity of Glutaraldehyde: Differential Sensitivity of Three Freshwater Organisms*; Larissa L. Sano, Ann M. Krueger and, Peter F. Landrum (2004) *Aquatic Toxicology* **71**: 283–296
28. *R.E.D. Facts: 2,2-dibromo-3-nitrilopropionamide (DBNPA)*; Unites States Environmental Protection Agency Office of Prevention, Pesticides and Toxic Substances (September 1994) EPA-738 F-94-023
29. *EPA Reregistration Eligibility Decision (RED): 2,2-dibromo-3-nitrilopropionamide (DBNPA)*; Environmental Protection Agency Office of Prevention, Pesticides and Toxic Substances (September 1994) EPA-738 R-94-026
30. *NTP Technical Report on the Toxicology and Carcinogenesis Studies of Dibromoacetonitrile (CAS No. 3252-43-5) in F344/N Rats and B6C3F1 Mice (Drinking Water Studies)*; National Toxicology Program, National Institutes of Health, Public Health Service, DHHS (February 2008) NTP PR-544 NIH Publication No. 08-5886
31. *Material Safety Data Sheet acc. to OSHA and ANSI: Propargyl Alcohol*; Alfa Aesar (November 10, 2008)
32. *Hazardous Substance Fact Sheet: Propargyl Alcohol*; New Jersey Department of Health and Senior Services (November 2004)
33. *Propargyl Alcohol*; U.S. EPA HPV Challenge Program Revised Submission (July 30, 2003) Publication 201-14641A
34. *Material Safety Data Sheet: Airfoam HD*; Aqua-Clear, Inc. (July 11, 2005)
35. *Toxicological Review of Ethylene Glycol Monobutyl Ether (EGBE)*; U.S. Environmental Protection Agency, Integrated Risk Information System (IRIS) (April 2008)
36. *2-Butoxyethanol: A Review of the Current Toxicity Information*; Kathleen Burns, Sciencecorps (2010)
37. *Material Safety Data Sheet: Heavy Naphtha*; American AGIP Company, Inc. (September 1, 2006)
38. *Shale Gas: Focus on the Marcellus*; Lisa Sumi, Earthworks' Oil & Gas Accountability Project (May 2008)
39. Slide courtesy of Devin N. Castendyk, Earth Sciences Department (Hydrology), SUNY Oneonta

References, Continued:

40. Baseline Water Quality Testing – Marcellus Shale Development: What Parameters Should be Tested?; Brian Oram, GoMarcellusShale.com (August 16, 2010)
http://gomarcellusshale.com/profiles/blog/show?id=2274639%3ABlogPost%3A38461&commentId=2274639%3AComment%3A54421&xg_source=activity
41. *Toxicological Profile for Barium and Barium Compounds*; Agency for Toxic Substances and Disease Registry (ATSDR), Public Health Service, US DHHS (August 2007)
42. *Toxicological Profile for Lead*; ATSDR, PHS, DHHS (August 2007)
43. *Toxicological Profile for Arsenic*; ATSDR, PHS, DHHS (August 2007)
44. *Mobility of Metals from Weathered Black Shale: the Role of Salt Efflorescences*; M.L.W. Tuttle, M.B. Goldhaber and G. N. Breit (2001) U.S. Geological Survey
45. *Draft Toxicological Profile for Chromium*; ATSDR, PHS, DHHS (September 2008)
46. *Toxicological Profile for Strontium*; ATSDR, PHS, DHHS (July 2001)
47. *Toxicological Profile for Benzene*; ASTDR, PHS, DHHS (August 2007)
48. Table 6-1, *Draft Supplemental Generic Environmental Impact Statement on the Oil, Gas and Solution Mining Regulatory Program*; New York State Department of Environmental Conservation, Division of Mineral Resources (September 2009)
49. 4-Nitroquinoline-1-oxide Induced Experimental Oral Carcinogenesis; D. Kanojia and M.M. Vaidya (August 2006), *Oral Oncology* **42(7)**: 655 – 667
50. *Compatibility of Two MEOR Systems with Sulfate-Reducing Bacteria*; Jonell Douglas and Rebecca S. Bryant (September 1987), National Institute for Petroleum and Energy Research, U.S. Department of Energy
51. *Biofilm of Desulfovibrio desulfuricans*; Pacific Northwest Laboratory's photostream (June 25, 2009)
52. *Inter-Relationship Between Sulfate Reducing Bacteria Associated with Microbiologically Influenced Corrosion and Other Bacterial Communities in Wells*; Cullimore and Johnston (2004), Droycon Bioconcepts, Inc.
53. *Hydrogen Sulfide, Oil and Gas, and People's Health*; Lana Skrtic, Energy and Resources Group, University of California, Berkeley (May 2006)

References, Continued:

54. *Oil and Gas Operators Manual, Chapter 4: Oil and Gas Management Practices*; Pennsylvania Department of Environmental Protection, Bureau of Oil and Gas Management (October, 2001)
55. Sudha P. Pandalai, Cincinnati Office, NIOSH / CDC; Personal communication (April 21, 2010).
56. *Health Survey Results of Current and Former DISH/Clark, Texas Residents*; Wilma Subra (December 2009), Earthworks' Oil and Gas Accountability Project
57. *Potential Exposure-Related Human Health Effects of Oil and Gas Development: a Literature Review 2003 – 2007*; Roxana Witter, Kaylan Stinson, Holly Sackett, Stefanie Putter, Gregory Kinney, Daniel Teitelbaum and Lee Newman (August 1, 2008), Colorado School of Public Health, University of Colorado, Denver.
58. *Final Rule, Practice and Procedure 2 CCR 404-1, Eff. 09/30/2007*; Colorado Department of Natural Resources, Oil and Gas Conservation Commission.
59. *Order No. R-12939*; New Mexico Oil Conservation Commission (May 9, 2008)
60. *Air Quality Concerns at Woodland Management Gas Drilling Site, Damascus, PA*; Greg Swartz and Tannis Kowalchuk, (September 15, 2010), private communication
61. *Component of LE SUPERMUL, Appendix E*; DEP Permit No. 37-127-20017-00 to Newfield Appalachia PA, LLC (May 27, 2010)
62. *Analytical Report, DRBC Well Smp, Wayne County PA*; Steve Moyer, Tetra Tech NUS, Inc., TestAmerica Laboratories, Inc. (August 18, 2010)
63. *Lithium Levels in Drinking Water and Risk of Suicide*; Hirochika Ohgami, Takeshi Terao, Ipeei Shiotsuki, Nobuyoshi Ishii and Noboru Iwata (2009), British Journal of Psychiatry **194**: 464 – 465

Record of Pennsylvania Gas Industry Inspections, Violations and Enforcements
Exhibits for the Delaware River Basin Commission Exploratory Well Hearing

Ronald E. Bishop, Ph.D., CHO

To:

Delaware Riverkeeper Network

And

Damascus Citizens for Sustainability

Responding to Act 15, signed into law by Governor Rendell in March, 2010 (1), Pennsylvania's Department of Environmental Protection developed the DEP Oil and Gas Electronic Reporting website (2). Having obtained the records from that site, I am submitting a series of spreadsheets which summarize the Inspections, Violations and Enforcements related to natural gas extraction from (a) all target formations and (b) Marcellus shale. These official documents support a stance that gas industry operators in the Commonwealth have accumulated a poor safety record from 2008 to the present.

I summarize the official data in the following table:

| Year | Formation | Inspections | Violations | Enforcements |
|-------|-----------|-------------|------------|--------------|
| 2008 | All | 937 | 1447 | 662 |
| | Marcellus | 130 | 179 | 122 |
| 2009 | All | 1801 | 3159 | 693 |
| | Marcellus | 314 | 639 | 190 |
| 2010 | All | 1193 | 2193 | 590 |
| | Marcellus | 496 | 970 | 254 |
| Total | All | 3931 | 6799 | 1945 |
| | Marcellus | 940 | 1788 | 566 |

These records indicate that total violations and serious violations (enforcements) correlate well with the numbers of inspections, but Marcellus projects tend to generate violations and enforcements at rates that increase with the passing of time. Overall, out of 19,473 total new gas well projects reported in this period (3), these data indicate a serious (potentially groundwater-impacting) violations rate of 10%. Put another way, approximately one of every ten new gas well projects in Pennsylvania has run into serious trouble.

Footnotes:

1. DEP Oil & Gas Reporting Website – Welcome;
<http://www.marcellusreporting.state.pa.us/OGREReports/Modules/Welcome/Welcome.aspx>
2. Oil & Gas Inspections - Violations – Enforcements, Division of Oil and Gas Management;
<http://www.dep.state.pa.us/dep/deputate/minres/oilgas/OGInspectionsViolations/OGInspviol.htm>
3. 2010 Permit and Rig Activity Report, Division of Oil and Gas Management;
<http://www.dep.state.pa.us/dep/deputate/minres/oilgas/RIG10.htm>

Respectfully submitted,

A handwritten signature in blue ink that reads "Ronald E. Bishop". The signature is written in a cursive style with a large initial 'R'.

Dr. Ronald E. Bishop

**Delaware River Basin Commission (DRBC)
Consolidated Administrative Hearing on
Grandfathered Exploration Wells**

Prepared for:

**Delaware Riverkeeper Network
and
Damascus Citizens for Sustainability**

Prepared by:

Demicco & Associates, LLC



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State of Pennsylvania, PG-003690-E

November 15, 2010



1. Executive Summary

Demicco & Associates, LLC has been retained by the Delaware Riverkeeper Network and Damascus Citizens for Sustainability to provide expert review and opinion on the Delaware River Basin Commission's (DRBC) decision to exclude 11 Pennsylvania state permitted wells from DRBC review of exploratory wells under its June 12, 2010 and July 23, 2010 Supplemental Determinations. The decision to exclude the 11 wells has resulted in the Consolidated Administrative Hearings on actions of the DRBC relative to exploration wells being drilled into the Marcellus Shale. Specifically the Hearing will address DRBC decisions to:

- Regulate so-called “exploratory wells” and subject them to DRBC’s temporary moratorium (challenge brought by Northern Wayne County Property Owners’ Alliance, joined by Newfield and Hess Corporation as interested parties)
- Exclude certain state-permitted wells from DRBC review of exploratory wells, (challenge brought by the Delaware Riverkeeper Network (DRN) and the Damascus Citizens for Sustainability (DCS))

The findings in this report are based on the material provided by DRN and DCS included within the references presented at the end of the report. Should additional materials and reports be disclosed as part of the Hearing process the findings and conclusions in this report are subject to revision.

Conclusion 1 - Grandfathering

In our opinion, the 11 wells listed as grandfathered exploration wells do not meet the DRBC criteria of exploration well due to the lack of an appropriate certification of Intent by Well Operator to Plug the Well. The Marcellus Shale in sections of Wayne County,



PA may exceed the average thickness of the shale unit throughout much of the rest of the state and vertical wells can expose a significant volume of Marcellus shale for gas production. True exploration wells would be sealed and decommissioned immediately upon completion.

Conclusion 2 – Exploratory Drilling Impacts

Drilling of exploratory holes can, with lack of regulatory oversight, cause as much if not more harm to the water resources of the Delaware River Basin than a properly permitted and installed nontraditional horizontal well. Specific problems with exploratory drilling are the apparent dominance of air rotary drilling techniques to increase speed of drilling and decrease the cost of drilling. Air rotary drilling uses generally uses either naturally occurring ground water or a source of potable water and compressed air to remove the rock cuttings from the borehole as well as cooling the compression air hammer drill bit. When extensive fractures are encountered during air rotary drilling, large volumes of ground water approaching 1000 gpm can be blown from the borehole. Extensive fracturing will also cause problems with borehole stability and resulting problems with achieving a proper grout seal. Grout seals are the single most important element to protecting ground water resources from contamination as presented within this report.

Conclusion 3 – Water Resource Impacts

Damage to ground water resources can occur through both negative impacts on quantity and quality. The month long process of drilling may exceed the 100,000 gallons per day (gpd), 3.1 million gallon per month (mgm) threshold for an allocation permit if numerous fractures are encountered during air rotary drilling. Again, adequate and complete grouting of the gas well from the principal fresh water aquifers is critical to protect the water resources. Leakage along the grout wall can promote vertical upward movement of low quality water if over pressure from deeper zones in the well creates an upward gradient. Large movement of gas and deep brine fluids into shallow zones will have



negative water quality impacts on both water resource wells and streams. However, vertical downward leakage of freshwater into newly exposed and opened fracture zones from air rotary drilling can remove fresh water from the shallow aquifer zones. Loss of fresh water to deeper portions of the aquifer would diminish summer base flow to headwater streams. The increased runoff from site construction and road construction will also have a negative impact on the quantity summer base flow by decreasing the amount of rainfall that would normally reach the ground water.

Conclusion 4 – Exploratory Well and Grouting Efficiency

The drilling of the stated “exploratory” hole is done predominantly by air rotary methods based on the examined documents obtained to date. This results in an underbalanced borehole at depth where formation pressure exceeds borehole pressure. When formation pressure exceeds borehole pressure water, petroleum and gas, if present in the formation enter into the borehole and are brought up to the surface. The result is even greater strain on the borehole increasing the importance of properly grouting the well. Regulatory changes are currently being proposed in Pennsylvania indicating the inadequacies of the current regulatory procedures. Air rotary drilled wells, if drilled quickly without maintaining directionality, will potentially drift off vertical. The rapidly varying rock types encountered in Pennsylvania will create an uneven borehole with a wide borehole where soft shale is easily removed and a narrower borehole when passing through hard sandstones. Both the verticality (i.e. deviations from a purely vertical bore) and uneven borehole width will have negative impacts on the efficiency of the grout installation. It should be noted that State of Pennsylvania requires only a 1 inch grout diameter, whereas the State of New Jersey, where gas wells are not being drilled, requires a two inch diameter grout seal on any borehole annulus (eg. water, oil, geothermal, water, etc.).

The four issues described above result in an overall summary conclusion. It is my opinion, given with a reasonable degree of scientific certainty, that the grandfathering of these so-called exploratory wells is not protective of the Special Protection Waters of the



Delaware River Basin due to lack of regulatory review by DRBC, reliance on outdated and inadequate drilling regulations that are currently undergoing modification, and uncertainty in proper development of grout seals with the use of air rotary exploration drilling into an over-pressurized geologic zone.



2. Introduction

The primary topic of this expert report focuses on water resource issues, specifically possible water usage and water resource contamination which can occur during exploratory drilling operations. Mr. Peter Demicco is the author of this report and has over 28 years in ground water resource development including water well design, water resource and allocation permitting, ground water recharge wells, and deep geothermal wells. Part of his experience includes several years of appointment to the New Jersey Well Drillers Licensing Board for the New Jersey Department of Environmental Protection. Mr. Demicco is also a registered geologist in the State Of Pennsylvania. His curriculum vita is attached to this report (Exhibit 1).

2.1 Discussion of Drilling Techniques

The first topic of the presentation will include a discussion of drilling techniques including background experience in both mud and air rotary drilling. Volumes of water needed vary based on drilling techniques and conditions encountered during drilling. In addition, air rotary drilling can result in large volumes of water production when fracture zones are encountered along with borehole stability issues. The quality of this water will vary with depth of materials encountered with naturally occurring contaminants and radionuclides increasing with depth.

2.2 Discussion of Well Grouting

The second topic is the potential long term impacts that can occur if casing or grout failure occurs from unexpected drilling conditions or improper grouting. Grout and casing failure are jointly caused by rock shearing and pressure changes in the formation. These impacts range from casing deformation to breakdown of the grout



seal, both often occur together. The breakdown of the grout seal potentially leads to migration of water from one aquifer zone to another, vertical upward movement of naturally occurring non-potable water into potable zones and vertical downward movement of aquifer water into a non-potable zone. The latter condition would potentially result in diminished aquifer resources and potentially have a negative effect on stream base flow. In addition, migration of water even within potable aquifer zones can have negative consequences. The most common example of this is migration of water with dissolved oxygen into an anoxic zone containing specific minerals, most notably pyrite. With the introduction of oxygen into such zones, dissolution of pyrite will result in water with low pH and high iron and either elevated sulfate or sulfide concentrations. Arsenic contamination can occur as arsenic is known to be a secondary element in iron pyrite.

Multiple reports and publications were reviewed for this opinion. The documents most germane to this report are presented as exhibits attached to this report. Several background documents also reviewed for this report include the followings:

- PaDEP's existing Chapter 78 Oil and Gas Well Regulations
- PaDEP's proposed amendments to Chapter 78 Oil and Gas Regulations in the Pa Bulletin (July 10, 2010)
- DRBC's May 19, 2009 Executive Director Determination (EDD)
- DRBC's June 14, 2010 Supplemental Executive Director Determination (SEDD)
- DRBC's July 23, 2010 Amendment to Supplemental Executive Director Determination
- DRBC's Delaware River Basin Code: 18 CFR Part 410



3.0 Background Geology

A cursory overview of the geology of Wayne County is needed in the context of drilling. The background overview of the geology has been obtained from “Ground water in Northeastern Pennsylvania” by S. W. Lohman. (1937; 2nd printing, 1957). Exhibit 2 presents an updated review of the stratigraphy of northeastern Pennsylvania from Frank Fletcher. Generally, the Upper Devonian rocks of the Catskill Continental Group are the dominant bedrock unit below any glacial deposits. The Catskill Group consists of various non-marine sandstone, shale and conglomerate units. These rock units were largely deposited in fluvial (i.e. riverine) environments. The rocks exhibit the fining upward characteristics of the classic fluvial sequence. The fining upward sequence starts with coarse sandstones and some conglomerates channel deposits at the base with finer grained river overbank siltstone and shale at the top of the sequence. These cycles repeat throughout most of the sequence of unit.

Wells drilled into the Catskill Group produces abundant water for nearly all domestic needs (Lohman, 1957). This geologic group is the most important water bearing unit in Wayne County and provides not only domestic and other human needs, but provides a large part of the base flow to local surface waters along with flows from surficial glacial deposits. The sandstones form the largest water bearing group of sediments. The Catskill Group can range in thickness from 1,800 feet thick in Susquehanna County in the north to over 6,000 feet in Carbon County (see Lohman, 1957).

Beneath the Catskill Group non-marine units are marginal marine units of the Portage Group dominated in this area by the Trimmers Rock Formation. These marine units contain typically coarsening upward deposits of off shore deltaic deposition. Soft shale from deep water environments forms the basal units and, as the delta builds out into the shallow seas, coarser and cleaner sandstones are deposited near the top of the



sequence. This Group is not considered an aquifer in Wayne County due to depth, probable salt and hydrogen sulfate concentrations. This Group, as with the Catskill Group will exhibit rapidly varying drilling conditions. The unit is roughly 1,500 feet thick in the eastern part of northeast Pennsylvania thickening to 3,000 feet westward into Luzerne County (see Lohman, 1957).

The Hamilton Group, which includes the upper Hamilton Formation (see Lohman, 1957 for an in depth discussion of stratigraphy) and lower Marcellus Shale, underlies the Portage Group. The Hamilton Formation represents shallower marine waters than the depositional environment of the Marcellus Shale. In the Hamilton Formation, beds of fossiliferous olive-gray to dark grey sandy shale and sandstone with locally thin beds of calcareous shale to coral limestone and coquinite can be found (see Lohman, 1957). This unit is on the order of 1,100 to 1,600 feet thick (see Lohman, 1957). The Marcellus Shale is a gray to black shale with some fine sand in locations and contains pyrite indicative of the anoxic environment that resulted in the formation of natural gas. The thickness of the Marcellus Shale is on the order of 700 to 900 feet in the eastern counties of northeast Pennsylvania, including Wayne County) decreasing to 400 feet in the western counties of northeastern Pennsylvania (see Lohman, 1957).

The Onondaga Formation, a cherty limestone, underlies the Marcellus Shale in the northeastern portion of Pennsylvania. This formation has been listed as the target formation by some drilling operations presumably to ensure that the full thickness of the Marcellus Shale has been penetrated.

Each of the 11 grandfathered wells will have to be drilled through this highly variable geologic column. The amount of the Catskill Group penetrated will vary the most depending on location of the well.



4.0 Well Permits

Several well permits and related documents were reviewed including the Docket NO. D-2009-18-1 on the Stone Energy Corporation Matoushek 1 Well (Exhibit 3). Only this Docket provided any details on the actual drilling of an gas well into the Marcellus Shale. The other exploratory well permits reviewed had some details on specific aspects of the drilling including the MSDS sheets for material to be brought on-site, the “Preparedness, Prevention, and Contingency Plan, Wayne County Field, Wayne County, Pennsylvania” report, and site construction details. (see Exhibit 4, Woodland Mgmt Partners 11: Exhibit, 5 HL Rutledge 11; and Exhibit 6, VE Crum 11). However, the permits were completely silent on the actual drilling methods, well construction methods and the critically important grouting methods. It is important to note that the materials and grouting techniques will not vary greatly from an exploratory hole to a production well.

The Stone Energy Corporation, Matoushek 1 well was reported in the Docket (Exhibit 3) to be drilled by air rotary methods to the top of the Marcellus Shale, and then the Marcellus Shale was cored using a 3 percent potassium chloride solution. Air rotary drilling is different than mud rotary drilling in that air and chemicals are used as the fluid to cool the drilling bit, lift the cuttings from the hole, and lubricate the drill column. Usually foaming agents are used with air rotary drilling. The borehole should be underbalanced in this process, in other words the pressure of water and gas in the formation should be greater than the pressure created by the air compressor. As a result, oil, gas and brine ground waters will be pulled up to the ground surface during this type of drilling. Air drilling should be significantly faster than mud rotary through the use of air hammer drilling bits and with less deterioration and damage to the drill bit. However, there is a greater risk of well blowout if overpressurized (i.e. greater than atmospheric pressure at the depth of the overpressure area) zones are encountered as the borehole is advanced.



As stated above, the other permits (the grandfathered exploratory well permits) were silent on drilling method(s), so there is no information available to evaluate the risks associated with the drilling technique that will be used on these wells. A discussion of drilling methods should be mandatory in these permits. -. Typically, mud rotary drilling would be used to drill through the gas producing Marcellus shale.

Several other significant differences with air rotary drilling versus mud rotary exist. The compressed air injected during drilling also lifts the water encountered in borehole and surrounding fractures to the surface. Air drilled wells can remove significant volumes of water during the drilling process. Exhibit 7 presents a set of e-mails discussing the volume of discharge to the Valley Joint Sewerage Authority. Significant volumes of water are reported to have been removed during drilling of the Matoushek well.

Where large fractures are encountered, borehole collapse can occur further enhancing the water flow and slowing drilling. A mud cake is not formed on the borehole of an air drilled well to diminish water movement into or out of fracture zones. As a result air drilling allows for greater movement of water between fracture zones during drilling. On occasion, I have observed drillers of geothermal wells stop and grout up sections of failing rock before drilling deeper. Conventional wisdom was that very few high water yielding fractures existed below 500 feet. Again, I have seen yields close to 800 gpm being blown from fractures zones below 1000 feet deep. Bottom line, during the month long drilling process using air rotary, the potential exists to withdraw more than 100,000 gallons per day on average, or 3.1 million gallons for the month.

It is not unusual for air drilled wells to have significant deviation from the vertical in areas of nearly flat lying to slightly dipping bedrock (Dr. Greg Herman, New Jersey Geological Survey, 2005). Dip is the angle from the horizontal of the bedding plane of the rock. Typically, the drill bit may follow the near vertical (but not completely



vertical) fractures in the rock mass. This is also a concern when rocks of very different characteristics are adjacent to one another as is the case in Wayne County, PA. Typically, a very ragged borehole will result with zones of collapsed fractured sandstone.

Problems with the verticality and variability of the borehole will potentially result in grouting difficulties. Questions on the integrity of the grout seal arise when the casing to be grouted may lie up against one side of the borehole. Centralizers may not align the well properly in a rough borehole. In addition, Pennsylvania requires only 1 inch diameter of grout whereas New Jersey requires 2 inches of grout. Since details on well drilling and construction are absent in the permit papers, how is the issue of the casing grout going to be reviewed and documented during drilling? The PaDEP regulations do not appear to require disclosure of drilling method on the permit application. However, DRBC has not required this information on any of the 11 exploratory well sites to know potential drilling risks at the 11 sites and have a better inventory of chemicals stored at these sites to conduct mud rotary drilling before allowing these 11 “grandfathered” wells to proceed. In my opinion, these data are necessary to evaluate potential impacts to the water resources of the basin.

Grouting at the depth of the production casing occurs with only 1¼ inch of grout on either side of the casing. This assumes that the casing is centered, the hole is truly vertical and the drill bit drilling the 8-inch borehole had not been worn down significantly. The potentially rapidly varying casing pressures that occur if test fracturing or test gas production occurs may shear the grout and even the casing (Dusseault, et al, 2001). If grout failure occurs at this interval, high pressure gas and fluids could reach up to the surface and conductor casings via the ungrouted portion of the borehole. At the shallower depths, the higher pressures could damage the surface and conductor casings allowing further upward migration of gas and fluids into the aquifer zones above.



The significant issue with these wells is the pressures placed on the grout seals and casings. Experience even in the water industry has led to field observations of grout mixtures that have excess water to improve pumping characteristics. The result is a grout subject to shrinkage, a situation that could prove disastrous in high and overpressured environments such as the Marcellus shale in the Delaware River Basin. Skimping on the grout seal may be an inevitable problem that has been the cause of well blowouts. Again, the result is vertical upward migration of gas and fluids into the area of the surface and conductor casings and eventually into the aquifers above.

The PaDEP regulations do not appear to require disclosure of drilling method on the permit application. However, DRBC has not required this information on any of the 11 exploratory well sites to know potential drilling risks at the 11 sites and have a better inventory of chemicals stored at these sites to conduct mud rotary drilling before allowing these 11 “grandfathered” wells to proceed. In my opinion, these data are necessary to evaluate potential impacts to the water resources of the basin.

In summary, in my opinion, water use and resource losses can be an issue with exploratory wells. Drilling and grouting plans for any well must be fully developed prior to any drilling activities and, because these 11 exploratory wells are going unregulated by the DRBC, there is no review of these plans and procedures and no basis for any conclusion by the executive director of DRBC that the drilling of these exploratory wells will not have a substantial effect on the water resources in the Special Protection Waters of the Delaware River Basin.

The opinions expressed in this report are stated to a reasonable degree of scientific and professional certainty.



5. References

Dusseault, M. B., Gray, M. N., and Nawrocki, P. A., 2000, Why oil wells leak: Cement behavior and long-term consequences: SPE International Oil and Gas Conference and Exhibition; Beijing, China, November, 2000.

Dusseault, M. B., Bruno, M. S., and Barrera, John., 2001, Casing shear; casues, cases, cures: SPE Drilling and Completion, March, 2001, pages 98 – 107.

Herman, G. C., 2005, Joints and veins in the Newark basin, New Jersey, in regional tectonic perspective: in Gates, A. E., editor, Newark Basin – View from the 21st Century, 22nd Annual Meeting of the Geological Association of New Jersey, College of New Jersey, Ewing, New Jersey, p. 75-116.

Lohman, S. W., 1957, Ground water in northeastern Pennsylvania: Pennsylvania Topographic and Geologic Survey Bulletin W 4, Harrisburg, Pennsylvania, 2nd printing, 312 pages.

Exhibit 1

PETER M. DEMICCO, P.G.

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(908) 806-7638

Education

M.S. Geology, University of Delaware, 1982

B.S. Geology and Geophysics, University of Connecticut, 1980

Registrations

Registered Professional Geologist, State of Delaware, #S40000406

Registered Professional Geologist, State of Pennsylvania, #PG-003690-E

Certified Professional Geologist, State of Virginia, #2801001817.

Certified Geologist, American Institute Professional Geologist, #7160

Technical/Professional Expertise

Water Resource Evaluations

Water Well Design and Aquifer Testing

Aquifer Storage and Recovery (ASR) Systems

Wastewater Recharge Systems

Groundwater Flow Modeling

Analysis of Fractured Rock Groundwater Flow

Remediation of Petroleum and Chlorinated VOC sites

Capabilities

Aquifer Testing and Well Hydraulics

Wastewater Infiltration Analysis and Modeling

Groundwater-Surface Water Interaction

Regional Watershed Hydraulic Analysis

Well Design and Redevelopment

Groundwater Flow and Solute Transport Modeling

Groundwater Geochemistry Analyses

Design of Hydraulic Controls for Remedial Recovery System

In-ground Iron and Manganese Removal

Professional Profile

Mr. Peter Demicco is the Principal Hydrogeologist and President of Demicco & Associates, LLC. Mr. Demicco has over 30 years of experience in the fields of water supply and ground water remediation.

Mr. Demicco's technical expertise in water resource development includes Groundwater Resource Planning, Water Allocation permits for municipal and industrial water users, Aquifer

Storage and Recovery (ASR) projects, extensive single and multiple well aquifer testing projects, ground water flow modeling for well head protection, regional water resource planning, surface water induced infiltration projects and in-ground iron and manganese removal projects. Mr. Demicco has also evaluated sites for the installation of high capacity horizontal collector wells and has conducted extended 30-day aquifer tests for the evaluation of induced infiltration. Major projects have included analysis of ground water recharge, surface water runoff, and stream base flow to evaluate impacts of development on stream hydrology.

Mr. Demicco's experience includes analysis of water reuse projects primarily focusing on the recharge of waste water for municipalities and public and private utilities. This work has focused on large volume rapid infiltration basins for disposal projects up to 1.5 Million Gallons per Day (MGD). These projects include ground water flow models of the mounding effects beneath the basins, evaluation of geochemistry changes within the aquifer, and seasonal changes in aquifer water elevations.

Mr. Demicco's consulting management experience has included oversight of over 50 major water allocation projects from single wells to multiple well installations. Mr. Demicco has managed many projects related to NJDEP critical aquifers in both Critical Areas 1 and 2. His experience includes one of the only alternative water supply plans approved in Critical Area 2. He has extensive experience in interfacing with the NJDEP Bureau of Water Allocation and the Bureau of Safe Drinking Water. His project works includes consulting for municipal planning and health boards.

Mr. Demicco's expertise also extends to ground water remediation of both water supply systems and industrial site remediation. He has managed projects on nitrate and VOC contamination of municipal and industrial wells, as well as remedial investigations and remedial action projects under NJDEP Technical Requirements for Site Remediation. Mr. Demicco has assisted clients in developing natural attenuation remedial action plans and groundwater Classification Exception Areas (CEA). Mr. Demicco also has managed multi-discipline teams in remedial projects related to NJDEP ACO, ISRA and UST programs, and federal EPA Superfund Program.

Project Experience

Water Resource Evaluations

- Provided single and multiple well aquifer tests, regional analysis of aquifer impacts and public testimony for a new water supply system in Gloucester County, New Jersey in the PRM Aquifer System. Analysis included reviews and comments on a regional model of the PRM aquifer produced by the U. S. Geological Survey.
- As Professional Geologist, provided oversight for the expansion of a major water purveyor in the State of Delaware. Projects include the development of a new 2.0 million gallon per day (MGD) well site in west-central New Castle County, technical assistance for new well exploration in both New Castle, Kent Counties and Sussex Counties, development of a water supply system in multiple aquifers for an estimated 5 to 6 MGD needed for development in Southern New Castle County, assistance with 72-hour allocation permit aquifer tests and well efficiency step tests, and technical assistance with ASR sites in New Castle County.

- Oversaw multiple Horizontal Collector Well test and individual site tests for a 45 MGD facility at a nuclear power facility along the Mississippi River in the State of Mississippi. Site testing involved the evaluation of induced infiltration for estimating yield of individual collector well sites along the banks of the Mississippi River. The multiple well test involved operating three collector wells at steady rates and then testing the fourth new collector well for a 96 hour period. Report preparation included estimating total well yield with all four horizontal collector wells operating at low-river stage.
- Provided Expert Witness testimony for a legal case involving a municipal zoning ordinance on domestic water supply well and septic systems on appropriate housing density. The court case focused on regional ground water recharge rates and nitrate dilution of septic system discharge.
- Well Redevelopment and evaluation of sand production from a 1300 foot deep Potomac-Raritan-Magothy well in Jackson Township, New Jersey. Project included location of the sand producing interval of the screen. Different techniques of redevelopment applied to reduce sand production from the interval identified as producing sand.
- Project Geologist for development of new water resources for Henrico County, Virginia. Reviewed available surface and ground water resources, evaluated existing well system, development of well maintenance criteria, and selection of sites for new ground water exploration.

Waste Water Recharge

- Ground water flow model for waste water disposal of a 400 home subdivision in Sussex County Delaware using the USGS Modflow model and the Surfact unsaturated flow package. The results of the model were used to obtain regulatory approval for a subsurface drip irrigation system through modeling of the potential mounding beneath each site. The project included small scale well tests to evaluate shallow subsurface hydraulic conductivity of the sediment as part of the inputs to the model.
- Analysis of waste water disposal for a 1.5 MGD expansion of a municipal wastewater system in southern New Castle County, Delaware. Analysis included detailed hydraulic analysis for 40 to 60 rapid infiltration basins including seasonal high ground water mounding analysis and detailed geochemistry of the recharge-ground water interaction. A Modflow model of seasonal high ground water elevations is currently underway.
- Analysis of several rapid infiltration basins for residential developments in New Castle and Sussex Counties, Delaware for expansion and permitted capacity increases. These projects focused on analysis of seasonal high ground water elevations due to expanded capacities through ground water flow modeling.

Water Allocation

- Project Manager of an extended 30-day aquifer test to prove induced infiltration from the Delaware River for acquisition of an Alternative Water Source in NJDEP Critical Area 2, Potomac-Raritan-Magothy Aquifer. This project included NJDEP approval of the aquifer test plan and oversight by U.S. Geological Survey of the testing procedures and final hydrogeologic report.
- Developed Aquifer Testing Plan, production well location and design and 72-hour aquifer tests for a major new water supply in Cecil County Maryland. Project included the modification of the water appropriation permit for these new sources in the Potomac Group Aquifer.
- Project Manager of the development and allocation permitting of a new 3.5 MGD well field in southern New Castle County, Delaware in the Potomac Formation aquifer. Oversight of the project included evaluation of 7 new well installations, 72 hour aquifer testing, and computer modeling to illustrate the overall impact of the new wells on the future productivity of the aquifer system. The allocation permit included analysis of regional impacts using a MODFLOW model and public testimony at the permit hearing.
- Project Manager for a project involving the transfer of roughly 10 MGD of water allocation rights between two industrial clients in NJDEP Critical Area No. 1. The project focus was the regulatory oversight and obtaining of approvals needed to secure transfer the diversion permits. Previous work at both sites included extended aquifer testing and analysis for induced infiltration to increase diversion permits in Critical Area 1.
- Submittal of several hydrogeologic reports and allocation permit applications for golf courses most recently including Baltusrol, Shore Gate and Suburban Golf Clubs. Also provided oversight to East Amwell Township Planning Board and Board of Health on the application for the Ridge at Back Brook golf course.
- Prepared and provided public testimony for a new water supply system for Aqua New Jersey in Woolwich Township, New Jersey. Work included a multiple well stress test and extensive investigation of impact of the proposed new wells on existing users and on contaminated sites. Public testimony included comment on USGS regional ground water flow model for this region of New Jersey.

Aquifer Storage and Recovery

- Technical oversight and field testing on ASR demonstration project in New Castle County, Delaware at two (2) facilities in the upper and lower Potomac Aquifer. Reviews for the project included well design criteria, review and modification to groundwater geochemistry cycle testing, conduct the field geochemical testing, regulatory compliance issues, elevated iron levels in the receiving aquifer, and salt water intrusion in the receiving aquifer from existing use of the well field. Currently, this project includes on-going review of compliance monitoring results for geochemical changes in the aquifer, well plugging and MODFLOW modeling of the migration of the injected water.

- Planning, development and testing of a new ASR system in NJDEP Critical Area 1 in Lakewood, New Jersey using an existing Englishtown Aquifer well. Project is through field-testing and is currently waiting regulatory approvals from the Bureaus of Water Allocation, Safe Drinking Water, and Nonpoint Pollution Control. The project included aquifer yield testing, development of a Ground Water Protection Plan and field and laboratory testing of water quality through three injection and recovery test cycles. The project also included geochemical modeling of the injected and recovered water using the U. S. Geological Survey model PHREEQC.
- Review of maintenance procedures for the existing ASR system in Brick Township, New Jersey. Work included development of a monitoring plan for water quality collection on recovery, geochemical modeling using PHREEQC and suggestions on modification of backwash frequency and injected water quality to reduce precipitation of calcite in the well screen, pump and recovered water transmission lines. On-going work will include further analysis of iron levels and approval from NJDEP Bureau of Safe Drinking Water for direct discharge of most of the recovered water to the distribution system without retreatment.
- Technical oversight on the preliminary feasibility and aquifer testing for a new ASR system in New Jersey Critical Area No. 2. Primary focus of this study was the geochemical evaluation of mixing surface source water and aquifer waters. This project included an economic assessment of ASR versus development costs of new water supply wells, regulatory approvals for test drilling and recharges test cycles.
- Technical oversight and field analysis for an ASR system operation and maintenance plan in Critical Area No. 1 of New Jersey in the PRM Aquifer. The ASR system was not being utilized due to on-going issues with the levels of iron in the recovered water. Primary issues were compliance with NJDEP Bureau of Safe Drinking Water, developing a maintenance plan for the ASR well, and monitoring water quality of recovered water.
- Project Manager for the evaluation of an existing ASR system in the Cohansey and Kirkwood Aquifer systems in Coastal New Jersey to improve system maintenance and operational to prevent damage to the system wells by over-pressure during recharge cycles. Work included cycle testing of geochemical reaction and rates of plugging on four existing wells. Work was concluded in the late 1980's with operation and maintenance plan for the recharge wells.

Ground Water Modeling

- Project Manager for a ground water flow and contaminant transport model for a EPA Superfund site in Region 2. The project included developing a MODFLOW and MT3D model for the design of a ground water treatment system. The model included several cleanup scenarios from natural attenuation to a 1 MGD recovery system. Oversight on the project included personnel from EPA Region II and the U.S. Geological Survey.

- Project Manager on a groundwater MODFLOW model of a petroleum facility. The goals of the project were to evaluate maximum petroleum recovery while minimizing ground water pumping and maintaining hydraulic control.
- Project Manager on an evaluation of induced infiltration into a water table aquifer in central New Jersey to increase the facility's water allocation in NJDEP Critical Area No. 1. The goal of the project was to evaluate the maximum sustainable yield of the water table aquifer from within the property boundaries of the facility with a minimum of new well installations.
- Project Manager for a ground water flow model projecting capture and recovery volumes of ground water contaminants in a fractured rock aquifer in central New York State. The goal of the project was to estimate the minimum rates of recovery needed for complete plume recovery and estimate the impact of ground recovery on flow gradients beneath the landfill contaminant source.

NJDEP Spill Fund Sites

- Project Manager on a diesel fuel remediation project that included RI and RA phases of work under a NJDEP ACO. Project included obtaining a NJPDES permit for discharge to ground water as part of the site remediation. The project also included the installation of a multiple well recovery system with free product recovery equipment and development of an iron removal step in the treatment system. Project required regular compliance monitoring sampling and reporting.
- Project Manager on a DNAPL investigation and recovery well installation with treatment system at an industrial facility in Newark, New Jersey. The DNAPL investigation led to a detailed investigation of site geology as the DNAPL migrated from an outwash sand and gravel into a glacial till. A small lacustrine sand unit within the till become the conduit of migration of the DNAPL and recovery well installation focused on the mapping the lacustrine unit.

Publications

Demicco, P. M., Price, B. C., and Penman, R. E., 2010, Well field resource optimization, six years of successful aquifer storage and recovery (ASR) cycles for the Delaware Coastal Plain: Sixth International Conference on Sustainable Water Environment, University of Delaware, Newark, Delaware, 10 p.

Demicco, P. M., Carbaugh, B. C., and Deputy, Morris, 2010, Detailed Hydrogeochemistry of rapid infiltration basins under normal and stressed recharged conditions in Middletown, Delaware: Sixth International Conference on Sustainable Water Environment, University of Delaware, Newark, Delaware, 10 p.

Mulhall, M. J., and Demicco, P. M., 2005, Evaluation of groundwater resources of the Sourland Mountain region of Central New Jersey: in Smart Growth Planning and Management Project for the Sourland Mountain, Sourland Planning Council, 59 p.

Demicco, P.M., Waters, B.B. and Rambo, D.E., 1998, Ground-water Modeling of the Coastal Plain Aquifers as a tool to map water resources for Water Allocation Permitting: 1998 Maryland State-County Water Symposium, Maryland Dept. of the Environment; Baltimore, Maryland; abs. with attachments.

Demicco, P. M. and Zinkevich, Andre, 1994, "Challenges of Aquifer Storage and Recovery (ASR) Applications in Sand and Gravel Aquifers": in *Proceedings of American Water Works Association Annual Meeting*, New York, New York pp 423-435.

Demicco, P. M. and Schmidt, C.A., 1988, "Groundwater Contamination Impacts on a Municipal Water Supply in a Fractured Media: Second National Outdoor Action Conference, NGWA, Las Vegas, Nevada, 23 p.

Groot, J.J., Demicco, P.M., and Cherry, P.J., 1983, "Ground Water Availability in Southern New Castle County, Delaware": Delaware Geological Survey Open File Report No. 23, 20 p.

Groot, J.J., Demicco, P.M., and Cherry, P.J., 1983, "Saturated Thickness of the Water Table Aquifer in Southern New Castle County, Delaware": Delaware Geological Survey Open File Report No. 24, Map with Discussion, Scale 1:24,000.

Groot, J.J., Demicco, P.M., and Cherry, P.J., 1983, "Saturated Thickness of the Columbia Formation in Southern New Castle County, Delaware": Delaware Geological Survey Open File Report No. 25, Map with Discussion, Scale 1:24,000.

Demicco, P. M., 1982, "Hydrogeology of the Southern Half of the Marydel Quadrangle, Delaware": Unpublished Masters Thesis, University of Delaware, 124p.

Record of Employment

| | |
|----------------|---|
| 2007 – Present | Director of Ground Water Resources, Artesian Water Company, Newark, Delaware and Demicco & Associates, LLP. |
| 1999 – 2007 | President and Principal Hydrogeologist, Demicco & Associates, Inc., Pittstown, NJ |
| 1998 – 1999 | Principal Geoscientist, McLaren/Hart, Inc., Warren, NJ. |
| 1998 – 1998 | Supervising Geoscientist, McLaren/Hart, Inc., Warren, NJ. |
| 1989 – 1998 | District and Technical Manager, Ground Water Associates, Inc., Bridgewater, NJ |
| 1988 – 1989 | Environmental Scientist, JCP&L Environmental Affairs Dept., Morristown, NJ |
| 1987 – 1988 | Project Manager, The Earth Technology Corporation, Somerset, NJ |
| 1985 – 1987 | Sr. Project Hydrogeologist, Ground Water Associates, Inc., Bridgewater, NJ |
| 1983 – 1985 | Project Hydrogeologist, Ground Water Associates, Inc., Westerville, OH |
| 1982 | Geologist, Delaware Geological Survey, Newark, DE |
| 1980 – 1982 | Teaching Assistant/Instructor, University of Delaware |

Exhibit 2

A Stratigraphic Framework for the Catskill Facies, Southeastern New York and Northeastern Pennsylvania

Frank W. Fletcher, 4 Thompson Court, Reedville, VA, ffletcher@rivnet.net

ACKNOWLEDGEMENTS

I am profoundly indebted to Jon D. Inners, Robert G. Sutton, and Donald L. Woodrow for their friendship and their insights and good counsel regarding Catskill rocks over the years. "No man is an island, . . ."

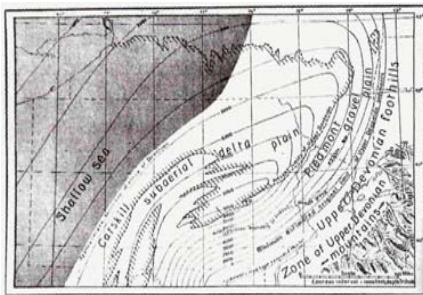
"Any geologist who has followed this series of rocks from central New York eastward to the Catskills, and then along their eastern slope into Pennsylvania, knows very well that red beds appear at different horizons in various parts of the area, and also realizes the utter impossibility of indicating the same approximate horizon by drawing a line through the lowest red beds." C. S. Prosser, 1894.

Research Poster Design Services

TIME AND ROCK

THE CATSKILL DELTA

JOSEPH BARRELL wrote the first comprehensive description of the thick wedge of Middle and Upper Devonian clastic rocks known as the Catskill Delta in 1913. Since that time the stratigraphy, sedimentology, and paleontology of these rocks have been the subject of countless publications, including two notable overviews: Shepps (ed.), 1963, and Woodrow and Sevon (ed.), 1985. The stratigraphic relations of the Catskill Delta are well illustrated on correlation charts published by the geologic surveys of New York (Rickard, 1975) and Pennsylvania (Berg and others, 1983).

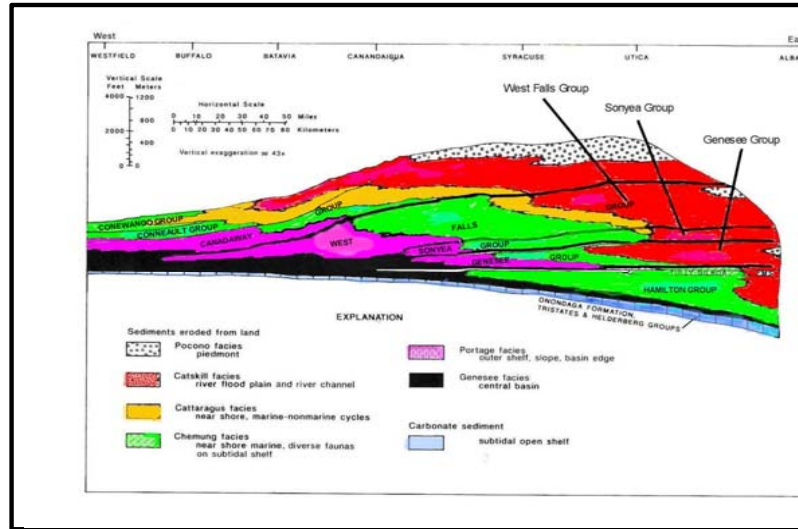


Joseph Barrell's paleogeographic map of the Catskill Delta (Barrell, 1913)

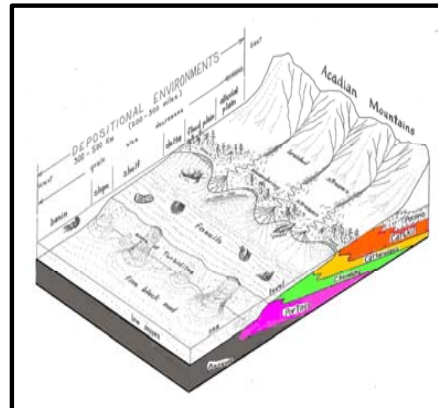
The sedimentary sequence of the Catskill Delta consists six major clastic facies, representing six discrete environments of deposition associated with the filling of the Appalachian foreland basin during the Devonian Period.

| Facies | Typical Lithology | Depositional Environment |
|-------------|--|--------------------------|
| Pocono | conglomerate and coarse-grained sandstone | alluvial fan |
| Catskill | interbedded red and gray sandstone and shale, land plant fossils | alluvial plain |
| Cattaraugus | gray and green shale, siltstone, and sandstone | shoreline |
| Chemung | gray shale, siltstone, and fine- to medium-grained sandstone | shelf |
| Portage | dark gray shale and siltstone | slope |
| Genesee | black shale | basin floor |

Table illustrating the facies of the Catskill delta, together with the associated rock types and depositional environments.



Representational cross section of Catskill facies east to west across New York state (modified from Isachsen and others, 2000).



Isometric diagram of the facies and depositional environments of the Catskill Delta (modified from Isachsen and others, 2000).

► The entire Middle and Upper Devonian sequence is thickest in eastern New York and thins progressively westward.

► The coarser, non-marine facies, Pocono and Catskill, predominate in eastern New York, while the finer-grained, shoreline and marine facies, Cattaraugus, Chemung, Portage, and Genesee, make up an increasingly greater proportion of the sequence westward across the state.

► Tongues of black and dark gray shale of the Genesee facies extend eastward from the Lake Erie region, first splitting the non-marine Portage and Chemung facies of central New York and then the non-marine Catskill facies of eastern New York, where they are evidence of marine transgression.

► The tongues of black and dark gray shale have been employed to sub-divide the facies into four groups. Because the anoxic muds that formed each tongue of black and dark gray shale were deposited everywhere in the Appalachian foreland basin at nearly the same time, the shales may be viewed as time horizons.

► To trace a single group, such as the Sonyea Group, from the Catskill Mountains westward to Lake Erie is to pass from one *magnafacies* to another and to cross the Devonian depositional basin from alluvial fans, to alluvial plain, to shoreline, to shelf, to slope, to basin floor, respectively.

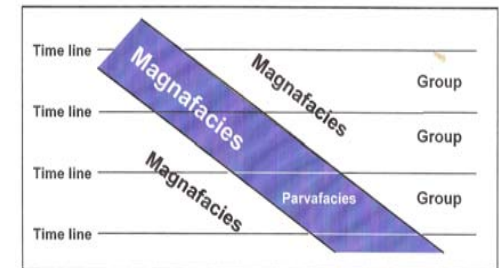
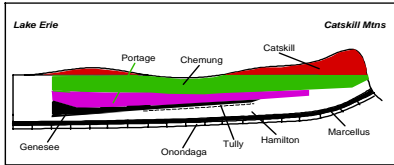


Diagram illustrating the magnafacies concept.

PRESENT AT THE CREATION



During the first Geological Survey of New York (1836-1843), WILLIAM W. MATHER employed the name *Catskill* to denote the red strata found in the Catskill Mountains. Together with his colleagues James Hall and Lardner Vanuxem, Mather assembled one of the famous rock sequences of the eastern United States: (in ascending order) Genesee, Portage, Chemung, and Catskill.



"Layer-cake" model of the New York Middle and Upper Devonian.

In Pennsylvania 19th Century geologists also recognized a "layer-cake" model for the Genesee, Portage, Chemung, and Catskill sequence; although debates about Portage-Chemung relationships raged into the 20th Century. I. C. WHITE (1881, 1882) subdivided the Catskill in northeastern Pennsylvania into eight "members." White believed that the boundary between the Chemung and Catskill occurred at the same stratigraphic level everywhere in the region, and that the younger units were stacked in order above it. He did not, however, illustrate these subdivisions on his geologic maps of Susquehanna, Wayne and Pike Counties, which displayed only vast expanses of the "Catskill formation."



I. C. White's geologic map of Wayne County, Pennsylvania.

Stratigraphic Explorations

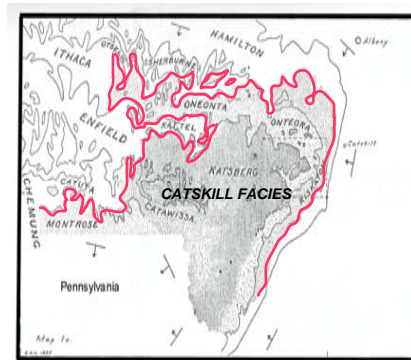
The Search for a Paradigm

paradigm: a set of assumptions, concepts, values and practices that constitutes a way of viewing reality for the community that shares them, especially in an intellectual discipline.

MULTIPLE WORKING HYPOTHESES

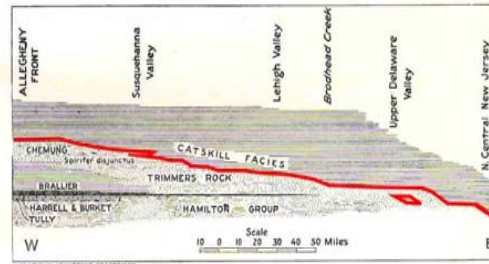
Although revision of Upper Devonian stratigraphy had already begun by the beginning of the 20th century, not until the 1930's did geologists fully understand that the Genesee, Portage, Chemung, and Catskill rocks of New York did not lie one above another in a stacked sequence but were inter-tonguing facies. Chief among the pioneers of the new paradigm were George H. Chadwick and G. Arthur Cooper in New York and Bradford Willard in Pennsylvania

CHADWICK proposed a radical division of the Catskill red beds into several chronostratigraphic units. Although his terminology was later abandoned, he produced the first geologic map showing individual Catskill formations and their marine equivalents in southeastern New York. He also drew attention to serious errors in I. C. White's Catskill stratigraphy, pointing out that it was "scrambled."



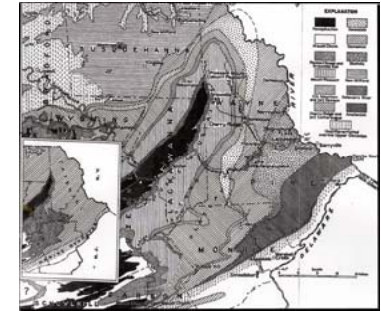
Chadwick's geologic map of southeastern New York (modified from Chadwick, 1936).

WILLARD (1939) lucidly documented the facies changes of Devonian rocks across Pennsylvania and the Upper Devonian lithologies involved in the Catskill offlap.



Schematic east-to-west cross section of the Catskill offlap (modified from Willard, 1939).

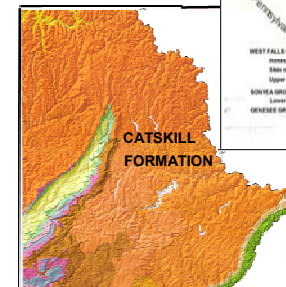
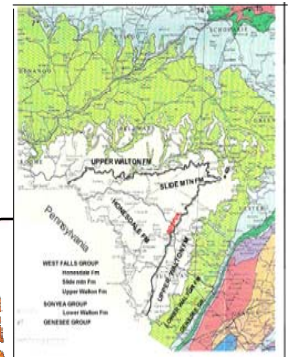
But in northeastern Pennsylvania, Willard adopted much of White's flawed stratigraphic column and terminology and, like White, pictured the subdivisions of the Catskill as discrete layers stacked up like pancakes. Willard further confused the geologic picture by constructing a geologic map that displays these (fictitious) units as concentric bands about the Lackawanna syncline.



Willard's geologic map of northeastern Pennsylvania (Willard, 1938).

The publication of STATE GEOLOGIC MAPS, in New York (Fisher and others, 1970) and Pennsylvania (Berg and others, 1980), brought forth two very different views of the Catskill sequence. The authors of the *Geologic Map of New York State* divided the Catskill facies into five time-rock units totaling over 3,500 feet and mapped these across of broad region of southeastern New York. The geologists of the Pennsylvania Geologic Survey, however, illustrated this series of rocks throughout northeastern Pennsylvania as a single, monochromatic formation.

Geologic map of southeastern New York (modified from Rogers and others, 1990).

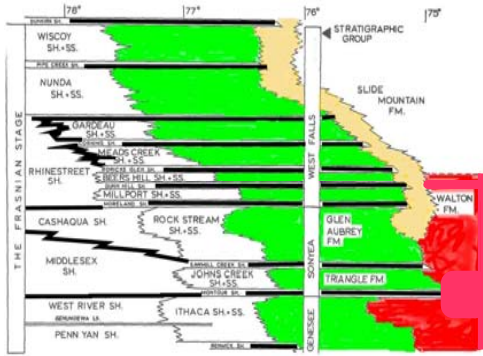


Geologic map of northeastern Pennsylvania (modified from Miles, 2003).

Middle and Upper Devonian Stratigraphy of the Upper Delaware River Valley

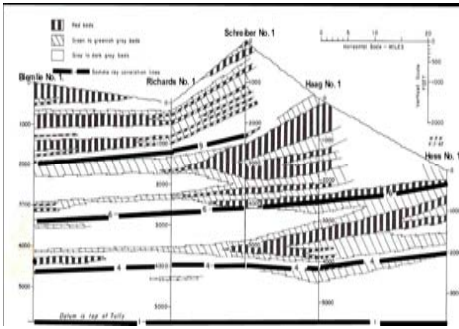
SUBDIVIDING THE CATSKILL FACIES

WALLACE DEWITT, JR. and GEORGE W. COLTON of the USGS and ROBERT G. SUTTON and his students at The University of Rochester demonstrated that the black and dark gray shale tongues split the Portage and Chemung (marine) facies of south-central New York and form the basis for the defining the principal rock units (groups)—the Genesee, Sonyea, and West Falls Groups of the Upper Devonian Frasnian Stage (see Rickard, 1975). Sutton (1963) traced dark gray shales of the Rhinestreet Formation eastward into the Walton Formation of the Catskill facies.



The Frasnian stratigraphic record of south-central New York (modified from Sutton and McGhee, 1983, after Rickard, 1975).

FRANK W. FLETCHER and DONALD L. WOODROW (1964, 1970, and 2002) identified dark gray shale tongues of the Middlesex and Rhinestreet Formations among Catskill strata in exploratory gas wells and in outcrop at several localities in northeastern Pennsylvania. WALTER R. WAGNER (1963) of the Pennsylvania Geological Survey, employing lithic and gamma-neutron logs of five gas wells, traced dark shale horizons in the subsurface through the Catskill facies of northeastern Pennsylvania.

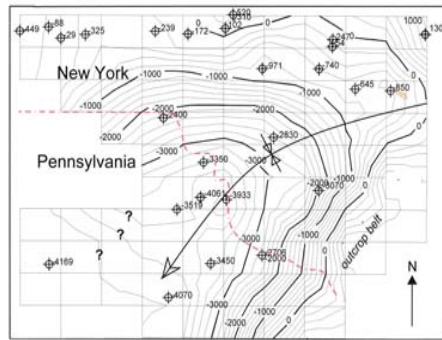


Stratigraphic relation of red beds to gamma ray correlation lines within the Catskill facies of northeastern Pennsylvania (modified from Wagner, 1963). See profile D-E of the index map.

"The key to unraveling the complex facies that occur in this part of the Devonian has proven to be the tracing of the black or dark gray shale tongues that persist eastward across the major facies boundaries." L.V. Rickard, 1975

A STRATIGRAPHIC FRAMEWORK FOR THE INTERPRETATION OF CATSKILL SEQUENCES AND PALEOENVIRONMENTS

Employing well data from Rickard (1989), a structure contour map of the top of the Tully-Gilboa interval, shown below, was constructed for this study. The map illustrates a broad syncline underlying a large portion of southeastern New York and plunging toward the southwest into northeastern Pennsylvania. Further, it demonstrates that the regional strike of the Upper Devonian strata of Delaware County (N.Y.) and northern Wayne County (Pa.) is roughly east to west, fully perpendicular to the strike orientation indicated by Willard and displayed on his geologic map. Evidently, any structural influence that the Lackawanna syncline may have on the rocks of the region is largely local.

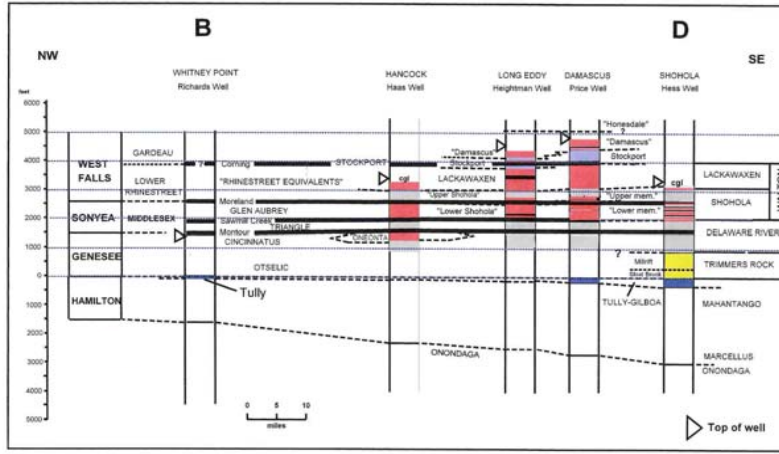


Computer-generated, contour map of the top of the Tully-Gilboa interval in southeastern N. Y. and northeastern Pa. (contours in feet).



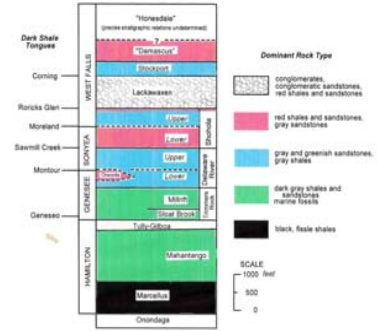
Index map to wells and profiles.

The current study of the Catskill facies in the upper Delaware River valley utilized subsurface information derived from a reexamination of lithic logs originally described by Fletcher (1964) and augmented by additional data from Fletcher and Woodrow (1970) and Rickard (1975, 1989). The cross section displayed below demonstrates that more than 5,000 feet of rock overlie the Tully-Gilboa in this region. The sequence includes strata belonging to the Genesee, Sonyea, and West Falls Groups.



Cross section from Whitney Point (Broome County), N. Y. to Shohola (Pike County), Pa. illustrating the stratigraphic intervals of the post-Tully (Late Devonian) sequence. Stratigraphic nomenclature for the rocks of the Shohola region is based on Fletcher and Woodrow, (1970), while the nomenclature of the Whitney Point rocks is after Rickard, 1975.

Dark gray shale tongues, representing members of the Genesee, Middlesex, and Rhinestreet Formations, extend south-eastward from the Upper Devonian marine facies in Broome County, N. Y. and provide a basis for extending the Genesee, Sonyea, and West Falls Groups from south-central New York to eastern Pike County, Pennsylvania.



Stratigraphic column illustrating the Middle and Upper Devonian units of southeastern New York and northeastern Pennsylvania.

The Lackawaxen Formation represents the westward extension of the Slide Mountain Formation, which caps the highest peaks of the Catskill Mountains, and is the non-marine equivalent of the Rhinestreet shales. The Stockport Formation can be correlated with the Gardeau Formation, while the "Damascus" and "Honesdale" intervals are correlative of the Nunda and Wiscoy Formations.

REFERENCES

Berg, T., and others, 1983, Stratigraphic correlation chart of Pennsylvania: Pennsylvania Geological Survey General Geology Report 75.
 Chadwick, G. H., 1936, History and value of the name "Catskill" in Geology: New York State Museum Bulletin no. 307.
 Fisher, D. W., and others, 1970, Geologic map of New York State: New York State Museum Map and Chart Series No. 15.
 Fletcher, F. W., 1963, Regional stratigraphy of Middle and Upper Devonian non-marine rocks in southeastern New York: p. 25-42, in Shepps, V. C. ----- 1964, Middle and Upper Devonian stratigraphy of southeastern New York: unpublished Ph.D. Thesis, The University of Rochester.
 Fletcher, F. W., and Woodrow, D. L., 1970, Geology and economic resources of the Pennsylvania portion of the Milford and Port Jervis 15-minute quadrangles: Pennsylvania Geological Survey Atlas 223.
 Isachsen, Y. W., and others, 2000, Geology of New York: A simplified account (2nd ed.): New York State Museum Educational Leaflet 28.
 Miles, C. E. (compiler), 2003, Geologic shaded-relief map of Pennsylvania: Pennsylvania Geological Survey.
 Prosser, C. S., 1894, The Devonian System of eastern Pennsylvania and New York: U. S. Geological Survey Bulletin 120.
 Rickard, L. V., 1975, Correlation of Devonian rocks of New York State: New York State Museum Map and Chart Series No. 24.
 -----, 1989, Stratigraphy of the subsurface Lower and Middle Devonian of New York, Pennsylvania, Ohio, and Ontario: New York State Museum Map and Chart Series No. 39.
 Rogers, W. B., and others, 1990, New York State geological highway map: New York State Museum Educational Leaflet 33.
 Shepps, V. C., 1963, Symposium on Middle and Upper Devonian stratigraphy of Pennsylvania and adjacent states: Pennsylvania Geological Survey General Geology Report 30.
 Sutton, R. G. 1963, Correlation of Upper Devonian strata in south-central New York: p. 87-102, in Shepps, V. C.
 Sutton, R. G., and McGhee, Jr., 1983, The evolution of Frasnian marine "community-types of south-central New York: p. 211-224, in Woodrow, D. L., and Sevon, W. D.
 Wagner, W. R., 1963, Correlation of Susquehanna Group in part of northeastern Pennsylvania, p. 63-78, in Shepps, V. C.
 White, I. C., 1881, The geology of Susquehanna and Wayne Counties: Pennsylvania Geological Survey Report G 5.
 Willard, B., 1939, The Devonian of Pennsylvania: Pennsylvania Geological Survey Bulletin G 19.
 Woodrow, D. L., and Fletcher, F. W., 2002, Late Devonian stratigraphy in northeastern Pennsylvania: in Inners, J. D. and Fleeger, G. M. (eds.), From Tunkhannock to Starucca: Guidebook, 67th Annual Field Conference of Pennsylvania Geologists.
 Woodrow, D. L., and Sevon, W. D., 1983, The Catskill Delta: Geological Society of America Special Paper 201.

Exhibit 3

This DRAFT Docket has been prepared for the purposes of the scheduled public hearing and may be substantially modified as a result of the public hearing process prior to Commission action.
2/9/2010

DOCKET NO. D-2009-18-1

DELAWARE RIVER BASIN COMMISSION

Special Protection Waters

**Stone Energy Corporation, Matoushek 1 Well Site
Shale Gas Exploration and Development Project
Clinton Township, Wayne County, Pennsylvania**

PROCEEDINGS

This docket is issued in response to an Application submitted to the Delaware River Basin Commission (DRBC or Commission) by Stone Energy Corporation (Stone) on February 13, 2009 for review and approval of a Marcellus Shale natural gas exploration and development project referred to as the Stone-Matoushek Site (Well Site or Well Pad) which contains a single vertical shale gas well referred to as the Matoushek 1 Well (M1) in Clinton Township, Wayne County, Pennsylvania. On March 14, 2008, the Pennsylvania Department of Environmental Protection (PADEP) Oil and Gas Management Program approved its oil and gas Well Permit for the well (Well Permit No. 37-127-20006-00).

The Application was reviewed for approval under Section 3.8 of the *Delaware River Basin Compact*. The Wayne County Planning Commission and Clinton Township have been notified of pending action on this docket. A public hearing on this project was held by the DRBC on February 24, 2010.

A. DESCRIPTION

1. Purpose. The purpose of this project is for the approval of natural gas exploration and development activities of the M1 well from the Marcellus Shale Formation.

2. Natural Gas Well Location. The existing M1 well is located at latitude 41° 41' 6.39" North and longitude 75 ° 21' 58.21" West on the north central portion of an approximate 116-acre parcel (Tax Map Parcel Number 06-1-0212-0016) in Clinton Township, Wayne County, Pennsylvania. The M1 well is situated in the central portion of an approximate 250 foot by 300 foot existing well pad constructed in an agricultural

field between Bethany Turnpike (SR 670) to the north, Johnson Creek Road to the west, and Creamton Drive (SR 247) to the east and the south in Clinton Township, Wayne County, Pennsylvania. The well site is located approximately 0.8 miles southwest of Red Schoolhouse Corner (the intersection of Bethany Turnpike and Creamton Drive).

The M1 well is located in the outcrop area of the Upper Devonian-age Catskill Formation in the Johnson Creek and West Branch Lackawaxen River watersheds in Clinton Township, Wayne County, Pennsylvania. The surficial material at the site is mapped as Wisconsin Till.

3. Area Served. This Docket applies to natural gas exploration and development activities only to the M1 well located on the Well Site. For the purpose of this docket, natural gas exploration and development activities include or are associated with: Well site and associated access road construction, air rotary/mud rotary natural gas well drilling, natural gas well construction and testing, support vehicle tire cleaning, dust control on access roads, storage of fresh water, hydraulic fracturing well stimulation, hydraulic fracturing chemical storage, flow-back water storage, transport and disposal of all domestic and non-domestic wastewaters and site reclamation on the well pad surrounding the M1 well. Any additional wells proposed at the M1 well site or any property leased by Stone requires separate DRBC docket approval.

4. Definitions.

Conductor casing- A short length of large-diameter pipe used to stabilize the upper portion of the borehole.

Domestic wastewater- Sanitary waste collected in portable self-contained toilets.

Drill cuttings- Rock cuttings and related mineral residues generated during the drilling of an oil or gas well.

Flowback- Return of fluids used in the stimulation process to the surface. While a large proportion of flowback returns to the surface shortly after hydraulically fracturing a well, flowback may return to the surface along with produced water over the production life of the well.

Natural gas exploration and development activities- All activities necessary for the development of and extraction of natural gas including but not limited to well pad and associated access road construction, air rotary/mud rotary natural gas well drilling, natural gas well construction and testing, support vehicle tire cleaning, dust control on access roads, storage of fresh water, hydraulic fracturing well stimulation, hydraulic fracturing chemical storage, flow-back water storage, transport and disposal of all domestic and non-domestic wastewaters, and site reclamation.

Non-Domestic wastewater- Brines, produced water, hydraulic fracturing flowback and any water containing brines, drilling muds, stimulation fluids, well servicing fluids, oil, production fluids or drilling fluids, and cement mixer or cement truck washout water.

Produced water- Water and other fluids brought to the surface during production of oil or gas.

Production casing- A string of pipe other than surface casing and coal protective casing which is run for the purpose of confining or conducting hydrocarbons and associated fluids from one or more producing horizons to the surface.

Surface casing- A string of pipe which extends from the surface and that segregates and protects fresh groundwater and stabilizes the hole.

Tophole water- Water that is brought to the surface while drilling through the strata containing fresh groundwater and water that is fresh groundwater or water that is from a body of surface water. Tophole water may contain drill cuttings typical of the formation being penetrated but is not polluted or contaminated by additives, brine, oil or man induced conditions.

Well site- The area occupied by the equipment or facilities necessary for or incidental to the drilling, production or plugging of a well.

5. Physical Features.

a. **Site Description.** The M1 well site is located in the Glaciated Low Plateau Section of the Appalachian Plateaus Physiographic Province. This area is characterized by rounded hills and valleys of low to moderate relief. The well pad is located in the northern portion of an open field with wooded areas to the north and west of the drilling site. Access to the drilling site is provided by an improved existing farm road located along the perimeter of the open area with an entrance to Creamton Road.

The drilling site is located on a crest of a low-relief ridge at an approximate elevation of 1,545 feet above mean sea level (MSL). Drainage at the drilling site slopes west toward Johnson Creek, located approximately 3,000 feet from the drilling site, and south toward an unnamed tributary of the West Branch Lackawaxen River, located approximately 1,400 feet from the drilling site. Slopes in the immediate area surrounding the drilling site range from approximately 2 to 4 percent. Based on U.S. Fish and Wildlife Service (FWS) National Wetlands Inventory database, the closest mapped wetlands are located at the headwaters of the unnamed tributary of West Branch Lackawaxen River, approximately ¼ mile east of the well location. The well location conforms to the setback limitations from existing buildings, water wells, streams, springs, bodies of water, and wetlands greater than 1 acre in size as required by Pennsylvania Oil and Gas Act Chapter 2 Section 601.205 *Well Location Restrictions*.

b. Well Pad and Well Description. The existing well pad is an approximate 250 foot by 300 foot level area containing an existing well and a lined fresh water impoundment. The perimeter of the well pad contains an earthen berm. The pad area and access roads were first stripped of topsoil to expose firm sub-base material. The topsoil has been stockpiled around the well pad. Coarse aggregate was used where additional stabilization was necessary. In order to control runoff and minimize soil erosion, a diversion swale was constructed on the upslope (north) side of the drilling pad and filter fabric fencing was used on the down-slope sides of the well pad. The docket holder indicated that design and construction of the drilling pad incorporated non-structural and structural best management practices (BMPs). BMP's utilized at the site included siting the well/disturbed area outside of sensitive and special value features and minimizing total disturbed area during clearing, grading, and grubbing. Structural BMP's included, silt fencing, road stabilization with geosynthetics and coarse aggregate, seeding and mulching, straw bail barriers, and temporary drains and swales. The Erosion and Sediment Control Plan was posted at the entrance of the site during well construction.

The M1 well is a vertical well drilled between May 9, 2008 and June 2, 2008 to a total depth of 8,350 feet below ground surface for the purpose of natural gas extraction. The well was air drilled from the ground surface to a depth just above the Marcellus Shale. The Marcellus Shale was cored with 3 % potassium chloride (KCl) water. Drilling muds were not used in the construction of the well. The deepest freshwater was encountered in the Devonian-age Catskill Formation at a depth of approximately 665 feet. Drill cuttings and fluids were captured in a lined drill pit excavated in the drilling pad in proximity to the well. Tanks were used to store tophole water during the drilling of the gas well. After drilling, the cuttings were solidified by mixing with cement and disposed of in the lined drill pit in accordance with PA Code § 78.61.

The M1 well log included as part of the Application indicates that the well was constructed in accordance with PADEP Chapter 78 Subchapter D regulations. The well contains a total of three (3) strings of nested casing (conductor casing, surface casing, and production casing). The conductor casing (13 3/8-inch diameter) was installed in a 17 1/2 inch borehole and extends from the ground surface to a depth of 710 feet. The entire annular space was filled with cement. The surface casing (9 5/8-inch diameter) was placed in a 12 1/4-inch diameter borehole and extends from the ground surface to a depth of 1,964 feet. The entire length of the annular space was filled with cement. The surface casing was pressure tested to a maximum pressure of 1,500 pounds per square inch (psi) for 5 minutes. The purpose of the pressure test is to ensure the integrity of the cemented surface casing to effectively isolate fresh water bearing zones from the wellbore prior to drilling through deeper, non-fresh water or other fluid-bearing zones. The production casing (5 1/2-inch diameter) was placed in an approximate 8-inch diameter borehole from the ground surface to a depth of 8,350 feet (bottom of the drilled well). The annular space was filled with cement from the production casing seat at 8,350 feet up to a depth of 5,500 feet.

The M1 well and well site were constructed in accordance with PA Chapter 78 and PADEP Permit No. 37-127-20006-00.

c. **Access Roads.** An improved existing farm road was used to access the well site containing M1. The improved access road is approximately 30 feet in width and 1,200 feet in length and stabilized with compacted crushed stone aggregate. Silt fencing was installed along the length of the road. The total acreage of the access road is approximately 0.8 acres.

d. **Drill Cuttings and Water Containment/Disposal.** During drilling, drilling fluids and cuttings were contained in a drill pit excavated and maintained in accordance with PA Chapter 78 Subchapter C. The water generated during drilling was removed from the drill pit and disposed of at Valley Joint Sewer Authority in Athens, PA. The drill cuttings were solidified and disposed of in the M1 Well drilling pit in accordance with the requirements of PA Chapter 78 Subchapter C.

e. **Water Source/Water Storage Facility.** The docket holder will only utilize water from the DRBC approved surface water withdrawal located on the West Branch Lackawaxen River (WBLR) to support the natural gas exploration and development project at the M1 well. The surface water withdrawal project (Docket No. D-2009-13-1) is being processed concurrently with the M1 Well docket. Fresh water used for site activities will be stored in a 0.8 million gallon capacity, lined, earthen impoundment constructed and maintained in accordance with PA Chapter 78.

f. **Onsite Chemical Storage Facilities.** All chemicals, fuels, lubricants, etc. required for natural gas exploration and development at the site will be properly stored on the well pad in accordance with the Preparedness Prevention and Contingency Plan (PPC Plan) as required by 25 PA Code Chapters 91.34 and 78.55.

g. **Wastewater Containment, Sampling, Transport, Treatment and Disposal.**

i. **Non-Domestic Wastewater.** Non-domestic wastewater shall be stored on site in a manner to prevent its release except in accordance with this docket. Approximately 6,200 barrels of non-domestic wastewater and top-hole water generated during the drilling of the well was removed from the drill pit via vacuum-truck and transported to a disposal facility. Stone informed the Commission that hydraulic fracturing flowback generated from additional work at the site shall be transferred to steel tanks for storage, reuse, or disposal. As such, the use of steel tanks for non-domestic wastewater storage is required at the M1 Well Site as stated in Condition No II.u. in the Decision Section of this docket. The docket holder is encouraged to reuse the flow-back water for well stimulation in accordance with Condition II.m. in the Decision section of this docket. Non-domestic wastewater that cannot be reused for well stimulation will be removed from the site via tanker truck and conveyed to treatment and disposal facilities approved by the DRBC (if in the DRB and subject to Commission approval) as

well as by the applicable state/Federal agency (if inside or outside of the DRB). No on-site discharge of such non-domestic wastewaters, other than as allowed in this docket is permitted.

ii. Domestic Wastewater. Domestic wastewater shall be stored on site in portable self-contained toilets and in a manner to prevent its release onsite. All domestic wastewater shall be conveyed to treatment and disposal facilities approved by the DRBC (if in the DRB and subject to Commission approval) as well as by the applicable state/Federal agency (if inside or outside of the DRB).

iii. Sampling and Record Keeping. Prior to removal from the M1 Well Site, all non-domestic wastewater shall be sampled and the results recorded in accordance with the Operation Plan required by Condition No. II.e. in the Decision section of this docket. Samples shall be representative of the non-domestic wastewater that shall be transported to the DRBC and State-approved off-site treatment and disposal facility. The chemical analysis of non-domestic wastewater must include the following: acidity, alkalinity (total as CaCO_3), aluminum, ammonia nitrogen, arsenic, barium, benzene, beryllium, biochemical oxygen demand, boron, bromide, cadmium, calcium, chemical oxygen demand, chlorides, chromium, cobalt, copper, ethylene glycol, gross alpha, gross beta, hardness (total as CaCO_3), iron-dissolved, iron-total, lead, lithium, magnesium, manganese, MBAS (surfactants), mercury, molybdenum, nickel, nitrite-nitrate nitrogen, oil & grease, pH, phenolics (total), radium-226, radium-228, selenium, silver, sodium, specific conductance, strontium, sulfates, thorium, toluene, total dissolved solids, total kjeldahl nitrogen, total suspended solids, uranium, and zinc. Domestic wastewater can be transported offsite without sampling; however, it may be subject to sampling at or by the treatment facility.

iv. Wastewater Treatment and Disposal. All wastewater, domestic and non-domestic shall be conveyed to the treatment facility designated in the M1 Well Site Operation Plan or as otherwise approved in writing by the DRBC Water Resource Branch Manager as well as by the applicable state/Federal agency (if inside or outside of the DRB).

h. Supporting Ancillary Facilities. The proposed ancillary facilities include Stone's WBLR surface water withdrawal point and the off-site wastewater treatment facilities that will accept the domestic and non-domestic wastewater. Additional facilities will be required to convey and process the natural gas from M1 Well Site including pipelines, compressor stations, separators/liquid storage tanks, etc, however, the locations of these facilities have not been specified.

i. Cost. The overall cost of this project is estimated to be \$3,000,000.00.

B. FINDINGS

This docket is issued in response to an Application submitted to the Delaware River Basin Commission (DRBC or Commission) by Stone Energy Corporation (Stone) for review and approval of a natural gas exploration and development project at its M1 Well site in Clinton Township, Wayne County, Pennsylvania. The Commission recognizes that each natural gas well also will be subject to the review of the environmental agency of a signatory state in which the project is located. The Commission staff coordinates with and, where feasible, will utilize the review process and approvals of the applicable state or federal agency to minimize duplication of effort and redundant requirements imposed on project sponsors.

On June 6, 2008 the Executive Director of the DRBC issued a determination to Stone by certified letter that natural gas exploration and development at the M1 Well site may have substantial impacts on the water resources of the Delaware River Basin (DRB). As such, the DRBC requested that an Application for the M1 Well Site be submitted to the Commission for review and approval.

Stone drilled and cased the M1 well without Commission approval. On December 10, 2008, a settlement agreement between Stone and the Commission required Stone to submit an application to the DRBC for review and approval of the well and to pay a fine as specified in the settlement agreement.

On February 13, 2009, Stone submitted an application to the Commission for approval of the M1 Well. Additional information pertaining to the Application was submitted to the Commission on June 11, 2009.

On May 19, 2009, the Executive Director issued the “*Determination of the Executive Director Concerning Natural Gas Extraction Activities In Shale Formations Within The Drainage Area of Special Protection Waters*” that clarified which natural gas related activities require Commission review and approval (EDD).

SPECIAL PROTECTION WATERS

The project is located in the area of the Delaware River Basin that is designated by the Commission as Special Protection Waters (SPW) as set forth in the DRBC *Water Quality Regulations* (WQR). The SPW designation and associated regulations are designed to protect waters with exceptional value including without limitations existing high water quality in applicable areas of the Delaware River Basin. Article 3.10.3A.2.e.1). and 2). of the *WQR, Administrative Manual - Part III*, requires that projects subject to review under Section 3.8 of the Compact that are located in the drainage area of Special Protection Waters must submit for approval a Non-Point Source Pollution Control Plan (NPSPCP) that controls the new or increased non-point source loads generated within the portion of the docket holder’s service area which is also located within the drainage area of Special Protection Waters.

The M1 Well Site is located within the drainage area to SPW. Therefore, the NPSPCP plan requirement is applicable to this project. This project includes the constructed well pad (completed), well drilling (completed), and well stimulation through hydraulic fracturing. Water necessary for the well stimulation at the M1 Well Site is being processed concurrently with this docket (Docket No. D-2009-013-1). The docket holder submitted a general NPSPCP with the Application. However, no additional site construction activities, well stimulation, or water staging approved by this docket shall take place at the M1 Well Site until a site specific NPSPCP including measures to control stormwater both during and post construction on the site has been submitted to the Commission and approved by the Executive Director and any other necessary federal, state, and local authorizations have been issued.

WATER STORAGE

Water brought to the M1 Well Site from the Commission-approved West Branch Lackawaxen River site will be stored in a lined impoundment constructed and maintained in accordance with PADEP Chapter 78. Under no circumstances shall any material other than surface water originating from a Commission-approved source or precipitation be stored or be allowed to enter the impoundment. If water in this storage facility or the storage facility comes into contact with hydraulic fracturing chemicals, flow back water, or other chemicals and contaminants, all water in the storage facility shall be considered non-domestic wastewater and handled as discussed below.

Unused water from any of the docket holder's Commission approved M1 well natural gas development and extraction site activities in the DRB may be transported to and used at other Commission-approved well pads targeting shale formations controlled by the docket holder in the DRB, with the written approval of the Executive Director. Such transfers shall also be reported to the Commission.

No water, fracturing fluids, flowback water, or otherwise (e.g. cement mixer wash-out, truck wash water, etc.) shall be discharged to waters of the DRB except in accordance with written approvals from the Executive Director and/or the appropriate state agency (Condition II.g. in the Decision section of this docket).

WELL STIMULATION

The docket holder has indicated that the vertical Marcellus shale gas well at the M1 Well Site will be stimulated for production through slick-water hydraulic fracturing. The docket holder has advised the Commission that the well stimulation will involve the injection of approximately 1.0 million gallons (mg) of water with propping agents (i.e. sand of various grain sizes) and hydraulic fracturing additives through the steel production casing into the Marcellus Shale formation underlying the lease holding(s) at approximately 8,200 feet below land surface (elevation 6,655 feet below mean sea level).

The injection will occur at the M1 Well over a period of approximately three days at injection pressures from 5,500 pounds per square inch (psi) to 7,000 psi. Injection of the hydraulic fracturing additives and solutions detailed in the Application into the target formation is acceptable to the Commission as the M1 well was installed by the docket holder in accordance with PA Chapter 78 Subsection D, and approved by the PADEP in Permit No. 37-127-20006-00.

WASTEWATER

Flowback Water

Following well stimulation, Stone estimates that approximately 30% of the estimated 1.0 million gallons of water used for hydraulic fracturing will be returned to the surface as flowback. Flowback from the M1 Well will be piped from the wellhead directly into steel frac tanks for temporary storage on the M1 Well Site, in accordance with Condition II.u. in the Decision Section of this docket.

Treatment and Reuse of On-site Generated Wastewaters

Treatment and reuse of onsite generated non-domestic wastewaters is not proposed at this site. However, the docket holder is encouraged to use the flowback water for well stimulation in accordance with Condition II.m. in the Decision section of this docket.

Recovered fracturing fluids may be recycled for use in natural gas well stimulation activities at the docket holder's Commission-approved natural gas well pads in the DRB with written approval of the Executive Director. Any reuse shall also be reported to the Commission in accordance with the reporting requirements in the Decision Section of this docket. Otherwise, no recovered fracturing fluids shall be used for any purpose other than hydraulic fracturing at natural gas wells targeting shale formations.

Wastewater Disposal

The docket holder has indicated that all non-domestic wastewater including flowback water will be removed from the site via tanker truck and conveyed to treatment and disposal facilities located outside of the DRB. Such disposal is an exportation of wastewater subject to review and approval under Article 2.3 of the Commission's Water Code. Currently, there are no wastewater treatment and disposal facilities within the DRB that are approved to accept these non-domestic wastewaters. In addition docket Condition No. II.m. in the Decision section of this docket requires the docket holder to implement a continuous program to encourage water conservation in all types of use within the facilities served by this docket including the reuse and recycling of flowback waters. The Decision section of this docket also contains conditions concerning the offsite disposal location and the tracking and reporting of non-domestic wastewaters transported from the project site. Therefore, the Commission staff recommends approval of the proposed exportation of non-domestic wastewater. No on-site discharge of such non-domestic wastewaters, other than as allowed in this docket is permitted. Any such

discharge shall be reported to the Project Review Section of the DRBC in accordance with Condition No. II.q. in the Decision Section of this docket.

The docket holder has indicated that domestic wastewater shall be collected in portable, self-contained toilets. When necessary, the toilets will be transported to the sewage treatment facility approved in the Operation Plan (described below). No on-site discharge of such domestic wastewaters is permitted.

The project is designed to conform to the requirements of the *Water Code* and *Water Quality Regulations* of the DRBC.

The natural gas well associated with this project was designed and constructed to conform to the casing and cementing requirements of Sections 78.81-.87 of the PADEP Oil and Gas Regulations. It has been determined by the Commission that these casing and cementing requirements satisfy the Basinwide Groundwater Requirements located in Section 3.40 of the Commission's Water Quality Regulations. These casing construction requirements are designed to sufficiently protect the designated uses of the ground waters of the Delaware River Basin.

The cuttings generated during drilling of the M1 well were solidified and buried in a lined pit on-site in accordance with PA Chapter 78 regulations. Non-domestic wastewater generated during drilling of the M1 well was removed from the site and disposed of at Valley Joint Sewer Authority in Athens, PA.

The DRBC estimates that the well stimulation through hydraulic fracturing, results in a consumptive water use of 100 percent of the total water used. The DRBC definition of consumptive use is defined in Article 5.5.1.D of the *Administrative Manual – Part III – Basin Regulations – Water Supply Charges*.

M1 WELL SITE OPERATION PLAN

In accordance with Condition II.e. of the Decision section of the docket, at least 45 days prior to the scheduled initiation of any activity at the M1 Well Site, the docket holder shall submit an Operation Plan (OP) for the M1 Well Site to the Executive Director. The OP shall include the specifics of the site operations, detailing at a minimum, the procedures necessary to comply with the conditions in the Decision section of this docket. In accordance with Condition II.e., no additional construction or natural gas development and extraction activities at the M1 Well Site is permitted until the OP is approved in writing by the Executive Director. The following shall also be included in the M1 Well Site Operations Plan:

Pre-Alteration Groundwater Quality Survey Plan. Prior to initiation of hydraulic fracturing at the M1 Well, the docket holder will submit a pre-hydraulic fracturing groundwater quality survey plan, receive Executive Director approval, and conduct the groundwater quality survey. The plan shall include an inventory and the locations of any

artificial penetrations including groundwater wells within a 1,000 ft radius of the project well. If no existing wells are identified within this distance, the search radius should be extended up to 2,000 feet from the gas well. The plan shall indicate the proposed sampling procedures to be conducted at a representative number of identified wells spaced around the proposed natural gas well. Prior to hydraulic fracturing at the M1 Well, water samples shall be collected and the samples submitted to a PADEP-certified laboratory for analysis of the following parameters: acidity, alkalinity (total as CaCO₃), aluminum, ammonia nitrogen, arsenic, barium, benzene, beryllium, boron, bromide, cadmium, calcium, chlorides, chromium, cobalt, copper, ethylene glycol, gross alpha, gross beta, hardness (total as CaCO₃), iron-dissolved, iron-total, lead, lithium, magnesium, manganese, MBAS (surfactants), mercury, molybdenum, nickel, nitrite-nitrate nitrogen, oil & grease, pH, phenolics (total), radium-226, radium-228, selenium, silver, sodium, specific conductance, strontium, sulfates, thorium, toluene, total dissolved solids, total kjeldahl nitrogen, total suspended solids, uranium, and zinc.

Wastewater Storage and Handling Details. The OP shall include the details of how domestic and non-domestic wastewater will be stored and handled on the project site.

Wastewater Disposal Locations. The OP shall include a list of the treatment sites where these domestic and non-domestic wastewaters will be disposed. The facility locations, state permit numbers, and acceptance agreements shall be included in the OP.

Measuring, Recording, and Records Maintenance System. The docket holder shall develop and submit with the OP a measuring, recording, and records maintenance system. The measuring, recording, and records maintenance system will include the proposed means with which to measure and record the amount of all water transported to the site by truck or any other means, the amount of water used at the site, the amount of water and fracturing fluids/ chemicals used in the natural gas well stimulation process, the amount of flowback recovered after stimulation, the amount and chemical composition of non-domestic wastewaters produced and stored at the site, and the amount and chemical composition of non-domestic wastewaters transported off-site for treatment and disposal. The method of sampling and analysis of non-domestic wastewater shall also be detailed in this plan. Measuring and record keeping activities shall be required for all non-domestic wastewater including produced water and flowback separated from the natural gas during the operational life of the natural gas well. The system will also record the truck number, license plate number and disposal location for each truck load of non-domestic wastewater transported off site.

Reporting System. The docket holder shall include in the OP the method for complying with the reporting requirements in accordance with docket conditions II.k. and II.l. in the decision section of the docket.

Preparedness Prevention and Contingency Plan (PPC Plan). The docket holder shall submit with the OP the PPC Plan that is required for Oil & Gas Wells as outlined in 25 PA Code Chapters 91.34 and 78.55.

The project does not conflict with the Comprehensive Plan and is designed to prevent substantial adverse impact on the water resources related environment, while sustaining the current and future water uses and development of the water resources of the Basin.

C. DECISION

I. Effective on the approval date for Docket No. D-2009-18-1 the project and the appurtenant facilities described in the Section A “Description” shall be added to the Natural Gas Database maintained by the DRBC.

II. The project and appurtenant facilities as described in the Section A “Description” are approved pursuant to Section 3.8 of the *Compact*, subject to the following conditions:

a. Docket approval is subject to all conditions, requirements, and limitations imposed by the PADEP in Well Drilling Permit No. 37-127-20006-00, and such conditions, requirements, and limitations are incorporated herein, unless they are less stringent than the Commission’s.

b. The lease holding, well pad site, and natural gas well, and operational records shall be available at all times for inspection by the DRBC.

c. The docket holder shall submit a Non-Point Source Pollution Control Plan (NPSPCP) for the M1 Well Site in accordance with Section 3.10.3.A.2.e, of the DRBC Water Quality Regulations to the Executive Director of the DRBC at least 45 working days prior to the scheduled initiation of any additional site clearing or construction at the well pad site. The NPSPCP and erosion and sedimentation control plan shall be designed in accordance with the more stringent of Commission and PADEP requirements. Prior to commencing any site clearing or construction work at the M1 Well Site, the docket holder shall obtain Executive Director’s written approval for the NPSPCP, as well as, any other necessary federal, state, and local authorizations. The NPSPCP shall describe erosion and sedimentation controls to be implemented at the site and shall include measures to control stormwater both during and post construction. The post-construction portion of the plan shall describe the final site conditions including a pre- and post-construction project hydrograph analysis, permanent facilities, equipment, access roads, and all sediment and erosion and stormwater control structures necessary after final site restoration has been achieved.

d. Sound practices of excavation, backfill and reseedling shall be followed at the well pad site and any associated appurtenances to minimize erosion and prevent non-point source pollutants from leaving the site. The docket holder shall abide by all state and local erosion and sediment control and storm water management control legislation.

e. **M1 WELL SITE OPERATION PLAN (OP).** As described in the Findings section of this docket, the docket holder shall submit the OP for approval in writing by the Executive Director. No activities other than those required to maintain or correct existing erosion and sedimentation controls shall be conducted at the M1 Well Site until the OP plan has been approved. The OP plan shall include the following:

- i. Pre-alteration groundwater quality survey plan.
- ii. Wastewater storage and handling details.
- iii. Wastewater disposal locations.
- iv. Measuring, Recording, and Records Maintenance System.
- v. Reporting system.
- vi. Preparedness Prevention and Contingency Plan (PPC Plan).

f. The docket holder shall demonstrate to the satisfaction of the Commission that all surface waters that are withdrawn for the purposes of hydraulic fracturing this well including, but not limited to flow-back fluids, produced brines, and drilling fluids have been treated and disposed of in accordance with applicable state and federal law.

g. No unused water withdrawn from the source approved for use at this well site, fresh or otherwise shall be discharged to waters of the DRB without the written approval of the DRBC and the appropriate state agency. All domestic and non-domestic wastewaters shall be treated at an approved treatment and discharge facility as provided for in the OP in Condition II.e. above.

h. Nothing herein shall be construed to exempt the docket holder from obtaining all necessary permits and/or approvals from other State, Federal or local government agencies having jurisdiction over this project or activities conducted under this project.

i. Upon completion of construction of the approved project, the docket holder shall submit a statement to the DRBC, signed by the docket holder's engineer or other responsible agent, advising the Commission that the construction has been completed in compliance with the approved plans, giving the final construction cost of the approved project and the date the project is placed in operation.

j. This docket approval shall expire three years from date below unless prior thereto the docket holder has commenced operation of the subject project or has expended substantial funds (in relation to the cost of the project) in reliance upon this docket approval.

k. The project natural gas well hydraulic fracturing volume and flow-back discharge volume shall be metered with an automatic continuous recording device

or equivalent that measures to within 5 percent of actual flow. An exception to the 5 percent performance standard, but no greater than 10 percent, may be granted if maintenance of the 5 percent performance is not technically feasible or economically practicable. A record of hydraulic fracturing stimulation volume and flow-back discharge volume from the project natural gas well shall be maintained, and monthly totals shall be reported to the DRBC after completion of natural gas well stimulation activities and shall be available at any time to the Commission if requested by the Executive Director.

l. The volume of all non-domestic wastewaters removed from the M1 Well Site shall be recorded and maintained and monthly totals shall be reported to the DRBC in accordance with the approved OP.

m. The docket holder shall implement to the satisfaction of the Commission, the continuous program to encourage water conservation in all types of use within the facilities served by this docket approval. This includes the reuse and recycling of flow-back waters to the greatest extent possible at the site. The docket holder will report to the Commission on the actions taken pursuant to this program and the impact of those actions as requested by the Commission.

n. No brines, flowback, produced waters or any other waste shall be used for any well, well pad site, or lease area not contained within this docket unless approved in writing by the Executive Director.

o. A complete application for the renewal of this docket, or a notice of intent to cease the operations (withdrawal, discharge, etc.) approved by this docket by the expiration date, must be submitted to the DRBC at least 12 months prior to the expiration date below (unless permission has been granted by the DRBC for submission at a later date), using the appropriate DRBC application form. In the event that a timely and complete application for renewal has been submitted and the DRBC is unable, through no fault of the docket holder, to reissue the docket before the expiration date below, the terms and conditions of this docket will remain fully effective and enforceable against the docket holder pending the grant or denial of the application for docket approval.

p. The issuance of this docket approval shall not create any private or proprietary rights in the water of the Basin, and the Commission reserves the rights to amend, alter or rescind any actions taken hereunder in order to insure the proper control, use and management of the water resources of the Basin.

q. The docket holder shall report to the Commission Project Review Section Supervisor any violation of the docket conditions within 48-hours of the occurrence or upon the docket holder becoming aware of the violation. In addition, the docket holder shall report in writing any violations of the approved operations plan or any other docket conditions to the DRBC Project Review Section Supervisor within three days of reporting the incident. The docket holder shall also provide a written explanation of the causes of the violation within 30 days of the violation and shall set forth the

action(s) the docket holder has taken to correct the violation and protect against a future violation.

r. If the monitoring required herein, or any other data or information demonstrates that the operation of this project significantly affects or interferes with any designated uses of ground or surface water, or if the docket holder receives a complaint regarding this project, the docket holder shall immediately notify the Executive Director of any complaints and unless excused by the Executive Director, shall investigate such complaints. The docket holder shall direct phone call notifications of complaints involving water resources to the DRBC Project Review Section at 609-883-9500, extension 216. Oral notification must always be followed up in writing directed to the Executive Director. In addition, the docket holder shall provide written notification to all potentially impacted users of wells or surface water users of the docket holder's responsibilities under this condition. Any ground or surface water user which is substantially adversely affected, rendered dry or otherwise diminished as a result of the docket holder's project withdrawal, shall be repaired, replaced or otherwise mitigated at the expense of the docket holder. A report of investigation and/or mitigation plan prepared by a hydrologist shall be submitted to the Executive Director as soon as practicable or within the time frame directed by the Executive Director. The Executive Director shall make the final determination regarding the validity of such complaints, the scope or sufficiency of such investigations, and the extent of appropriate mitigation measures, if required.

s. The Executive Director may modify or suspend this approval or any condition thereof, or require mitigating measures pending additional review, if in the Executive Director's judgment such modification or suspension is required to protect the water resources of the Basin.

t. For the duration of any drought emergency declared by either Pennsylvania or the Commission, water service or use by the docket holder pursuant to this approval shall be subject to the prohibition of those nonessential uses specified by the Governor of Pennsylvania, the Pennsylvania Emergency Management Council, PADEP, or the Commonwealth Drought Coordinator to the extent that they may be applicable, and to any other emergency resolutions or orders adopted hereafter by the Commission.

u. All non-domestic wastewaters including, but not limited to, brines, flow-back water, produced waters, etc. must be temporarily stored on-site in steel, water-tight tanks at a minimum unless the docket holder has received written approval from the Executive Director to use an alternative method of storage. All wastewaters will be removed from the site in accordance with the approved OP.

v. The Commission has determined that the review of the reports and requests for modifications and approvals developed under the above docket and any amendments or changes thereto will continue to cause the Commission to expend exceptional efforts and costs. As such, Commission staff will continue to maintain a record of all time and expenses associated with the post-docket approval reviews of the project and associated deliverables. A fee in the amount of 100% of these costs will be

assessed on a quarterly basis. In the event of a docket amendment or renewal, the larger of actual project review costs or the calculated project review fee will be charged.

w. The docket holder and any other person aggrieved by a reviewable action or decision taken by the Executive Director or Commission pursuant to this docket may seek an administrative hearing pursuant to Articles 5 and 6 of the Commission's *Rules of Practice and Procedure*, and after exhausting all administrative remedies may seek judicial review pursuant to Article 6, section 2.6.10 of the *Rules of Practice and Procedure* and section 15.1(p) of the Commission's *Compact*.

BY THE COMMISSION

APPROVAL DATE: , 2010

EXPIRATION DATE: , 2020

DRAFT

Exhibit 4

COPY

5500-FM-OG0001A Rev. 11/2007



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

| DEP USE ONLY | |
|-----------------------------------|-------------------|
| Permittee's eFACTS ID 277879 | Auth ID 830957 |
| Watershed Name Hollister Creek | Quality HQ |

WELL PERMIT

| | | | |
|--|---|--|---|
| Permittee NEWFIELD APPALACHIA PA LLC | OGO.# OGO-67425 | Permit Number 37-127-20017-00 | Date Issued 05/27/2010 |
| Address 363 N SAN HOUSTON PKWY E | | Farm Name & Well Number WOODLAND MGMT PARTNERS 1 1 | Well Serial # |
| SUITE 2020 | | Municipality Damascus | County Wayne |
| HOUSTON, TX 77060-2424 | | 7 1/2' Quadrangle Name Callicoon | Map Section # 7 |
| Phone (281) 847-6031 | Project # | Latitude 41-45-57.2000 | Longitude -75-6-33.8000 |
| Surf Elev at Site 1193 feet | Anticipated Total Depth 8350 feet | Well Type GS | Offset distances referenced to NE corner of map section. South 9393 feet West 7108 feet |

This permit covering the well operator and well location shown above is evidence of permission granted to conduct activities in accordance with the Oil and Gas Act and the Oil and Gas Conservation Law, if the well is subject to that act and any rules and regulations promulgated thereunder, subject to the conditions contained herein and in accordance with the application submitted for this permit. This permit does not convey any property rights.

This permit and the permittee's authority to conduct the activities authorized by this permit are conditioned upon operator's compliance with applicable law and regulations.

Notification must be given to the district oil and gas inspector, the surface landowner and political subdivision of the date well drilling will begin at least 24 hours prior to commencement of drilling activities.

The permittee hereby authorizes and consents to allow, without delay, employees or agents of the Department to have access to and to inspect all areas upon presentation of appropriate credentials, without advance notice or a search warrant. This includes any property, facility, operation or activity governed by the Oil and Gas Act, the Oil and Gas Conservation Law, the Coal and Gas Resource Coordination Act and other statutes applicable to oil and gas activities administered by the Department. The authorization and consent shall include consent to the Department to collect samples of wastewaters or gases, to take photographs, to perform measurements, surveys, and other tests, to inspect any monitoring equipment, to inspect the methods of operation and disposal, and to inspect and copy documents required by the Department to be maintained. The authorization and consent includes consent to the Department to examine books, papers, and records pertinent to any matter under investigation pursuant to the Oil and Gas Act or pertinent to a determination of whether the operator is in compliance with the above referenced statutes. This condition in no way limits any other powers granted to the Department under the Oil and Gas Act and other statutes, rules and regulations applicable to these activities as administered by the Department.

This permit does not relieve the operator from the obligation to comply with the Clean Streams Law and all statutes, rules and regulations administered by the Department.

Special Permit Conditions:

This permit expires 05/27/2011 unless drilling is commenced on or before that date and prosecuted with due diligence.

Regional Oil and Gas Program Manager

Stephen Watson
Oil & Gas Inspector

2 Public Square
Wilkes-Barre, PA 18711-0790

570-826-2320
Telephone

| |
|--|
| DEP USE ONLY |
| AUTH # |
| Check # <u>1064287</u> Amount \$ <u>1500</u> |

1950
 200
 50
 \$1500

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL

| | | | |
|--|---|---|----------------------------------|
| Notes | | DEP USE ONLY | |
| OGO # <u>67425</u> | Objection Date - Do not issue before: <u>5/3/10</u> | Well Permit # <u>127-20017</u> | Special Cond. <u>A B C D E F</u> |
| Bond # <u>12382</u> | Date Approved: <u>5/11/10</u> | Watershed Name: <u>HOLLISTER CREEK</u> | Designation: <u>(AO) EV</u> |
| C: <u>4/13/10</u> n: <u>5/3/10</u> s: <u>5/11/10</u> | INV: <u>5-27-10</u> | Please read instructions before you begin filling in this form. | |

| | | | | |
|--|---------------------------------|------------------------------|-----------------------------|--|
| Applicant (Operator) Name Newfield Appalachia PA LLC | DEP Client ID# 277879 | Phone 281-847-6031 | FAX 281-847-6160 | Check if new address. <input type="checkbox"/> |
| Mailing Address (Street or PO Box) 363 N. Sam Houston Pkwy E. Suite 2020 | City Houston | State TX | Zip +4 77060-2424 | Country (if not USA) |

| | | | | | |
|---|---------------------------------|----------------------|---|--|---|
| (Well) Farm Name Woodland Management Partners | Well # 1-1 | Serial # | PERMIT TYPE Check applicable. | TYPE OF WELL Check one. | APPLICATION FEE Check applicable. |
| County WAYNE | Municipality DAMASCUS | Project # (from DEP) | Application is to: <input checked="" type="checkbox"/> Drill a new well <input type="checkbox"/> Deepen a well <input type="checkbox"/> Redrill a well <input type="checkbox"/> Alter a well <input type="checkbox"/> E&S Control Module <input type="checkbox"/> Other (specify) | <input type="checkbox"/> Gas <input type="checkbox"/> Oil <input type="checkbox"/> Comb. (gas & oil) <input type="checkbox"/> Injection, recovery <input type="checkbox"/> Injection, disposal <input type="checkbox"/> Coalbed Methane <input type="checkbox"/> Gas Storage <input checked="" type="checkbox"/> Other (specify) vertical test well | <input type="checkbox"/> Marcellus Well: Non-Vertical <input type="checkbox"/> Marcellus Well: Vertical <input type="checkbox"/> Non-Marcellus Well: Non-Vertical <input checked="" type="checkbox"/> Non-Marcellus Well: Vertical <input type="checkbox"/> \$200 (Home Use Well) <input type="checkbox"/> \$500 E&S Fee <input type="checkbox"/> \$0 (Rehab orphan) <input checked="" type="checkbox"/> Vertical: Length <u>8350</u> ft. <input type="checkbox"/> Marcellus: Length _____ ft. <input type="checkbox"/> Non-Vertical: Length _____ ft. Total Application Fee \$ <u>1500</u> |

COORDINATION WITH REGULATIONS AND OTHER PERMITS

| | Yes | No | DEP USE ONLY |
|---|-------------------------------------|-------------------------------------|--------------------|
| 1. Will the well be subject to the Oil and Gas Conservation Law? If "No," go to 2). | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Date Stamps/Notes |
| a. If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Auth <u>830957</u> |
| b. Does the location fall within an area covered by a spacing order? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Site <u>73335</u> |
| 2. Will the well penetrate a workable coal seam? If "No," include justification and supporting documentation. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Cint <u>277879</u> |
| 3. If the well will penetrate a workable coal seam, and the well is a "non-conservation" gas well, does the location comply with the distance requirements of Section 7 of the Coal and Gas Resource Coordination Act? (At least 1,000 feet from all existing wells). | <input type="checkbox"/> | <input type="checkbox"/> | APS <u>717958</u> |
| a. If "No," is the required exception request attached? (Check here if re-working an existing well: <input type="checkbox"/> N/A) | <input type="checkbox"/> | <input type="checkbox"/> | Acct <u>676721</u> |
| 4. Will the well be drilled at a location where the coal has been removed? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | PF <u>729777</u> |
| 5. Will the well be drilled through an active (operating or projected) coalmine, or within 1,000 feet of the boundary? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | SF <u>101251</u> |
| a. If "Yes," print the names of: Mine: _____ Operator: _____ | | | |
| 6. Will the well penetrate or be within 2,000 feet of an active gas storage reservoir boundary? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. If Yes, print the names of: Storage Field: _____ Operator: _____ | | | |
| 7. Is the proposed well location within the permitted area of a landfill? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 8. Will the well site be within 100 feet (measured horizontally) of a stream, spring or body of water identified on the most current 7 1/2' topographic map? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. If "Yes," is a request for a waiver (form 5500-FM-OG0057), and E&S control plan attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| 9. Will the well site be within 100 feet of a wetland or in a wetland? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. Is the well site within 100 feet of a wetland greater than one acre in size? | <input type="checkbox"/> | <input type="checkbox"/> | |
| If yes, is a waiver request (form 5500-FM-OG0057) and E&S control plan attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| 10. Will the well be drilled within 200 feet (horizontally) from any existing building or an existing water supply? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. If "Yes," is written consent from the owner attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| b. If written consent is not attached, is a variance request (form 5500-FM-OG0058) attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| 11. Will the well be located where it may impact a public resource as outlined in the "Coordination of a Well Location with Public Resources" form 5500-PM-OG0076? If yes, attach a completed copy of the form. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 12. Is the well site in a Special Protection High Quality (HQ) or Exceptional Value (EV) watershed? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |
| 13. Is this well part of a development where you need an Earth Disturbance Permit for Oil and Gas Activities disturbing more than 5 acres? If yes, attach a completed Erosion Sediment and Stormwater Control Module or list the number and date of the ESCGP-1 Approval. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |

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| | | | |
|--|-----------------|---|-----------------------|
| The person signing this form attests that they have the authority to submit this application on behalf of the applicant, and that the information, including all related submissions, is true and accurate to the best of their knowledge. | | | |
| Signature of Person Authorized to Submit Application <u>Donald F. Sleeth</u> | (Print or Type) | Name of Signer: DONALD F. SLEETH | Date <u>4-6-10</u> |
| Application Preparer/Contact: BETSY COLLINS | | Title: Drilling Manager | |
| Phone: 412-921-8250 | | | |



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL & GAS MANAGEMENT PROGRAM

Farm Name - Well #
Woodland Management Partners-Well #1-1
Applicant Name
Newfield Appalachia PA LLC
DEP ID#
277879
APPS #

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL
Page 2 --- Record of Notification / Written Consent

List the following: surface landowner, all landowners or water purveyors whose water supplies are within 1,000 feet of this proposed well location; gas storage operator if within 2000 feet; all coal owners and lessees of all underlying workable coal seams; operators of underground coal mines at the proposed location; and coal operators with a deep mine within 1,000 feet. Mark the boxes, "X," which show the parties' interests. Use additional forms if you need more space. You are required to notify each of these parties.

| Name: | Address: | Surface Landowner | Coal Owner | Coal Lessee | Coal Mine Operator | Gas Storage Operator | Within 1,000 feet | | | Notification | | |
|------------------------------|--|-------------------|------------|-------------|--------------------|----------------------|-------------------|----------------|--------------------|----------------|-------------------|-----------------|
| | | | | | | | Surf Owner | Water Purveyor | Coal Mine Operator | Return Receipt | Address Affidavit | Written Consent |
| Donald and Marie Hartnett | 841A Calicoon Rd. Damascus, PA 18415-3514 | | | | | | X | | | 3/25/10 | 3/29/10 | |
| Woodland Management Partners | 308 Egypt Rd. Taffon, PA 18464 | X | | | | | X | | | 3/25/10 | 4/1/10 | |
| Alfred Cimino | 124 Monroe St, Apt. 1 Archibald, PA 18403-1818 | | | | | | X | | | | | X |
| Leon N Clause, Sr. | PO Box 241 Stanhope, NJ 07874-0241 | | | | | | X | | | | | X |
| Name: | Address: | | | | | | | | | | | |
| Name: | Address: | | | | | | | | | | | |
| Name: | Address: | | | | | | | | | | | |

Optional: Signature below indicates the party's approval of the well location, and waives the 15-day objection period. Check applicable box.

| | | | |
|--|------|--|------|
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| Surface Landowner at proposed location | Date | Coal Operator within 1,000 feet of proposed location | Date |
| Surface Landowner at proposed location | Date | Gas Storage Operator within 2,000 feet | Date |

Signature below indicates written consent. Check applicable box.

Owner of: water supply, or building within 200 feet Date: 3/16/10

Address (of above):
Leon N Clause

Owner of: water supply, or building within 200 feet Date:

Address (of above):

127-20017



Farm Name - Well #
Woodland Management Partners-Well #1-1

Applicant Name
Newfield Appalachia PA LLC

DEP ID#
277879

APS #

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL
Page 2 -- Record of Notification / Written Consent

| Name: | Address: | Surface Landowner | Coal Owner | Coal Lessee | Coal Mine Operator | Gas Storage Operator | Surt Owner | Within 1,000 feet | | | Notification | | |
|------------------------------|--|-------------------|------------|-------------|--------------------|----------------------|------------|-------------------|--------------------|----------|----------------------|----------------|-------------------|
| | | | | | | | | Water Purveyor | Coal Mine Operator | Operator | Certified Mail Dates | Return Receipt | Address Affidavit |
| Donald and Marie Harneit | 841A Calicoon Rd. Damascus, PA 18415-3514 | | | | | | X | | | | 3/25/10 | 3/29/10 | |
| Woodland Management Partners | 308 Egypt Rd. Taffton, PA 18464 | X | | | | | | | | | | | X |
| Alfred Cimino | 124 Monroe St, Apt. 1 Archibald, PA 18403-1818 | | | | | | X | | | | 3/25/10 | 4/1/10 | |
| Leon N Clouse, Sr. | PO Box 241 Starbuck, NJ 07874-0241 | | | | | | X | | | | | | X |
| Name: | Address: | | | | | | | | | | | | |
| Name: | Address: | | | | | | | | | | | | |
| Name: | Address: | | | | | | | | | | | | |

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Optional: Signature below indicates the party's approval of the well location, and waives the 15-day objection period. Check applicable box.

Water Purveyor or Landowner with water supply within 1,000 ft. Date

Coal Operator, Owner, or Lessee Date

Water Purveyor or Landowner with water supply within 1,000 ft. Date

Coal Operator, Owner, or Lessee Date

Water Purveyor or Landowner with water supply within 1,000 ft. Date

Coal Operator, Owner, or Lessee Date

Water Purveyor or Landowner with water supply within 1,000 ft. Date

Coal Operator, Owner, or Lessee Date

Surface Landowner at proposed location
Date

WOODLAND MANAGEMENT PARTNERS LP 3/14/2010

Surface Landowner at proposed location
Date

WOODLAND MGT SERVICES, INC. General
Tollman, J. J. President

Signature below indicates written consent. Check applicable box.

Owner of: water supply, or building within 200 feet Date

Address (of above)

Owner of: water supply, or building within 200 feet Date

Address (of above)

127-20017



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Oil and Gas Management Program
WELL LOCATION PLAT

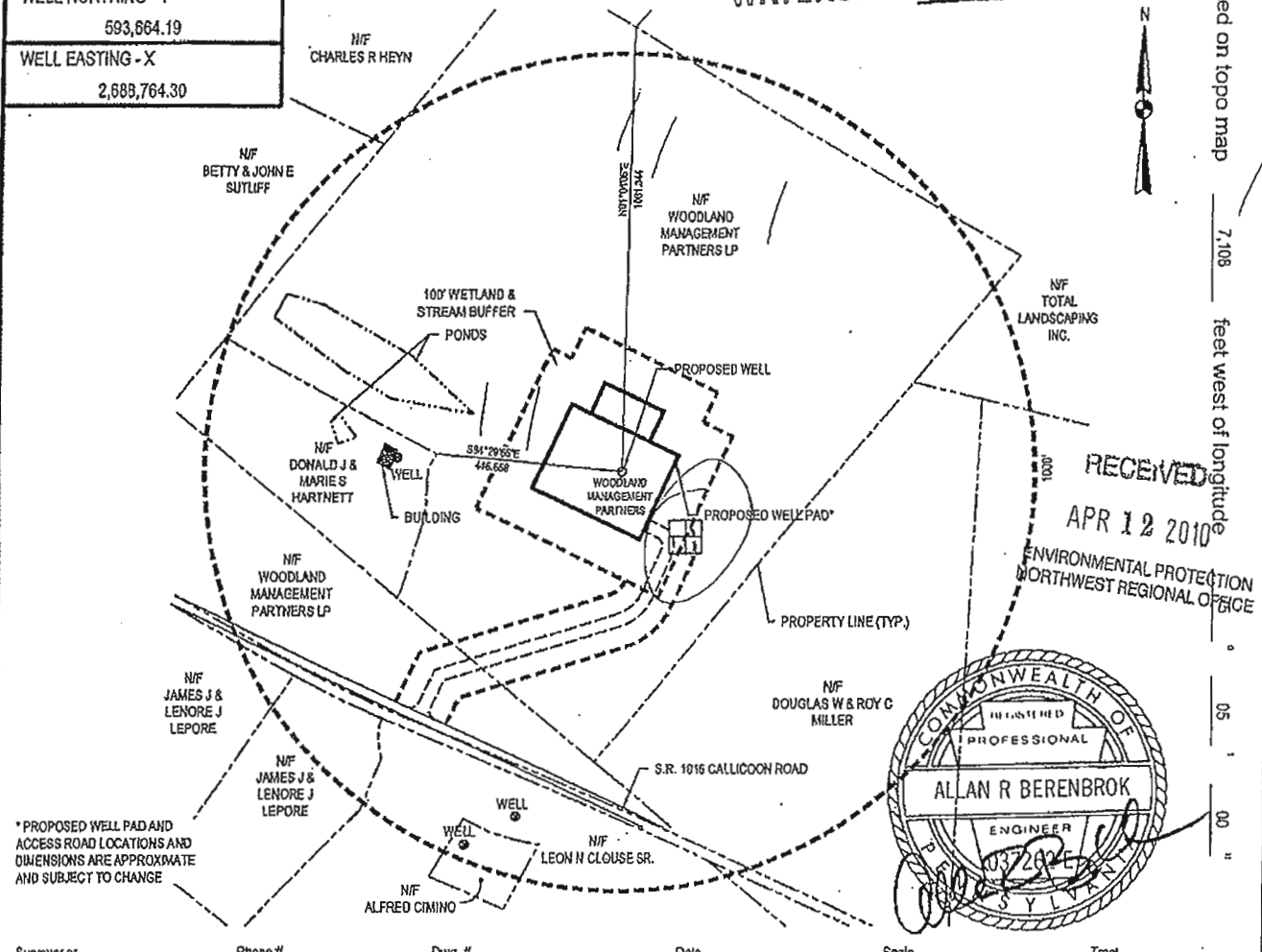
| | |
|----------------------------|------------------|
| DEP Application Tracking # | G: <i>ju</i> |
| Permit # | C: <i>5/3/10</i> |
| Project # | <i>127-20017</i> |

| |
|--|
| <input type="checkbox"/> Denotes location of well on topo map. |
| True Latitude: NORTH 41° 45' 57.2" |
| True Longitude: WEST 75° 06' 33.8" |
| WELL NORTHING - Y 593,664.19 |
| WELL EASTING - X 2,688,764.30 |

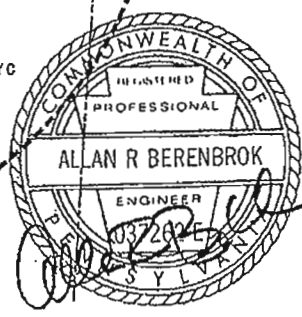
Well is located on topo map 9,393 feet south of latitude 41° 37' 30"

HQ

WATERSHED Hollister Creek



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Surveyor or Engineer: **TETRA TECH** Phone # (412) 921-8873 Dwg. # 1 Date 4/6/2010 Scale 1" = 400' Tract Acreage

| | | | | |
|--|--|--|--------------------------|-------------------------------|
| Lat. & Long Metadata Method GPS Accuracy +/- 1 ft. Datum NAD83 | | Elevation Metadata Method GPS Accuracy +/- 1 ft. Datum NAD83 | | Survey Date Jan. 2010 |
| Applicant / Well Operator Name Newfield Appalachia PA LLC | | Well (Farm) Name Woodland Management Partners | | Well # 1-1 |
| Address 363 N. Sam Houston Parkway E., Suite 2020, Houston, TX 77080 | | County - Code Wayne | Municipality Damascus | Well Type Vertical Test |
| Surface Landowner / Lessor Woodland Management Partners | | USGS 7 1/2 Quadrangle Map Name Callicoon, PA | | Map Section 7 |
| Target Formation(s) Onondaga | | Angle & Course of Deviation (Drilling) N/A | | Surface Elevation 1193 ft. |
| Anticipated Total Depth TVD 8,350 ft. | | TMD 8,350 ft. | | |
| Donald and Marie Hartnett N86d 22° 34' W 537' | | N/A | | N/A |
| Leon N. Clouse Sr. S16d 46° 23' W 862' | | N/A | | N/A |
| Alfred Cimino S22d 36° 51' W 965' | | N/A | | N/A |

RA: Marcelus Shale Project\Newfield\0279 - Newfield Well\Well Plat\Permit\Drawings\Well Pad Plat\Plat Estd\A.dwg PTT BEN.HOPPE 4/22/10 10:54:04 AM



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

| DEP USE ONLY | |
|-----------------------------------|-------------------|
| Permittee's eFACTS ID 277879 | Auth ID 830967 |
| Watershed Name Hollister Creek | Quality HQ |

WELL PERMIT

| | | | |
|---|--------------------------------------|---|--|
| Permittee NEWFIELD APPALACHIA PA LLC | OGO.# OGO-67425 | Permit Number 37-127-20017-00 | Date Issued 05/27/2010 |
| Address 363 N SAN HOUSTON PKWY E | | Farm Name & Well Number WOODLAND MGMT PARTNERS 1 1 | Well Serial # |
| SUITE 2020 | | Municipality Damascus | County Wayne |
| HOUSTON, TX 77060-2424 | | 7 1/2' Quadrangle Name Callicoon | Map Section # 7 |
| Phone (281) 847-6031 | Project # | Latitude 41-45-57.2000 | Longitude -75-6-33.8000 |
| Surf Elev at Site 1193 feet | Anticipated Total Depth 8350 feet | Well Type GS | Offset distances referenced to NE corner of map section. South 9393 feet West 7108 feet |

This permit covering the well operator and well location shown above is evidence of permission granted to conduct activities in accordance with the Oil and Gas Act and the Oil and Gas Conservation Law, if the well is subject to that act and any rules and regulations promulgated thereunder, subject to the conditions contained herein and in accordance with the application submitted for this permit. This permit does not convey any property rights.

This permit and the permittee's authority to conduct the activities authorized by this permit are conditioned upon operator's compliance with applicable law and regulations.

Notification must be given to the district oil and gas inspector, the surface landowner and political subdivision of the date well drilling will begin at least 24 hours prior to commencement of drilling activities.

The permittee hereby authorizes and consents to allow, without delay, employees or agents of the Department to have access to and to inspect all areas upon presentation of appropriate credentials, without advance notice or a search warrant. This includes any property, facility, operation or activity governed by the Oil and Gas Act, the Oil and Gas Conservation Law, the Coal and Gas Resource Coordination Act and other statutes applicable to oil and gas activities administered by the Department. The authorization and consent shall include consent to the Department to collect samples of wastewaters or gases, to take photographs, to perform measurements, surveys, and other tests, to inspect any monitoring equipment, to inspect the methods of operation and disposal, and to inspect and copy documents required by the Department to be maintained. The authorization and consent includes consent to the Department to examine books, papers, and records pertinent to any matter under investigation pursuant to the Oil and Gas Act or pertinent to a determination of whether the operator is in compliance with the above referenced statutes. This condition in no way limits any other powers granted to the Department under the Oil and Gas Act and other statutes, rules and regulations applicable to these activities as administered by the Department.

This permit does not relieve the operator from the obligation to comply with the Clean Streams Law and all statutes, rules and regulations administered by the Department.

Special Permit Conditions:

This permit expires 05/27/2011 unless drilling is commenced on or before that date and prosecuted with due diligence.

S. Craig John

Regional Oil and Gas Program Manager

Stephen Watson
Oil & Gas Inspector

2 Public Square
Wilkes-Barre, PA 18711-0790

570-826-2320
Telephone



pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL & GAS MANAGEMENT PROGRAM

| | |
|--------------|---------|
| DEP USE ONLY | |
| AUTH # | CNC |
| Check # | 1064287 |
| Amount \$ | 1500 |

1950
200
50
\$1500

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL

| | | | |
|--------------|-----------|---------------------------------------|---------------------------------|
| Notes | | DEP USE ONLY | |
| OGO # | 67425 | Objection Date - Do not issue before: | Well Permit # |
| Bond # | 12382 | 5/3/10 | 127-20017 |
| C: 4/13/10 | G: 5/3/10 | Date Approved: | Special Cond. A B C D E F |
| INV: 5-21-10 | 5/11/10 | Roll | Watershed Name: Hollister Creek |
| | | | Designation: (HQ) EV |

Please read instructions before you begin filling in this form.

| | | | | |
|---|--------------------------|-----------------------|----------------------|--|
| Applicant (Operator) Name Newfield Appalachia PA LLC | DEP Client ID# 277879 | Phone 281-847-6031 | FAX 281-847-6160 | Check if new address. <input type="checkbox"/> |
| Mailing Address (Street or PO Box) 363 N. Sam Houston Pkwy E. Suite 2020 | City Houston | State TX | Zip +4 77060-2424 | Country (if not USA) |

| | | | | | |
|--|--------------------------|----------------------|---|---|--|
| (Well) Farm Name Woodland Management Partners | Well # 1-1 | Serial # | PERMIT TYPE Check applicable. | TYPE OF WELL Check one. | APPLICATION FEE Check applicable. |
| County WAYNE | Municipality DAMASCUS | Project # (from DEP) | Application is to: <input checked="" type="checkbox"/> Drill a new well <input type="checkbox"/> Deepen a well <input type="checkbox"/> Redrill a well <input type="checkbox"/> Alter a well <input type="checkbox"/> E&S Control Module <input type="checkbox"/> Other (specify) | <input type="checkbox"/> Gas <input type="checkbox"/> Oil <input type="checkbox"/> Comb. (gas & oil) <input type="checkbox"/> Injection, recovery <input type="checkbox"/> Injection, disposal <input type="checkbox"/> Coalbed Methane <input type="checkbox"/> Gas Storage <input checked="" type="checkbox"/> Other (specify) vertical test well | <input type="checkbox"/> Marcellus Well: Non-Vertical <input type="checkbox"/> Marcellus Well: Vertical <input type="checkbox"/> Non-Marcellus Well: Non-Vertical <input checked="" type="checkbox"/> Non-Marcellus Well: Vertical <input type="checkbox"/> \$200 (Home Use Well) <input type="checkbox"/> \$500 E&S Fee <input type="checkbox"/> \$ 0 (Rehab orphan) <input checked="" type="checkbox"/> Vertical: Length 8350 ft. <input type="checkbox"/> Marcellus: Length _____ ft. <input type="checkbox"/> Non-Vertical: Length _____ ft. Total Application Fee \$ 1500 |

| COORDINATION WITH REGULATIONS AND OTHER PERMITS | Yes | No | DEP USE ONLY |
|---|-------------------------------------|-------------------------------------|-------------------|
| 1. Will the well be subject to the Oil and Gas Conservation Law? If "No," go to 2). | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Date Stamps/Notes |
| a. If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Auth 830957 |
| b. Does the location fall within an area covered by a spacing order? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Site 73335 |
| 2. Will the well penetrate a workable coal seam? If "No," include justification and supporting documentation. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Cmt 271879 |
| 3. If the well will penetrate a workable coal seam, and the well is a "non-conservation" gas well, does the location comply with the distance requirements of Section 7 of the Coal and Gas Resource Coordination Act? (At least 1,000 feet from all existing wells). | <input type="checkbox"/> | <input type="checkbox"/> | APS 71958 |
| a. If "No," is the required exception request attached? (Check here if re-working an existing well: <input type="checkbox"/> N/A) | <input type="checkbox"/> | <input type="checkbox"/> | Acct 676721 |
| 4. Will the well be drilled at a location where the coal has been removed? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | PF 729777 |
| 5. Will the well be drilled through an active (operating or projected) coalmine, or within 1,000 feet of the boundary? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | SF 101201 |
| a. If "Yes," print the names of: Mine: _____ Operator: _____ | | | |
| 6. Will the well penetrate or be within 2,000 feet of an active gas storage reservoir boundary? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. If Yes, print the names of: Storage Field: _____ Operator: _____ | | | |
| 7. Is the proposed well location within the permitted area of a landfill? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 8. Will the well site be within 100 feet (measured horizontally) of a stream, spring or body of water identified on the most current 7 1/2' topographic map? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. If "Yes," is a request for a waiver (form 5500-FM-OG0057), and E&S control plan attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| 9. Will the well site be within 100 feet of a wetland or in a wetland? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. Is the well site within 100 feet of a wetland greater than one acre in size? | <input type="checkbox"/> | <input type="checkbox"/> | |
| If yes, is a waiver request (form 5500-FM-OG0057) and E&S control plan attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| 10. Will the well be drilled within 200 feet (horizontally) from any existing building or an existing water supply? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. If "Yes," is written consent from the owner attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| b. If written consent is not attached, is a variance request (form 5500-FM-OG0058) attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| 11. Will the well be located where it may impact a public resource as outlined in the "Coordination of a Well Location with Public Resources" form 5500-PM-OG0078? If yes, attach a completed copy of the form. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 12. Is the well site in a Special Protection High Quality (HQ) or Exceptional Value (EV) watershed? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |
| 13. Is this well part of a development where you need an Earth Disturbance Permit for Oil and Gas Activities disturbing more than 5 acres? If yes, attach a completed Erosion Sediment and Stormwater Control Module or list the number and date of the ESCGP-1 Approval. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |

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| | | | |
|---|--|----------------------------------|---------------------|
| Signature of Applicant | The person signing this form attests that they have the authority to submit this application on behalf of the applicant, and that the information, including all related submissions, is true and accurate to the best of their knowledge. | | |
| Signature of Person Authorized to Submit Application <i>Donald F. Sleeth</i> | (Print or Type) | Name of Signer: DONALD F. SLEETH | Date 4-6-10 |
| Application Preparer/Contact: BETSY COLLINS | | Title: Drilling Manager | Phone: 412-921-8250 |



| | |
|--|-------------------|
| Farm Name - Well # Woodland Management Partners-Well #1-1 | DEP ID# 277879 |
| Applicant Name Newfield Appalachia PA LLC | APS # |
| | |

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL
Page 2 --- Record of Notification / Written Consent

| Name: | Address: | Surface Landowner | Coal Owner | Coal Lessee | Coal Mine Operator | Gas Storage Operator | Within 1,000 feet | | | Notification | | |
|------------------------------|--|-------------------|------------|-------------|--------------------|----------------------|-------------------|----------------|--------------------|----------------------|----------------------------------|-----------------|
| | | | | | | | Surf Owner | Water Purveyor | Coal Mine Operator | Certified Mail Dates | Note the means and attach proof. | Written Consent |
| | | | | | | | | | Sent | Return Receipt | Address Affidavit | Date |
| Donald and Marie Hartnett | 841A Calicoon Rd. Damascus, PA 18415-3514 | | | | | | | X | 3/25/10 | 3/29/10 | | |
| Woodland Management Partners | 308 Egypt Rd. Tarton, PA 18464 | X | | | | | | | | | | X |
| Alfred Cimino | 124 Monroe St, Apt. 1 Archibald, PA 18403-1818 | | | | | | | X | 3/25/10 | 4/1/10 | | |
| Leon N Clouse, Sr. | PO Box 241 Stanhope, NJ 07874-0241 | | | | | | | X | | | | X |
| Name: | Address: | | | | | | | | | | | |
| Name: | Address: | | | | | | | | | | | |
| Name: | Address: | | | | | | | | | | | |

| | |
|--|------|
| Optional: Signature below indicates the party's approval of the well location, and waives the 15-day objection period. Check applicable box. | |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date |
| Surface Landowner at proposed location | Date |
| Surface Landowner at proposed location | Date |

| | |
|--|------|
| Signature below indicates written consent. Check applicable box. | |
| Owner of: <input checked="" type="checkbox"/> water supply, or <input type="checkbox"/> building within 200 feet | Date |
| Address (of above) | Date |
| Owner of: <input type="checkbox"/> water supply, or <input type="checkbox"/> building within 200 feet | Date |
| Address (of above) | Date |

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127-20017

Leon N Clouse

3/6/10



Farm Name - Well #
Woodland Management Partners-Well #1-1

Applicant Name
Newfield Appalachia PA LLC

DEP ID#
277879

APPS #

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL
Page 2 --- Record of Notification / Written Consent

| Name | Address | Surface Landowner | Coal Owner | Coal Lessee | Coal Mine Operator | Gas Storage Operator | Within 1,000 feet | | | Notification | | |
|------------------------------|--|-------------------|------------|-------------|--------------------|----------------------|-----------------------|----------------|--------------------|----------------------|----------------|-------------------|
| | | | | | | | Surf Owner With Water | Water Purveyor | Coal Mine Operator | Certified Mail Dates | Return Receipt | Address Affidavit |
| Donald and Marie Hartnett | 841A Calicoon Rd. Damasous, PA 18415-3514 | | | | | | X | | | 3/25/10 | 3/29/10 | |
| Woodland Management Partners | 308 Egypt Rd. Tatton, PA 18464 | X | | | | | X | | | 3/25/10 | 4/1/10 | X |
| Alfred Cimino | 124 Monroe St, Apt. 1 Archibald, PA 18403-1818 | | | | | | X | | | | | X |
| Leon N Clouse, Sr. | PO Box 241 Stanhope, NJ 07874-0241 | | | | | | X | | | | | X |
| Name: | Address: | | | | | | | | | | | |
| Name: | Address: | | | | | | | | | | | |
| Name: | Address: | | | | | | | | | | | |

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Optional: Signature below indicates the party's approval of the well location, and waives the 15-day objection period. Check applicable box.

| | | | |
|--|------------------|--|------|
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| Surface Landowner at proposed location WOODLAND MANAGEMENT PARTNERS LP | Date 3/4/2010 | Coal Operator within 1,000 feet of proposed location | Date |
| Surface Landowner at proposed location WOODLAND MANAGEMENT PARTNERS LP | Date | Gas Storage Operator within 2,000 feet | Date |

Signature below indicates written consent. Check applicable box.

| | |
|---|------|
| Owner of: <input type="checkbox"/> water supply, or <input type="checkbox"/> building within 200 feet | Date |
| Address (of above) | |
| Owner of: <input type="checkbox"/> water supply, or <input type="checkbox"/> building within 200 feet | Date |
| Address (of above) | |

Woodland Management Partners LP General
Woodland Management Partners LP
President

127-20017



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Oil and Gas Management Program
WELL LOCATION PLAT

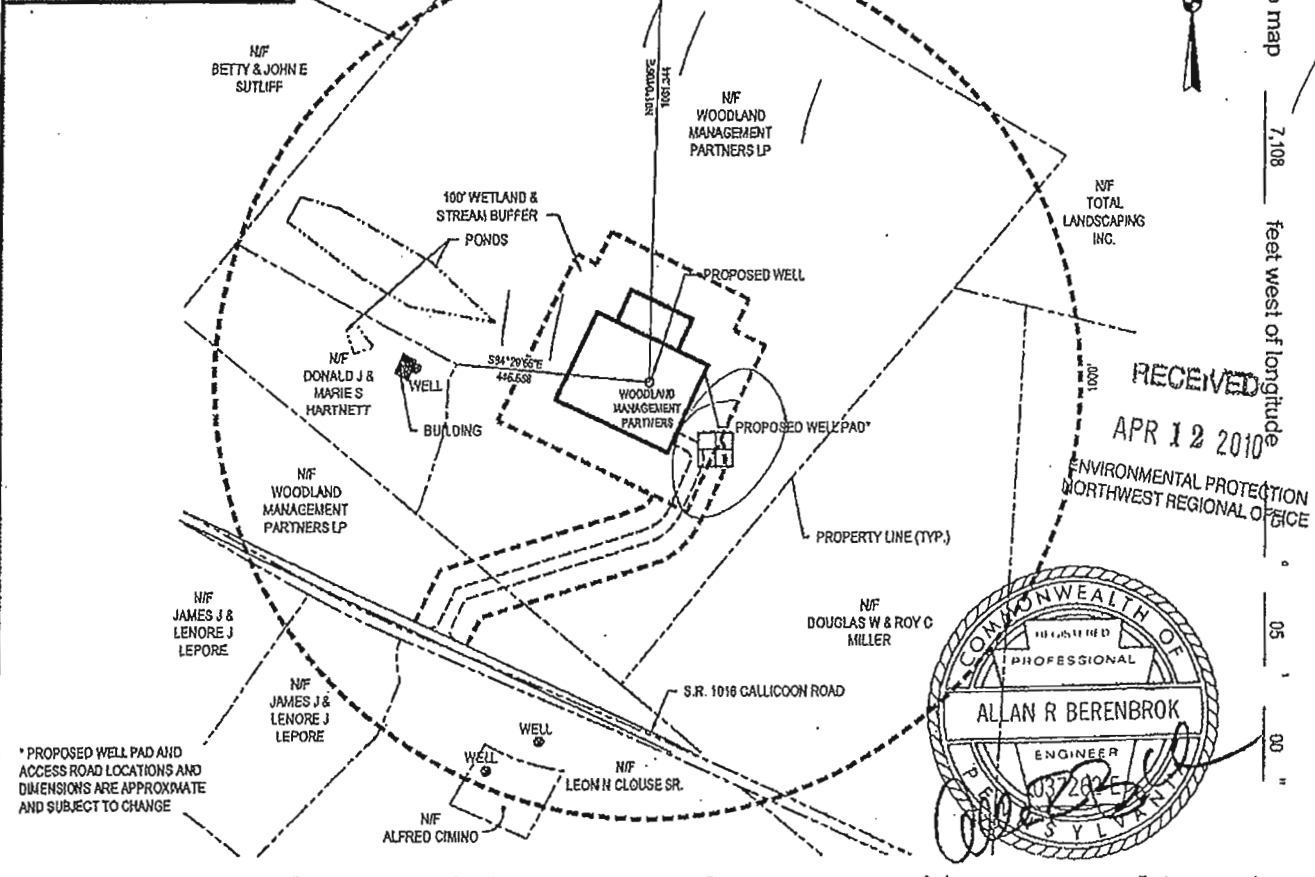
| | |
|----------------------------|------------------|
| DEP Application Tracking # | G: <i>ju</i> |
| Permit # | <i>5/3/10</i> |
| Project # | <i>127-20017</i> |

| |
|--|
| <input type="checkbox"/> Denotes location of well on topo map. |
| True Latitude: NORTH 41° 45' 57.2" |
| True Longitude: WEST 75° 06' 33.8" |
| WELL NORTHING - Y 593,664.19 |
| WELL EASTING - X 2,688,764.30 |

Well is located on topo map 9,393 feet south of latitude 41° 37' 30"

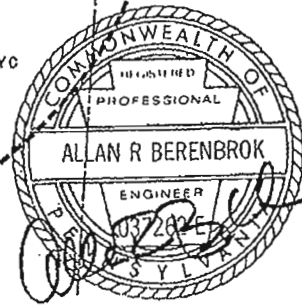
HQ

WATERSHED HOLLISTER CREEK



Well is located on topo map 7,108 feet west of longitude

RECEIVED
APR 12 2010
ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE



Surveyor or Engineer: **TETRA TECH** Phone #: **(412) 921-8873** Dwg. #: **1** Date: **4/6/2010** Scale: **1" = 400'** Tract Acreage: **0.05**

| | | |
|---|---|--|
| Lat & Long Metadata Method GPS Accuracy +/- 1 ft. Datum NAD83 | Elevation Metadata Method GPS Accuracy +/- 1 ft. Datum NAD83 | Survey Date Jan. 2010 |
| Applicant / Well Operator Name Newfield Appalachia PA LLC | Well (Farm) Name Woodland Management Partners | Well # 1-1 |
| Address 363 N. Sam Houston Parkway E., Suite 2020, Houston, TX 77060 | County - Code Wayne | Municipality Damascus |
| Surface Landowner / Lessor Woodland Management Partners | USGS 71/2 Quadrangle Map Name Callicoon, PA | Map Section 7 |
| Target Formation(s) Onondaga | Angle & Course of Deviation (Drilling) N/A | Anticipated Total Depth TVD 8,350 ft. |
| Donald and Marie Hartnett | N86d 22' 34"W 537' | N/A |
| Leon N. Clouse Sr. | S16d 46' 23"W 862' | N/A |
| Alfred Cimino | S22d 36' 51"W 965' | N/A |
| | | N/A |

R:\Hazardous State Projects\Newfield\Plat Permits\Permit Drawings\WAP Well Pad Plat Exhibit A.dwg PRT BERENBROK 4/12/2010 10:54:04 AM

PERMIT NO.

04043824

ORGANIZATION

046

DATE ISSUED

051010

PERMIT FEES

25.00

ACCOUNT NO.

COUNTY

53

TOWNSHIP/BORO

206



HIGHWAY OCCUPANCY PERMIT

PERMITTEE

WOODLAND MANAGEMENT PARTNERS LP

ADDRESS

308 EGYPT ROAD

POST OFFICE

TAFTON

PA

ZIP CODE

18454-

COUNTY

WAYNE

TOWNSHIP/BORO

DAMASCUS

BOND/AGREEMENT NUMBER

DESCRIPTION

512

1

STATE ROUTE NO.

1016

SEGMENT(S)

0090 0090

OFFSET TO OFFSET

0470 0470

ALL WORK UNDER THIS PERMIT MAY BE STARTED ON

05/10/10

AND SHALL BE COMPLETED ON OR BEFORE

05/10/11

Immediately upon completion of the work, Permittee shall notify the permit office where application was made. Subject to all the conditions, restrictions, and regulations prescribed by the Pennsylvania Department of Transportation, (see in particular 67 Pa. Code, Chapter 203/212, 441 and 459) and subject to the plans, special conditions, or restrictions herein set forth or attached hereto. This permit shall be located at the work site and shall be available for inspection by any police officer or department representative.

DESCRIPTION

2

STATE ROUTE NO.

SEGMENT(S)

OFFSET TO OFFSET

DESCRIPTION

3

STATE ROUTE NO.

SEGMENT(S)

OFFSET TO OFFSET

TOWNSHIP/BORO

4

DESCRIPTION

STATE ROUTE NO.

SEGMENT(S)

OFFSET TO OFFSET

DESCRIPTION OF WORK

INSTALL MINIMUM USE DRIVEWAY WITH DRAINAGE FACILITIES AT SR 1016 SEG 0090 OFFSET 0470 TO SEG 0090 OFFSET 0470 THIS PERMIT AUTHORIZES WORK ONLY IN DEPARTMENT HIGHWAY RIGHT OF WAY. IT IS THE PERMITTEE'S RESPONSIBILITY TO KEEP VEGETATION TRIMMED IN ORDER TO MAINTAIN MINIMUM SIGHT DISTANCE. NO OBJECTS MAY BE PLACED WITHIN THE LINE OF SIGHT. SHOULDERS MUST BE RESTORED IN ACCORDANCE WITH APPROPRIATE SECTION OF PUB. 408 AND ROADWAY CONSTRUCTION STANDARD RC-25. SURFACE DRAINAGE MAY NOT BE DIRECTED ONTO STATE HIGHWAY RIGHT OF WAY. PERMITTEE MUST MAINTAIN ACCESS FROM THE PAVEMENT EDGE TO AT LEAST 20 FEET OUTSIDE THE HIGHWAY RIGHT OF WAY. ALL DISTURBED AREAS OUTSIDE THE PAVEMENT OR SHOULDER SHALL BE RESTORED TO A CONDITION AT LEAST EQUAL TO THAT WHICH EXISTED BEFORE THE START OF WORK. MINIMUM WORK ZONE TRAFFIC CONTROL TO BE IN ACCORDANCE WITH PUB. 213, FIGURE(S): 5, 7, & 10A. SEE PUB 212 FOR ADDITIONAL DETAILS. DRAINAGE INSTALLED BY THIS PERMIT IS THE RESPONSIBILITY OF THE PERMITTEE TO CONTINUALLY MAINTAIN OR REPLACE. DEPARTMENT MUST BE NOTIFIED IN WRITING UPON COMPLETION OF WORK.

THIS PERMIT IS NOT VALID UNTIL SIGNED BY THE DISTRICT ENGINEER OR HIS AUTHORIZED REPRESENTATIVE

Acknowledgement of Completion

Permitted work has been completed.

Date _____ By _____

Allen D. Biehler
ALLEN D. BIEHLER, P.E.
5/13/10

Secretary of Transportation

GEORGE ROBERTS, P.E., D.E.

District Executive



APPLICATION FOR MINIMUM USE DRIVEWAY
 A Minimum Use Driveway Is A Residential Or Other Driveway Which Is
 Expected To Be Used By Not More Than 25 Vehicles Per Day (i.e. 50 A.D.T)

APPL. NO. **075293**

SEE PUBLICATION 312 GUIDE

| | | |
|---|--------------------------|--------------------------|
| APPLICANT/PROPERTY OWNER <i>WOODLAND MANAGEMENT PARTNERS, LP</i> | | |
| ADDRESS <i>308 Egypt Road</i> | | |
| POST OFFICE <i>TRIFTON PA</i> | ZIP CODE <i>18464</i> | |
| PHONE <i>570-857-1072</i> | FEE <i>25.00</i> | CHECK NO. <i>5049</i> |

LOCATION OF PROPOSED DRIVEWAY

County Wayne *63*

Township/Boro Damascus *206*

Route No. S.S. 1016 (Calliegon Rd)

Name of Nearest Intersection Little Kaminuk Creek

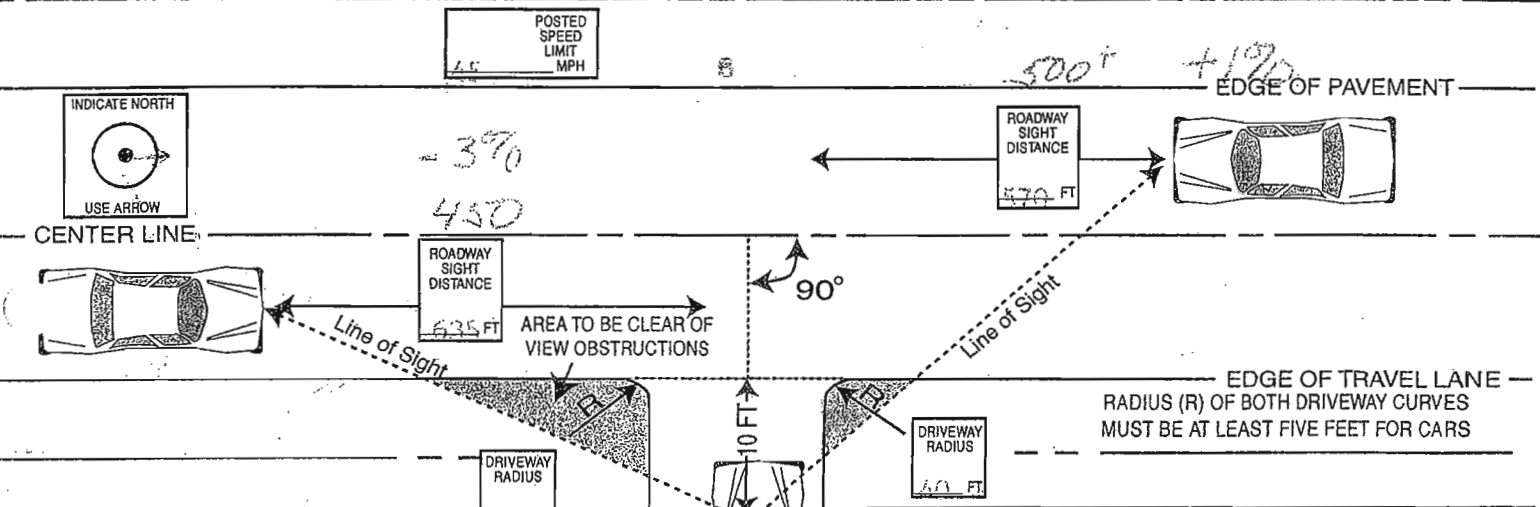
Distance to Nearest Intersection in Feet 3520 ft.

APPLICATION IS MADE TO

CONSTRUCT A NEW DRIVEWAY ALTER AN EXISTING DRIVEWAY

DATE WORK SCHEDULED TO BEGIN May 15, 2010

DATE WORK SCHEDULED TO BE COMPLETED August 31, 2010



FOR DEPARTMENT USE ONLY

324-341-342-351
357-359-366-369
388

457/34

YMM 5/10/10

FOR DEPARTMENT USE ONLY

Site Reviewed On 5/3/10 DATE(S)

Comments New Field Appalachia Gas Well Site

ROADWAY SHOULDER (Fill in appropriate line)
 SLOPE (Fill in appropriate slope)

Description 512
 S.R. 1016
 Segment 90
 Offset 470 (E)

Field Viewed By [Signature] SIGNATURE DATE

Is any portion of the property reserved for a person with a disability or a severely disabled veteran? YES NO

Under and subject to all the conditions, restrictions and regulations prescribed by the Pennsylvania Department of Transportation and the issued Permit, Form M-945P.

The applicant certifies that all statements contained herein are true and correct.

By **X** [Signature] SIGNATURE(S) 4/17/2010 DATE

ROADWAY USE AND
MAINTENANCE AGREEMENT

AND NOW THIS 21 day of June, 2010, it is agreed by and between Damascus Township, Wayne County, Pennsylvania, by and through its Board of Supervisors and New Field Explorations, a duly formed corporation with its principal place of residence at 363 Sam Houston, Houston, TX, (jointly "the Parties") to enter into this agreement regarding the use and maintenance of township roadways necessary for transportation and travel of equipment and personnel to and from oil and gas wells on various leaseholds within the Township;

WHEREAS, Damascus Township, (Hereinafter reference to as the "Township") has control and jurisdiction of various Township owned roadways with its boundaries; and

WHEREAS, the Newfield (Hereinafter referred to as the "Operator"), is the owner of certain oil and gas leaseholds in Wayne County, Pennsylvania; and

WHEREAS, the Township and Operator are desirous of entering into a formal agreement for the use of Township roadways for the purposes of providing ingress, regress and egress to various leaseholds for which excess traffic and equipment transportation is necessary for the development of said oil and gas wells on said leaseholds, and

WHEREAS, the Township and Operator are desirous of addressing the excess road maintenance costs and expenditures necessary for and incurring from construction, drilling and completion stages of gas and oil operations utilizing said Township roadways.

NOW THEREFORE, in consideration of a faithful performance of each party of mutual covenants and promises hereinafter set forth, and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged as follows:

1. The Operator agrees to identify those Township roads or portions of roads to be used by its vehicles and equipment prior to the commencement of operations.

2. After receiving from the Operator a list of such roads, the Parties agree to inspect the pertinent roadways promptly to determine the road structure, its condition and the existence of any buried utility lines, and to depict any surface characteristics. Operator will prepare a pre-use road inspection report documenting the road conditions and characteristics.
3. The Operator agrees to restore any affected roadways to a condition equal or better than the pre-use condition of said road(s) within 180 days of the conclusion of Operator's use, weather permitting; provided that Operator's liability shall be limited to only that portion of the cost of repair and restoration which exceeds normal and routine maintenance, costs, and which is caused by the Operator's vehicles and equipment.
4. In the event that the pre-use condition of any roadway requires or warrants repaving or improvements prior to use, the Operator shall be liable for such improvements only to the extent that the parties agree that such improvements would reduce damage caused by the Operator's use, and agree on ratably sharing the costs of such improvements.
5. In the event that the Township incurs additional costs associated with maintenance of said roadway as a direct result of the Operator's activities (including those of their agents, employees and contractors), including dust suppression needed during peak activity periods, the Township will provide prior notice of such additional maintenance needed, and if possible, obtain a cost estimate, and deliver the same to the Operator. Operator will only be liable for such maintenance costs to the extent that the parties agree that such maintenance is necessary and that the parties shall share the costs.
6. The Operator agrees to reimburse the Township for reasonable additional costs agreed upon in a reasonable and prompt period of time, but not to exceed forty-five (45) days.
7. Upon completion of all improvements called for in the final inspection report, the Operator shall submit a certification of the improvements made to the Township, and such certification shall be deemed approved unless the Township gives

written notice of objections to the certification within ten days of receipt of the certification.

8. Upon conclusion of the drilling activities anticipated by this Agreement, both parties will promptly inspect the roadways utilized and make a determination as to what, if any, improvements or maintenance need to be performed by the Operator to discharge the obligations required by this Agreement. This final report then shall be deemed to be a complete list of improvements needed to discharge this Agreement, binding upon all parties.
9. In the event that future drilling activities occur utilizing the same or part of a Township roadway(s) previously improved by virtue of this agreement, then the future contemplated activities shall cause the provisions of this agreement to resume as if said roadway(s) were being initially contemplated, with a new pre-use road inspection report, and such follow up requirements as previously herein set forth.
10. The Operator shall be given the option of having any agreed upon repair work performed by a contractor of its choice.
11. This Agreement is entered into in lieu of the Township incurring the cost and inconvenience of implementing a state compliant road bonding system and shall survive any future creation of any such system as to the Operator and remain the operative relationship between the Township and the Operator until terminated by the mutual agreement of the Township and the Operator.
12. This agreement shall be binding upon the successors and assigns of the parties hereto and shall be deemed to be a covenant running with the roads described above. This agreement shall not be transferred or assigned by the Operator without the consent in writing of the Township, which consent will not be unreasonably withheld.

IN WITNESS WHEREOF, this instrument has been executed by the undersigned the
Production Manager, this 21 day of June, 2010.

TOWNSHIP:

Damascus Township Supervisors

By: [Signature]

By: [Signature]

By: [Signature]

OPERATOR:

Newfield Exploration

(Company Name)

By: [Signature]

Company Representative



DAMASCUS TOWNSHIP, WAYNE COUNTY, PA.

ROAD INSPECTION REPORT

PRINT NAME: _____ DATE: _____

SIGN: _____ COMPANY: _____

- PRE-INSPECTION
- POST INSPECTION
- VIDEO RECORD: YES
 NO

ROAD CONDITION: _____

ROAD SURFACE: ACP \ ASBC \ CRUDE \ GRAVEL:

DRAINAGE [CENTERLINE, CULVERTS, APPROACHES]:

SIGNAGE: _____

EXISTING DUST CONTROL: YES
 NO: _____

OTHER FACTORS EFFECTING THE ROADWAY: _____

WILL THE COMPANY PROVIDE A GRADER TO MAINTAIN THE DRIVING SURFACE? YES OR NO

COMMENTS: _____

**PREPAREDNESS, PREVENTION,
AND CONTINGENCY PLAN
WAYNE COUNTY FIELD
WAYNE COUNTY, PENNSYLVANIA**

Prepared for:

NEWFIELD APPALACHIA PA LLC
363 N. Sam Houston Pkwy E., Suite 2020
Houston, TX 77060



Prepared by:

TETRA TECH NUS INC
116 N. Washington Avenue
Scranton, PA 18503



May 2010

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LIST OF APPENDICES

Appendix A Inspection Forms

Appendix B Site-Specific Figures

Figure 1 Well Field Map

Figure 2 7.5 Minute USGS Topographic Map

Figure 3 Site Plan

Appendix C Tables

Table 1 List of Materials & Wastes

Table 2 Inspection and Monitoring Activities

Table 3 Agency Notification List

Table 4 List of On-Site Emergency Response Equipment

Table 5 Chain of Command

Appendix D Reporting Form

Appendix E MSDS Sheets

1.0 DESCRIPTION OF FACILITY

1.1 DESCRIPTION OF THE INDUSTRIAL OR COMMERCIAL ACTIVITY

Newfield Appalachia PA LLC (Newfield) is a natural gas exploration company with operations planned for Wayne County, Pennsylvania. Operations will involve natural gas exploration of the Marcellus Shale formation, which will include site preparation, drilling, and well development and production activities. Wastes generated during these activities will be typical for gas drilling operations and will include drill cuttings, produced water, drilling and frac fluids, waste oil, municipal waste and trash. No hazardous waste is expected to be generated at the Newfield sites.

Newfield is currently in the exploratory phase of operations, which will require construction activities for new natural gas well pads and access roads.

This Prevention, Preparedness and Control (PPC) Plan applies to all well sites in Wayne County, Pa.

The attached map (Figure 1) in Appendix B shows the area covered under this PPC Plan. Figure 2 is the required 7.5 topographic map of the specific well site. The proposed Site Plan (Figure 3) shows the site layout, the well site boundaries, material storage areas, waste storage areas, dike drains and drainage that leads away from the well site, and the entrances and exits to the well site.

During the different stages of site preparation, construction, drilling, well development and production, the site will store various fuels, oils and chemicals on-site. A chemical and container inventory for the specific well site is located in Table 1 of Appendix C.

1.2 DESCRIPTION OF EXISTING EMERGENCY RESPONSE PLANS

This is a new facility and this plan has been prepared prior to construction of the well pad. There are no previous emergency response plans.

A separate Spill Prevention Control and Countermeasure (SPCC) Plan will be prepared for each facility meeting the requirements defined in 40 CFR§112.

1.3 MATERIAL AND WASTE INVENTORY

Information in this section is used to evaluate the prevention, containment, mitigation, cleanup, and disposal measures which would be used in the event of a spill, discharge, explosion, or fire. Oils, chemicals and other hazardous materials anticipated to be used and stored at the facility during site preparation and construction, drilling, well development and production are listed in Table 1.

MSDS's will be maintained onsite for chemicals and compounds used at the facility in accordance with the Occupational Safety and Health Administration (OSHA) worker right-to-know requirements, as appropriate.

1.4 POLLUTION INCIDENT HISTORY

Newfield has not had any reportable incidents for this facility.

1.5 IMPLEMENTATION SCHEDULE FOR PLAN ELEMENTS NOT CURRENTLY IN PLACE

All plan elements are in place.

1.6 PURPOSE AND IMPLEMENTATION OF PPC PLAN

Newfield has developed and will implement this PPC Plan for effective action to minimize and abate hazards to human health and the environment from fire, explosion, and emission or discharge of pollutants to air, soil, surface water or groundwater. This plan was prepared to satisfy the requirements set forth in 25 PA Code Section 78.

The Drilling Manager serves as the Primary Emergency Coordinator and is responsible for the preparation and implementation of the PPC Plan. The PPC Plan has been prepared and implemented in general accordance with Pennsylvania Department of Environmental Protection (PADEP) guidelines, and will be submitted to PADEP for approval at such time as the PADEP may prescribe.

This PPC Plan identifies and describes any arrangements with police departments, fire departments, hospitals, contractors, and state, county, and local emergency response teams to coordinate emergency services.

The PPC Plan lists names, addresses and phone numbers of all persons identified to act as Emergency Coordinator. One person is named as the Primary Emergency Coordinator and others are listed in the order in which they will assume responsibility as alternates. The PPC Plan also includes a list of emergency equipment at the facility, the location and a physical description of emergency equipment, and a brief outline of emergency equipment capabilities.

1.7 PLAN REVISIONS

This PPC Plan will be reviewed and amended, annually, or whenever:

- Applicable PADEP regulations are revised;
- The plan fails in an emergency;
- The list of Emergency Coordinators changes;
- The list of emergency equipment changes; and
- Construction, operation, maintenance, or other circumstances change in a manner that materially increases the potential for fires, explosions, or releases of toxic or hazardous constituents; or which changes the response necessary in an emergency.

2.0 IMPLEMENTATION OF PPC PLAN

2.1 ORGANIZATIONAL STRUCTURE OF FACILITY FOR IMPLEMENTATION

The Drilling Manager has been designated as the Primary Emergency Coordinator. The Primary Emergency Coordinator is responsible for the following:

- Coordination of spill cleanup activities;
- Notification of appropriate authorities; and
- Tank and chemical storage area inspections.

The Drilling Manager has administrative responsibility for updating, maintaining, and implementing this PPC Plan. Specifically, these responsibilities include:

- Identification of materials and wastes handled during site operation (inventory);
- Identification of potential spill sources (risk assessment);
- Establishment of spill reporting procedures;
- Coordination of the visual inspection program;
- Review of past incidents, spills, and countermeasures employed;
- Coordination and implementation of the PPC Plan goals;
- Training/educational programs and updates;
- Ensuring periodic review of the PPC Plan for adequacy and appropriateness;
- Administration and institution of appropriate changes at regular intervals;
- Review of new construction and process changes relative to the PPC Plan;
- Evaluation of PPC Plan effectiveness prior to, during and subsequent to its implementation; and
- Instituting improvements to the PPC Plan.

The Production Manager is designated as Secondary Emergency Coordinator, and, in the absence of the Drilling Manager, will assume the role of emergency coordinator for emergencies. The Secondary Emergency Coordinator will report directly to the Primary Emergency Coordinator in matters regarding this plan, and can assist with implementing the above-listed items.

2.2 LIST OF EMERGENCY COORDINATORS

As required by 25 PA Code 265.55, there will be at least one employee, either on the construction site or on call, with the responsibility for coordinating emergency response measures. The Primary and Secondary Emergency Coordinators will be thoroughly familiar with this PPC Plan, site operations and activities, the location and characteristics of materials and wastes, the location of the facility's records, and the layout of the facility. The Emergency Coordinators have the authority to commit the resources necessary to carry out the PPC Plan and for coordinating emergency response measures. In the event of a spill or release, one of the Emergency Coordinators will be immediately notified. The following individuals have been designated to act as Emergency Coordinators:

Primary Emergency Coordinator

Name: Don Sleeth
Title: Drilling Manager
Office: 281-674-2501
Cell: 281-974-0051

Secondary Emergency Coordinator

Name: Jack Cochran
Title: Production Manager
Office: 814-437-2344
Cell: 814-671-1557

2.3 DUTIES AND RESPONSIBILITIES OF THE EMERGENCY COORDINATOR

As required by 25 PA Code 265.56 and the PPC Plan Guidance Documents, whenever there is an imminent or actual emergency situation, the Emergency Coordinator or his designee must immediately:

1. Notify all facility personnel.
2. Notify appropriate state or local agencies with designated response roles and contracted emergency response companies if additional assistance is required.
3. Identify the problem. Is it a physical emergency such as a fire, explosion, or spill? Is it a natural disaster such as a flood, tornado, or other severe weather? Is it a social emergency such as a bomb threat, riot, or vandalism?

4. Assess the health or environmental hazards and how this problem or condition will affect employees or its affect on the surrounding community.
5. Take all reasonable measures to stabilize the situation. The Emergency Coordinator will take all reasonable measures to ensure that the fire, explosion, emission, or discharge does not reoccur or spread to other materials at the site. These measures can include, when appropriate, stopping operations, collecting and containing released materials or wastes, and removing or isolating containers.

Whenever there is an emission, discharge, fire, or explosion, the Emergency Coordinator or his designee must immediately attempt to identify the character, exact source, amount, and aerial extent of emitted or discharged materials. He/she may do this by observation, by review of facility records or manifests, and, if necessary, by instrumental and chemical analysis. Concurrently, the Emergency Coordinator or his designee must assess possible hazards to human health or the environment that may result from emission, discharge, fire, or explosion. This assessment must consider both direct and indirect effects of the emission, discharge, fire, or explosion.

If the Emergency Coordinator determines that the facility has had an emission, discharge, fire, or explosion which would threaten human health or the environment (beyond the limits of the site) and if evacuation of local areas may be advisable, he/she must immediately notify the applicable local authorities (police, fire, etc.); he/she must also immediately notify the PADEP by telephone at (800) 541-2050 (24-hour number), PADEP Northeast Region at (570) 826-2511 (24-hrs), the National Response Center at (800) 424-8802, Wayne County Emergency Management Agency (EMA) at (570) 253-1622, and the Pennsylvania Emergency Management Agency at (717) 651-2001, and report the following information:

- Name of the person reporting the incident;
- Name and location of the facility;
- Telephone number where the person reporting the spill can be reached;
- Date, time, and location of the incident;
- A brief description of the incident, nature of the materials involved, extent of any injuries, and possible hazards to human health or the environment;
- The estimated quantity of the materials spilled; and
- The extent of contamination of land, water, or air, if known.

If spills or discharges of a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) hazardous substance in greater than reportable quantities has occurred, the Emergency Coordinator must notify DEP at (800) 541-2050 and the National Response Center at (800) 424-8802 and report the above information. For an offsite release (spill or discharge) of a reportable quantity of a CERCLA hazardous substance or a Superfund Amendments and Reauthorization Act Extremely Hazardous Substance, the Emergency Coordinator must immediately notify the National Response Center at (800) 424-8802 and report the above information.

If a release occurs from a storage tank which enters a water supply or which threatens the water supply of downstream users, the Emergency Coordinator must immediately notify the Wayne County EMA (570) 253-1622, the Pennsylvania Emergency Management Agency at (717) 651-2001, and DEP at (800) 541-2050. If appropriate, the Emergency Coordinator may assist the Emergency Management Agencies in notifying the downstream water users. The priorities for notification will be by closest proximity to the release site.

During an emergency, the Emergency Coordinator will take all reasonable measures necessary to ensure that fire, explosion, emission, or discharge do not occur, recur, or spread to other materials at the facility. These shall include, where applicable, stopping facility operations, collecting and containing released materials, and removing or isolating containers. If the facility stops operations in response to a fire, explosion, emission, or discharge, the Emergency Coordinator must ensure that adequate monitoring is conducted for leaks, pressure buildup, gas generation, or ruptures in valves, pipes, or other equipment whenever this is appropriate.

The Emergency Coordinator will oversee and direct facility personnel in the performance of their responsibilities for addressing the emergency situation. Immediately following an emergency, the Emergency Coordinator (with PADEP approval) must provide for treating, storing, or disposing residues, contaminated soil, etc., from an emission, discharge, fire, or explosion at the construction site. The Emergency Coordinator must ensure that in the affected areas of the facility, no material incompatible with the emitted or discharged residues is processed, stored, treated, or disposed until cleanup procedures are completed and that all emergency equipment utilized in implementation of the PPC Plan is cleaned and fit for its intended use before operations are resumed. Newfield will notify PADEP and the appropriate State or local

authorities that the facility is in compliance before operations are resumed in the affected areas of the facility. Newfield will note the time, date and details of an incident that requires implementing the PPC Plan.

Within 15 days after the incident, Newfield will submit a written report on the incident to PADEP and the U.S. Environmental Protection Agency regional administrator. The report must be submitted to:

Director - Bureau of Water Quality Management
Pennsylvania Department of Environmental Protection
909 Elmerton Avenue
Harrisburg, PA 17110

Regional Administrator
U.S. Environmental Protection Agency
Region III
1650 Arch Street
Philadelphia, PA 19103

Director - PADEP Northeast Office
Pennsylvania Department of Environmental Protection
2 Public Square
Wilkes-Barre, PA 18711

The report should include the following information:

- Name, address, and telephone number of the individual filing the report;
- Name, address, and telephone number of the facility;
- Date, time, type, and location of incident;
- A brief description of the circumstances causing the incident;
- Description and estimated quantity (by weight) of materials or wastes involved;
- The extent of injuries, if any;
- An assessment of actual or potential threat to human health or the environment and assessment of contamination of land, water, or air, where applicable;
- Estimated quantity and disposition of recovered materials or wastes that resulted from the incident; and
- A description of what actions Newfield intends to take to prevent a similar occurrence in the future.

2.4 CHAIN OF COMMAND

Facility personnel must report emergency situations to the Emergency Coordinators. A Chain of Command flow chart (Table 5, Appendix C) has been developed and should be implemented during an emergency. The Emergency Response Chain of Command flow chart will be posted

next to all telephones onsite, posted in areas where potential emergency situations could arise, and placed in onsite company vehicles, as appropriate.

2.5 DISTRIBUTION OF THIS PPC PLAN

A copy of this PPC Plan and subsequent revisions will be distributed to:

- Drilling Manager (Primary Emergency Coordinator)
- Production Manager (Secondary Emergency Coordinator)

The PPC Plan will be reviewed and amended, if necessary, based on the criteria described earlier in Section 1.7.

3.0 SPILL AND LEAK PREVENTION AND RESPONSE

The site will be maintained and operated to minimize the possibility of a fire, explosion or discharge of oils, hazardous materials or their constituents to air, soil, surface water or groundwater which could threaten human health or the environment, in accordance with the requirements of 25 PA Code Section 265.31.

3.1 PRE-RELEASE PLANNING

The following sections discuss specific locations where the potential exists for accidental spills of oils and/or chemicals. The controls that are in place to minimize the potential for an uncontrolled release to the environment are also discussed. In the event that an uncontrolled spill of hazardous substances occurs, the procedures described in Section 4.0 will be followed.

To enhance spill prevention at the facility, great care will be exercised in handling oil and other materials covered in this PPC Plan. Any unusual conditions observed by any employees or contractors will be reported to one of the Emergency Response Coordinators. Management personnel whose responsibilities include involvement with the materials discussed in this document will also be familiar with this plan and the procedures recommended for spill prevention.

Spill Prevention Measures: Procedures that are to be followed to prevent and/or minimize oil spills at the Newfield facility include:

- ASTs and/or containers will be stored in secondary containment with sufficient volume;
- ASTs and regulated material containers will be visually inspected weekly for leaks;
- Special care will be taken when transferring regulated materials to prevent product loss;
- Regulated materials will be stored in a manner that minimizes the potential for contact with stormwater;
- Absorbent and spill control materials shall be maintained on-site for emergency use;

- Emergency response personnel will be familiar with procedures to follow in the case of a spill; and
- In cases where there may be leaking equipment or operations where oil or oil-related compounds are leaked, spilled, or otherwise released, containment booms or absorbent materials shall be used and equipment shall be repaired.

In the event that an uncontrolled spill of oil or a hazardous material occurs, the procedures described in Section 4.0 will be followed. Responses should be coordinated with federal, state and local agencies as appropriate.

3.2 MATERIAL COMPATIBILITY

The majority of materials received on-site in totes, drums, pails or other small containers are stored in the containers supplied by the manufacturer.

Construction materials used for the ASTs have been selected and designed to be compatible with the materials that are being stored and are typical for the natural gas industry.

3.3 INSPECTIONS AND MONITORING PROGRAM

Operating equipment will be inspected daily, and a copy of the inspection and maintenance form is included in Appendix A. Employees are responsible for detecting and reporting potential problems on the inspection and maintenance form.

Storage tank inspections will be conducted weekly and include evaluation of the following: pumps, valves, and fittings for leaks; the tank condition for evidence of corrosion; secondary containment; evidence of spilled materials; and effectiveness of housekeeping practices.

Completed inspection forms and inspection reports will be maintained in the Primary Emergency Coordinator's office. Noncompliance issues identified during the comprehensive site evaluation will be addressed in a timely manner. If additional control measures are required, implementation of the measures will generally occur within 90 days of the site evaluation. Compliance issues that require revisions to the PPC Plan (description of additional pollutant sources, measures, or controls) will be incorporated into the plan within approximately 15 days of the site evaluation.

Stormwater Management System: Stormwater inspections will include an evaluation of best management practices (BMPs), where appropriate. In accordance with the erosion and sedimentation control plan prepared for the site, erosion and sedimentation control (ESC) measures will be implemented where there is the potential for sediment or soil particles to impact stormwater quality. Repairs will be made, as necessary, following the site inspection.

Storage Tanks and Drum Storage Areas: Tanks and drum storage areas will be accessed daily. Spills or leaks that may occur will be contained by secondary containment and noted as part of routine facility operations. To enhance the daily observations, periodic inspections will be performed for the tank and drum storage areas as described in Table 2. The inspections will include observation of spill and/or leaks and observations of the condition of associated secondary containment structures. Records for the inspections will be maintained in the Primary Emergency Coordinator's office.

3.4 PREVENTIVE MAINTENANCE

Newfield will ensure that preventative maintenance of operating machinery on each construction site is performed regularly.

3.5 HOUSEKEEPING PROGRAM

The Newfield Construction Manager will be responsible for general construction site housekeeping. Specific steps taken under this program will include:

- Debris and/or sediment removal, as necessary.
- Regular refuse pickup and disposal.
- Proper filling and emptying of storage containers, tanks, and equipment to minimize spill potential.
- Periodic review of good housekeeping procedures in the employee-training program.

Once completed, the Production Manager will have overall responsibility for housekeeping at the facility. Newfield currently does not anticipate that bulk quantities of hazardous waste materials will be stored at the facility.

3.6 SECURITY

The facility is not fully fenced but is located in a remote location with limited access except via the site access road. The facility is normally manned during drilling and well development.

Flow and drain valves are locked and in the off position when in non-operational or non-standby status. The starter controls for each oil pump are locked in the off position when in non-operating or non-standby status. Master flow/drain valves are all located on the Facility and monitored by staff.

Any loading/unloading connections of facility piping is capped or blind flanged when not in service or is in standby service for an extended amount of time.

The facility has lighting sufficient for detection of spills during nighttime operations. Consideration has been given to: (a) discovery of spills occurring during hours of darkness, both by operating personnel, if present, and by non-operating personnel, and (b) prevention of spills occurring through acts of vandalism.

3.7 EXTERNAL FACTOR PLANNING

External factors are not anticipated to increase the risk of a spill or release that would impact human safety or the environment. Power outages, adverse weather conditions, or employee strikes could result in discontinuation of earth moving, drilling or well preparation activities. The Emergency Coordinator will monitor operations and initiate their orderly shutdown when necessary.

Access road conditions may be impacted by adverse weather conditions, possibly increasing the risk of a release of materials being delivered or removed. Truck drivers should report poor road conditions to the Construction or Drilling Manager. If conditions deteriorate to where they may impact safe movement of materials, the construction or Drilling Manager will review the conditions and initiate repairs or road closure as deemed necessary.

3.8 EMPLOYEE TRAINING PROGRAM

Newfield's employee training program enables employees to understand the processes and materials with which they are working, the safety and health hazards, the practices for preventing spills, and the procedures for responding properly and rapidly to spills. It also familiarizes personnel with emergency procedures.

All Newfield employees receive job specific training. Emergency Coordinators, Well Tenders, and other oil or hazardous material handling employees receive annual training on the facility's PPC and SPCC plans.

Job specific training includes preventive maintenance, inspection and monitoring activities, shut down procedures and housekeeping practices. PPC training will include spill/release recognition, initial response, initial notifications and follow-up. The training program is designed to ensure that personnel are able to respond effectively to emergencies by familiarizing them with emergency procedures, emergency equipment systems including, where applicable: procedures for using, inspecting, repairing, and replacing emergency and monitoring equipment; key parameters for automatic cut-off systems; communications and alarms systems; response to fires and explosions; site evacuation procedures; and shutdown of operations.

Annual right-to-know training for all facility employees is conducted relevant to the materials present at the facility. Employees will be given detailed instructions regarding the materials and wastes with which they are working; including safety and health hazards, handling methods, proper disposal procedures, and emergency procedures. The location of MSDS's for on-site materials will be identified to all employees.

Training records will be maintained at the facility and in the employee's personnel file.

4.0 COUNTERMEASURES

4.1 COUNTERMEASURES TO BE UNDERTAKEN BY FACILITY

The following sections present general spill response practices to be implemented at the Newfield facility, as appropriate.

4.1.1 Spill Clean-Up Procedures - General

Incidental spills should be contained and cleaned up when discovered per the employees job related training. Clean up material should be placed into a marked container and the Construction or Drilling Manager notified appropriately.

For large spills or spills of oils or hazardous materials which may reach surface water or impact the environment, the employee who first discovers the spill should contact the Emergency Coordinator. He should then work to contain and clean-up the spill.

Spill clean-up involves three steps: containment, removal, and disposal. In the event of a spill, it is very important that the material be contained to the maximum extent possible in order to minimize the effect of the spill and the cost of clean-up. **NOTE: ANY SHEEN ON A WATERBODY (STREAM, RIVER, OR WETLAND) IS A REPORTABLE RELEASE.** Once the spill is contained, the spilled material and contaminated material must be collected and physically removed from the area

4.1.2 Spill Clean-Up Procedures - Specific

The employee should do the following:

- Contain the spill to the smallest area possible using absorbent materials, earthen dikes or other diversion or containment structures. Stormwater collection structures will be either blocked or pumped.
- Block off the area to prevent traffic or employees from entering the area.
- For oils and other organic materials, apply a non-reactive sorbent material, such as Oil-Dri or Kitty Litter, to the spill.
- In the case of a spill of acids hazardous waste, check the MSDS and then neutralize with lime or soda ash if appropriate.
- If a leaking tank is involved, stop liquid flows as appropriate and dike the tank area with earth or absorbent material.

- If a leaking pail, drum or other small container is involved, place it in an over-pack container.
- Clean up spilled material and place it in a marked container.
- Work with the emergency coordinator to properly store the material and arrange for proper disposal

4.1.3 Fire or Explosion

In the case of a fire or explosion, the local fire department should be notified by calling 911. Employees may attempt to extinguish fires using handheld fire extinguishers based upon their job training.

The Emergency Coordinator will determine if evacuation per section 4.4 is required.

4.2 COUNTERMEASURES TO BE UNDERTAKEN BY CONTRACTORS

The following list shows area emergency response contractors to contact should the facility require outside help.

Company: Minuteman Spill Response, Inc.
Address: P.O. Box 10
Mifflinville, PA 18631
Telephone Number: 570-759-3658
Response Time: Approximately 2 to 3 hrs
Equipment and Services: Hazardous Materials Emergency Response

4.3 INTERNAL AND EXTERNAL COMMUNICATIONS AND ALARM SYSTEM

This section describes the internal communications or alarm used to provide immediate emergency instruction (voice or signal) to installation personnel, and the external communications or alarm system used to summon emergency assistance from local police or fire departments.

Newfield facilities in Wayne County are remote and generally do not have land-line telephone systems or alarm systems. The primary means of communication is via voice or mobile telephones. Mobile phones are provided to the Drilling and Production Managers (Primary and Secondary Emergency Coordinators).

Fire, police, and emergency service can be summoned by calling the 911 or per the numbers listed in Table 3.

4.4 EVACUATION PLAN

In the unlikely event that the site must be evacuated, the Emergency Coordinator will alert personnel to re-group at the pre-designated location for attendance taking. The Emergency Coordinator is responsible to verify that all site workers are accounted for during an evacuation. Periodic drills will be conducted, if deemed necessary, to evaluate the effectiveness of this evacuation plan.

If an emergency situation requires evacuation of personnel, the Emergency Coordinator will implement the following evacuation procedures:

1. The Emergency Coordinator will provide evacuation instructions to facility personnel via the construction site communications network, as appropriate.
2. Personnel evacuation will typically proceed as follows:
 - a. If downwind of incident: Evacuate via the most accessible route perpendicular to the prevailing wind direction.
 - b. If upwind of incident: Evacuate in an upwind direction.
3. Personnel will reassemble at the public road at the facility entrance as shown on Figure 3 or an alternate assembly point identified by the Emergency Coordinator, that is upwind of the incident location, and remain at this location until the Emergency Coordinator has accounted for all personnel.
4. The names of employees and the destination of employees transported to hospitals, etc. for treatment will be recorded by the Emergency Coordinator, first aid personnel or fire officials.

Once on public roadways, evacuation routes are left up to the individual.

4.5 EMERGENCY EQUIPMENT AVAILABLE FOR RESPONSE

This section provides a list of available emergency equipment, and procedures for maintenance and decontamination of emergency equipment. Newfield's emergency equipment at the facility will allow personnel to respond safely and quickly to emergency situations. Equipment will be inspected and maintained by Construction Manager to assure recommended quantities are available and its proper operation in time of emergency. After an emergency, equipment will be decontaminated, cleaned, and re-fit for its intended use before normal operations resume.

The Newfield facility will be equipped with the following emergency response equipment:

- (1) Mobile telephones are provided to the Drilling and Production Managers and are immediately available at the scene of operations for summoning emergency assistance from local police departments, fire departments or State or local emergency response teams.
- (2) Portable fire extinguishers, fire control equipment, spill control equipment and decontamination equipment. This equipment is detailed in Table 4 of Appendix C.

5.0 EMERGENCY SPILL CONTROL NETWORK

5.1 ARRANGEMENTS WITH LOCAL EMERGENCY RESPONSE AGENCIES AND HOSPITALS

This section provides a list of local emergency response agencies and hospitals, and associated phone numbers. Arrangements can be made, as appropriate, to inform local emergency response agencies and hospitals concerning the type of materials handled at the Newfield facility and the potential need for services.

If appropriate, arrangements can be made to designate who will be the primary emergency response agency and who will provide support services during emergencies. Efforts can be made to familiarize police, fire departments, emergency response teams, and the Wayne County Emergency Management Agency (EMA) Coordinator with the layout of the site, the properties and dangers associated with any hazardous materials handled, places where personnel would normally be working, entrances to roads inside the site, and potential evacuation routes.

If considered appropriate by Newfield's Emergency Coordinator, agreements with hospitals and emergency response agencies can be made and included in the periodic updating or amending of the PPC Plan. The agreements and/or arrangements include efforts to familiarize area agencies and emergency responders with facility operations and potential emergency operations. The following agencies can be contacted and provided with a copy of this PPC Plan, at the discretion of the Newfield Emergency Coordinator.

- Local fire companies;
- Local county emergency response personnel;
- Local ambulance personnel; and
- Local hospital.

Table 3 lists local emergency response agencies to be contacted in the event of an emergency or reportable spill. In the unlikely event that a widespread emergency exists, the Wayne County EMA would be contacted first, and the Coordinator in turn could contact appropriate emergency response agencies through their communications network.

The Wayne County Emergency Management Agency can be contacted at (570) 253-1622. Routing of injured persons will be performed by emergency medical services personnel based on the number and type of injuries requiring treatment. The emergency medical services coordinator may be provided with a copy of this PPC Plan to assist in planning. The nearest hospitals are Catskill Regional Medical Hospital in Callicoon, New York, and Wayne County Memorial Hospital in Honesdale, Pennsylvania. The nearest fire departments are Callicoon Fire District in Callicoon, New York, Protection Engine Co No. 3 in Honesdale, Pennsylvania, and Narrowsburg Fire Department, in Narrowsburg, New York. The nearest police departments are the Honesdale Police Department, located in Honesdale, Pennsylvania, and Waymart Police Department in Honesdale Pennsylvania. All emergency response departments shall be reached through the 911 system.

5.2 NOTIFICATION LISTS

If the Emergency Coordinator determines that the facility has had an emission, discharge, fire, or explosion that could threaten human health or the environment, he will contact and report as necessary his findings to the appropriate agencies listed in Table 3. When calling any of the agencies listed in Table 3, the following information should be available for reporting to the identified agencies:

- Company name and location;
- Name of person reporting the spill, title, and telephone number;
- The type of material released;
- Estimated or exact (if known) quantity of material released (i.e., gallons, pounds, etc.);
- A brief description of the incident, including type of incident, nature of hazardous material involvement, and possible hazards to human health and the environment outside the facility;
- Probable source and location of the spill source;
- Date and time of the spill;
- Location of entry point into surface water and amount reaching the waterway (if applicable);
- The name of the receiving water and the downstream water bodies of which it is a tributary;
- Confirmation that release has been stopped or, if not, when will it be stopped;
- Mitigation/containment actions initiated;
- Direction of material movement;

- Potential population affected by the release;
- Name of person to contact on behalf of the company who will be at the scene and will be directing response measures;
- Telephone number where the on-scene coordinator can be reached; and
- The extent of injuries, if any.

A reporting form is attached in Appendix D for use by the Emergency Coordinator.

A written report including the above listed information, and other information that may be required by the applicable regulations (see 25 PA Code Section 265.56) regarding the spilled material, will need to be transmitted within 15 days to the following agencies:

U.S. Environmental Protection Agency
Region III
Spill Response Section
1650 Arch Street
Philadelphia, PA 19103

Pennsylvania Department of Environmental Protection
Bureau of Water Quality Management
2 Public Square
Wilkes-Barre, Pennsylvania 18711

6.0 WASTE DISPOSAL PRACTICES

Produced water will be removed periodically from the tanks at each well site and transported by a licensed residual waste hauler to a permitted disposal facility. Other wastes generated onsite will include used hydraulic oil that will be reclaimed from operating equipment and transported offsite for recycling. All wastes will be disposed in accordance with applicable local, state, and federal regulations.

7.0 STORMWATER MANAGEMENT PRACTICES

Newfield implements several Best Management Practices (BMPs) at each well site to reduce the potential for stormwater runoff of suspended solids and other contaminants. These BMPs include routine visual inspections, preventive maintenance, good housekeeping, and management of stormwater run-on and runoff. Routine inspection and monitoring, preventive maintenance, and good housekeeping programs are discussed in Sections 3.3, 3.4, and 3.5 of this PPC Plan. These programs prevent accidental releases of contaminants and reduce contaminant migrations via stormwater discharges. Stormwater management activities are discussed in Section 3.1 of this PPC Plan. The certification statement regarding the evaluation of discharges and confirmation that they will be comprised solely of stormwater is presented at the beginning of this Plan. Potential "significant sources of non-stormwater at the site" may include condensate, brine, hydraulic oil drums and tanks, gasoline and diesel fuel. Storage areas for these significant sources will be inspected on a daily basis.

8.0 SEDIMENT AND EROSION PREVENTION

Erosion and sedimentation controls are managed in accordance with PADEP requirements. Copies of the site E&S Plan are available at the Newfield office in Honesdale, PA and at each well site.

APPENDIX A
INSPECTION FORMS

**NEWFIELD APPALACHIA PA LLC
Weekly Facility Inspection Form**

| | |
|----------------------------|------------------------|
| Facility: | Inspector Name: |
| | |
| Date of Inspection: | |
| | |

Instructions: Indicate yes or no. If no, record observations describing the specific equipment and discrepancy.

| Aboveground Storage Tanks | | |
|---|------------------------------|-----------------------------|
| • Equipment appears adequately supported | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • No evidence of active or past leaks from equipment, piping, connections, vales, vents, etc. | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Coating condition appears satisfactory | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Corrosion appears acceptable | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Level gauages/alarms are operative | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Containers are labeled | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Observations: | | |

| Processing Equipment | | |
|---|------------------------------|-----------------------------|
| • Equipment appears adequately supported | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • No evidence of active or past leaks from equipment, piping, connections, vales, vents, etc. | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Coating condition appears satisfactory | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Corrosion appears acceptable | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Observations: | | |

| Other Facility Equipment is Checked for: | | |
|---|------------------------------|-----------------------------|
| ❖ No evidence of active or past leaks | | |
| ❖ Condition of equipment appears to be satisfactory (i.e., not damaged, deteriorated, or worn), and | | |
| ❖ Corrosion appears to be acceptable. | | |
| • Wellheads | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Gathering systems | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Well test stations | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Traps/Sumps | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Drainage systems and nearby ditches | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Applicable flowlines including right-of-way areas | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Containment systems | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Facility piping | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Observations: | | |

NEWFIELD APPALACHIA PA LLC
Weekly Facility Inspection Form

Secondary Containment

- | | | |
|--|------------------------------|-----------------------------|
| • Passive containment (berm) has adequate capacity and integrity as intended | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Active containment measures are adequate | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • No evidence of active or past leaks (i.e., staining, sheen) | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Any valves are closed and plugged | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Active containment is free from a significant quantity of rain/snow | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

Observations:

Security

- | | | |
|--|------------------------------|-----------------------------|
| • Lighting is adequate to observe leaks, spills, and vandalism | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Pumps, valves, nozzles are locked | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

Observations:

Spill Response

- | | | |
|---|------------------------------|-----------------------------|
| • Spill response kits are stocked and located in readily accessible areas | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
|---|------------------------------|-----------------------------|

Observations:

Signature:

Date:

E&S INSPECTION FORM

The E&S plan contains a maintenance program which provides for inspection of BMPs (Best Management Practices such as filter sock, vegetation, construction entrances, etc.) on a weekly basis and after each measurable rainfall event, including the repair of BMPs to ensure effective and efficient operation. The maintenance program for both the temporary and permanent erosion and sediment control BMPs, including disposal of materials removed from the BMPs or project area, has been included in the narrative. The type of maintenance, such as cleanout, repair, replacement, regrading, re-stabilizing, etc. for each of the BMPs is included in the plan. **NOTE: This inspection report must be kept up to date and onsite.**

| INSPECTION DATE | INITIALS | RAINFALL OR WEEKLY? | LOCATION OF E&S CONTROL(S) | CONDITION NOTED | CORRECTIVE MEASURES TAKEN |
|-----------------|----------|---------------------|----------------------------|-----------------|---------------------------|
| | | | | | |
| | | | | | |
| | | | | | |
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| | | | | | |
| | | | | | |
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| | | | | | |
| | | | | | |
| | | | | | |

Facility: _____ Inspector: _____ Signed: _____ Date: _____
Print *Signature*

Tank Truck Loading and Unloading Checklist

Date: _____ Material being loaded/unloaded: _____

Driver/Loader present during loading or unloading of material _____
(signature)

_____ Current volume in storage tank was checked prior to loading.

_____ Fill hose inspected for condition prior to loading.

_____ Wheel chocks in place prior to loading.

_____ Tanker valve(s) were inspected for leakage prior to filling and departure.

_____ The loading of the tanker was monitored.

_____ Hoses were replaced and capped after loading.

_____ No material was spilled onto the containment pad or ground.

- These forms must be completed for every tank truck shipment and must be filed in the facility PPC Plan.
- All spills should be immediately reported to at least one of the following Newfield personnel:

Don Sleeth
Drilling Manager
Office: 281-674-2501
Cell: 281-974-0051

Jack Cochran
Production Manager
Office: 814-437-2344
Cell: 814-671-1557

Burl Eakle
Cell: 918-448-1296

Delivery Information

Invoice No. _____

Load No. _____

Company _____

APPENDIX B
FIGURES



TETRA TECH

Figure 1
Well Field Map
Newfield Exploration Company

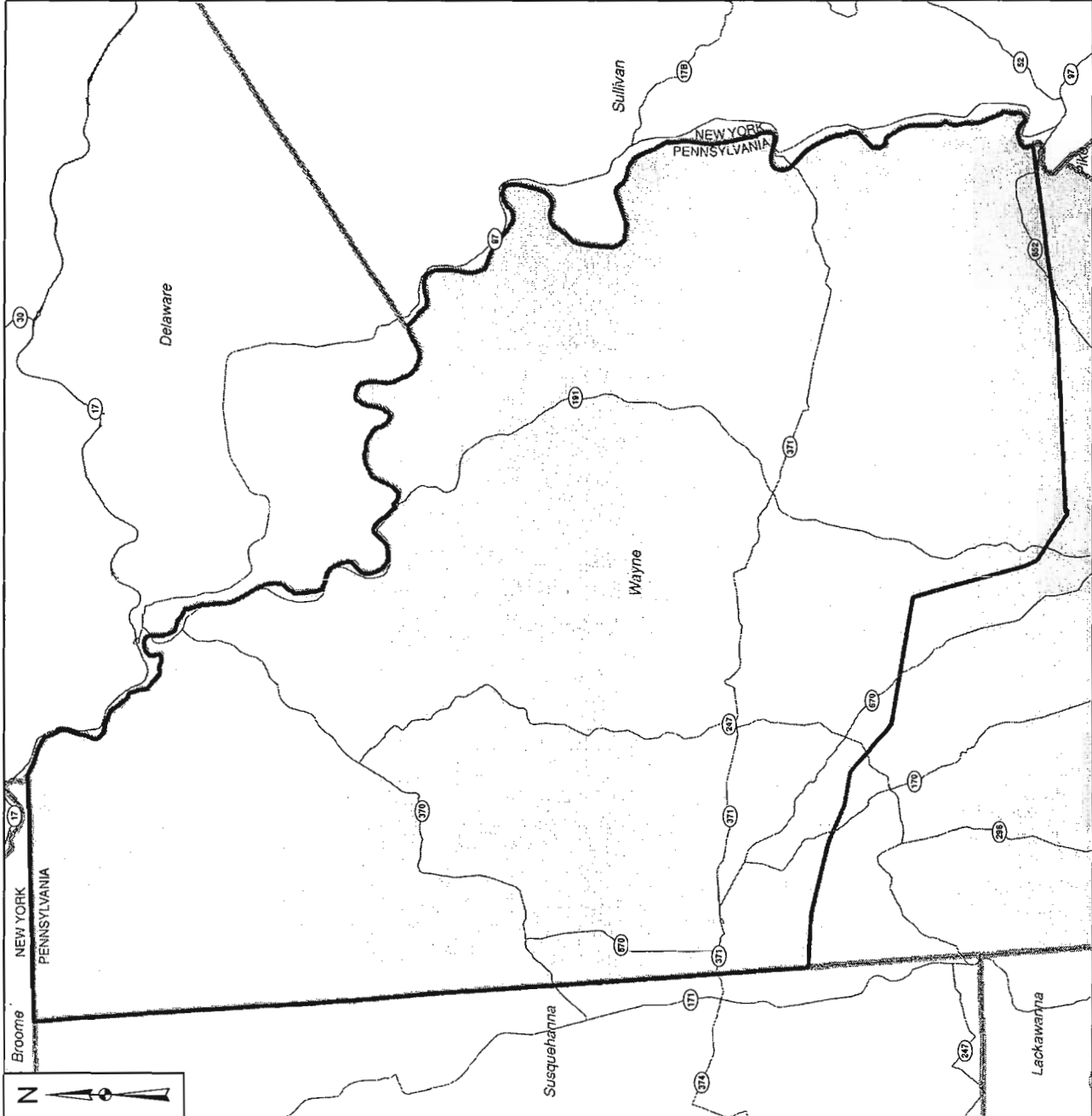
- Legend**
- Road (E)
 - County (E)
 - Wayne County (E)
 - Lease Area (N)

Sources:
 (E) - Indicates the data was provided by ESRI.
 (N) - Indicates the data was provided by Newfield Exploration Company

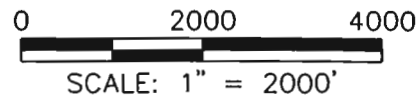


Drawn By: S. PAXTON 04/20/10
 Checked By: A. STRASSNER 04/20/10
 Approved By:

Contract Number: 112002679



C:\Documents and Settings\ben.hoppe\My Documents\CAD Work\2568\Woodland Management Partners Well\Figures\2568FC001.dwg PIT BEN.HOPPE 3/3/2010 4:01:53 PM



TETRA TECH

WWW.TETRATECH.COM

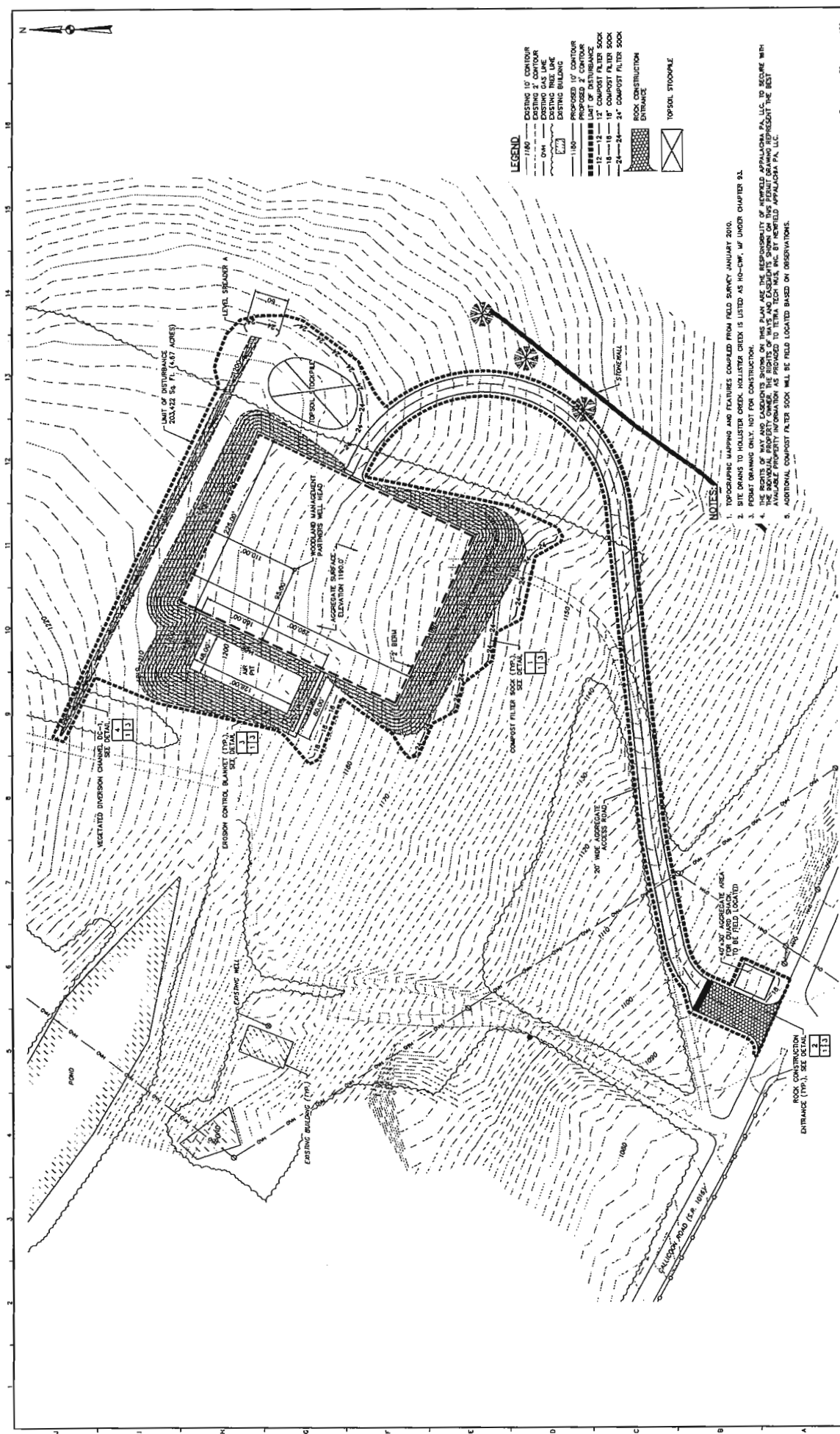
661 ANDERSEN DRIVE - FOSTER PLAZA 7
PITTSBURGH, PA 15220
T: (412) 921-7090 | F: (412) 921-4040

NEWFIELD APPALACHIA PA, LLC
WAYNE COUNTY, PENNSYLVANIA
WOODLAND MANAGEMENT PARTNERS
WELL PAD
LOCATION MAP
SCALE: 1" = 2000'

| | |
|--------------|-----------|
| DATE: | 3/4/10 |
| PROJECT NO.: | 112C02568 |
| DESIGNED BY: | RAL |
| DRAWN BY: | BH |
| CHECKED BY: | RAL |
| SHEET: | 1 OF 2 |

COPYRIGHT TETRA TECH INC.

FIGURE 2



- LEGEND**
- EXISTING 1' CONTOUR
 - EXISTING 2' CONTOUR
 - EXISTING GAS LINE
 - EXISTING WATER LINE
 - EXISTING BUILDING
 - 1:50 PROPOSED 1' CONTOUR
 - 1:20 PROPOSED 2' CONTOUR
 - 1:10 LIMIT OF DISTURBANCE
 - 12" COMPOST FILTER SOCK
 - 18" COMPOST FILTER SOCK
 - 24" COMPOST FILTER SOCK
 - ROCK CONSTRUCTION ENTRANCE
 - TOPSOIL STOCKPILE

- NOTES:**
1. TOPOGRAPHIC MAPPING AND FEATURES COMPILED FROM FIELD SURVEY JANUARY 2016.
 2. SITE DRAWS TO HOLLISTER CREEK. HOLLISTER CREEK IS LISTED AS 10-CW, W/ UNDER CHAPTER 93.
 3. EROSION CONTROL MEASURES NOT FOR CONSTRUCTION.
 4. THE PLAN USES THE RESPONSIBILITY OF NEWFIELD APPALACHIA PA, LLC TO SECURE WITHIN THE BOUNDARY PROPERTY OWNERS. THE RIGHTS OF WAYS AND EASEMENTS SHOWN ON THIS PLANIT DRAWING REPRESENT THE BEST AVAILABLE PROPERTY INFORMATION AS PROVIDED TO TETRA TECH INC. BY NEWFIELD APPALACHIA PA, LLC.
 5. ADDITIONAL COMPOST FILTER SOCK WILL BE FIELD LOCATED BASED ON OBSERVATIONS.

SCALE: 1" = 50'

| | |
|---------------|---------|
| DATE: | 5/2/20 |
| PROJECT NO.: | 1122223 |
| DESIGNED BY: | BR |
| DRAWN BY: | BR |
| CHECKED BY: | BR |
| CORRECTED BY: | BR |
| SHEET: | 1 OF 7 |

NEWFIELD APPALACHIA PA LLC.
WAYNE COUNTY, PENNSYLVANIA
WOODLAND MANAGEMENT PARTNERS WELL PAD
EROSION & SEDIMENT CONTROL PLAN

| MARK | DATE | DESCRIPTION | BY |
|------|------|-------------|----|
| | | | |
| | | | |

TETRA TECH
 www.tetra-tech.com
 681 ANDREW DRIVE, SUITE 1000
 PITTSBURGH, PA 15220
 E: (412) 281-2990 F: (412) 281-0440



FIGURE 3

APPENDIX C
TABLES

TABLE 1

LIST OF MATERIALS & WASTES

CONSTRUCTION

| POLLUTIONAL MATERIAL | VOLUME OR QUANTITY | LOCATION ONSITE | SPILL CONTAINMENT MATERIALS ONSITE/LOCATION |
|-----------------------------|---------------------------|------------------------|--|
| Diesel Fuel | 250 gallons | Well Pad | Sorbent pads; shovels/Gang box |
| Lubricants | 180 gallons | Well Pad | Sorbent pads; shovels/Gang box |
| OIL ABSORBANT | 2,500 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Trash & Debris | 2,000 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| | | | |

DRILLING

| POLLUTIONAL MATERIAL | VOLUME OR QUANTITY | LOCATION ONSITE | SPILL CONTAINMENT MATERIALS ONSITE/LOCATION |
|--|---------------------------|------------------------|--|
| Diesel Fuel | 2000 gallons | Well Pad | Sorbent pads; shovels/Gang box |
| Lubricants | 320 gallons | Well Pad | Sorbent pads; shovels/Gang box |
| DURATONE HT | 2,500 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| GELTONE V | 2,500 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Lime | 7,500 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| OIL ABSORBANT | 2,500 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Base Fluid | 300 bbl | Well Pad | Sorbent pads; shovels/Gang box |
| Rig Wash | 2,000 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Calcium Chloride (CaCl ₂) | 4,000 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| RHEMOD L | 1,770 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| LE SUPERMUL | 8,500 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| BARACARB 25, 50 (2 pallets each) | 12,600 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| WALNUT | 2,400 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| DRILTREAT | 1,900 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Liquid Mud | 1,500 bbl | Well Pad | Sorbent pads; shovels/Gang box |
| BAROID REGULAR / **BAROID BULK (barite) | 125,000 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Trash & Debris | 2,000 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Drill Cuttings | 100,000 lbs | Air Pit | Sorbent pads; shovels/Gang box |
| Cement | 130,000 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| | | | |

TABLE 2

INSPECTION AND MONITORING ACTIVITIES

| Activity | Frequency |
|---|--|
| Erosion and Sedimentation Control Measures | Weekly or after a significant rain event |
| Aboveground Storage Tanks | Daily |
| Drum Storage Areas | Daily |
| Best Management Practices (BMPs) | Per BMP requirements |
| Dust Control Measures | Daily |
| Preparedness, Prevention, and Contingency (PPC) Plan Compliance Evaluation Inspections and Update of PPC Plan, as Appropriate | Annually |

**TABLE 3
AGENCY NOTIFICATION LIST**

The following agencies are to be contacted, as appropriate, in the event of an emergency, accident, or chemical release.

| <u>Agency</u> | <u>Telephone No.</u> |
|---|----------------------|
| PADEP Northeast Regional Office | 570-826-2511 |
| PADEP Southcentral Office (Harrisburg) | 877-333-1904 |
| Pennsylvania Emergency Management Agency | 717-651-2001 |
| Police Department | 9-1-1 |
| Volunteer Fire Department | 9-1-1 |
| U.S. Environmental Protection Agency | 215-814-5700 |
| U.S. Coast Guard National Response Center | 800-424-8802 |
| U.S. Coast Guard (local) | 570-421-1191 |
| Pennsylvania Fish and Boat Commission | 814-445-8974 |
| Chemical Transportation Emergency Center: | |
| * Chemical Exposure Information | 800-424-9300 |

LOCAL EMERGENCY RESPONSE:

| | |
|---|--------------|
| Fire Department – | 9-1-1 |
| Callicoon Fire District in Callicoon, New York, | |
| Protection Engine Co No. 3 in Honesdale, Pennsylvania | |
| Narrowsburg Fire Department, in Narrowsburg, New York. | |
| Police Department – | 9-1-1 |
| Honesdale Police Department, Honesdale, Pennsylvania | |
| Waymart Police Department, Honesdale Pennsylvania | |
| Hospitals-Wayne County Memorial Hospital, Honesdale, Pennsylvania | 570-251-6672 |
| Catskill Regional Medical Hospital in Callicoon, New York | 845-887-5530 |
| Local Emergency Management | |
| Wayne County EMA | 570-253-1622 |

TABLE 4

On-Site Emergency Response Equipment

| On-Site Emergency Response Equipment |
|---|
| Fire Extinguishers |
| Tyvek Suits |
| Nitrile Gloves |
| Hearing Protection |
| Particulate Adsorbent |
| Absorbent Pads |
| Shovels |
| Earth Moving Equipment |
| Decontamination Equipment |

**TABLE 5
CHAIN OF COMMAND**

Primary Emergency Coordinator

Don Sleeth
Drilling Manager
Office: 281-674-2501
Cell: 281-974-0051

Secondary Emergency Coordinator

Jack Cochran
Production Manager
Office: 814-437-2344
Cell: 814-671-1557

Construction Manager

Burl Eakle
Cell: 918-448-1296

Offsite Emergency Response Contractors

Company: Minuteman Spill Response, Inc.
Telephone Number: 800-905-7788

**APPENDIX D
REPORTING FORM**

Spill Response Notification Form

| | | | |
|---|---------------|---|-------------------------|
| GENERAL REPORTING INFORMATION | | | |
| Prepared _____ | | | |
| (First) | (M.I.) | (Last) | (Position) |
| Daytime phone: (xxx) xxx-xxxx | | Evening phone: (xxx) xxx-xxxx | |
| Newfield Appalachia PA LLC | | | |
| (Company) | (Address) | (City) | (State) (Zip) |
| Calling for responsible party? Yes | | Were materials discharged? Yes Confidential? No | |
| Meeting Federal obligations to report: Yes | | | |
| INCIDENT DESCRIPTION | | | |
| Source and/or cause: | | | |
| Date of Incident: Time of Incident: | | | |
| Incident Location/Address | | | |
| Nearest City: XXXX, PA XXXXX (XXXXXXXX County) | | | |
| Distance from City: In city limits | | Direction from City: In city limits | |
| Facility Oil Storage Capacity: XXXXXX gallons | | | |
| Container Type: Container Capacity: | | (gals) | |
| Facility Latitude: xx° xx' xx" Longitude xx° xx' xx" | | | |
| MATERIAL | | | |
| Name (or CHRIS Code): | | | |
| Discharged Quantity (Units): | | Discharged to Water (Units): | |
| RESPONSE ACTION | | | |
| Actions taken to correct, control or mitigate incident: | | | |
| IMPACT | | | |
| No. of Injuries: | | No. of Deaths: | Other: |
| Evacuation (Y/N): | Damage (Y/N): | Amount (\$): | |
| Medium Affected: | Description: | | Additional Information: |
| AGENCY NOTIFIED | | | |
| NRC 800-424-8802 | Date: | Time: | Contact: |
| PADEP (570) 826-2511 | Date: | Time: | Contact: |
| USCG | Date: | Time: | Contact: |
| Other | Date: | Time: | Contact: |
| ADDITIONAL INFORMATION: | | | |

APPENDIX E
MSDS SHEETS



MATERIAL SAFETY DATA SHEET

Diesel Fuel (All Types)

MSDS No. 9909

EMERGENCY OVERVIEW

CAUTION!

OSHA/NFPA COMBUSTIBLE LIQUID - SLIGHT TO MODERATE IRRITANT
EFFECTS CENTRAL NERVOUS SYSTEM
HARMFUL OR FATAL IF SWALLOWED

Moderate fire hazard. Avoid breathing vapors or mists. May cause dizziness and drowsiness. May cause moderate eye irritation and skin irritation (rash). Long-term, repeated exposure may cause skin cancer. If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs).



NFPA 704 (Section 16)

1. CHEMICAL PRODUCT AND COMPANY INFORMATION

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

EMERGENCY TELEPHONE NUMBER (24 hrs): CHEMTREC (800) 424-9300
COMPANY CONTACT (business hours): Corporate Safety (732) 750-6000
MSDS INTERNET WEBSITE: www.hess.com (See Environment, Health, Safety & Social Responsibility)

SYNONYMS: Ultra Low Sulfur Diesel (ULSD); Low Sulfur Diesel; Motor Vehicle Diesel Fuel; Diesel Fuel #2; Dyed Diesel Fuel; Non-Road, Locomotive and Marine Diesel Fuel; Tax-exempt Diesel Fuel

See Section 16 for abbreviations and acronyms.

2. COMPOSITION and CHEMICAL INFORMATION ON INGREDIENTS

| INGREDIENT NAME (CAS No.) | CONCENTRATION PERCENT BY WEIGHT |
|---------------------------|---------------------------------|
| Diesel Fuel (68476-34-6) | 100 |
| Naphthalene (91-20-3) | Typically < 0.01 |

A complex mixture of hydrocarbons with carbon numbers in the range C9 and higher. Diesel fuel may be dyed (red) for tax purposes. May contain a multifunctional additive.

3. HAZARDS IDENTIFICATION

EYES

Contact with liquid or vapor may cause mild irritation.

SKIN

May cause skin irritation with prolonged or repeated contact. Practically non-toxic if absorbed following acute (single) exposure. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.

INGESTION

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.



MATERIAL SAFETY DATA SHEET

Diesel Fuel (All Types)

MSDS No. 9909

INHALATION

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

CHRONIC EFFECTS and CARCINOGENICITY

Similar products produced skin cancer and systemic toxicity in laboratory animals following repeated applications. The significance of these results to human exposures has not been determined - see Section 11 Toxicological Information.

IARC classifies whole diesel fuel exhaust particulates as probably carcinogenic to humans (Group 2A). NIOSH regards whole diesel fuel exhaust particulates as a potential cause of occupational lung cancer based on animal studies and limited evidence in humans.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash).

4. FIRST AID MEASURES

EYES

In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

SKIN

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

INGESTION

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

INHALATION

Remove person to fresh air. If person is not breathing provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES:

| | |
|-------------------------------|---------------------------------|
| FLASH POINT: | > 125 °F (> 52 °C) minimum PMCC |
| AUTOIGNITION POINT: | 494 °F (257 °C) |
| OSHA/NFPA FLAMMABILITY CLASS: | 2 (COMBUSTIBLE) |
| LOWER EXPLOSIVE LIMIT (%): | 0.6 |
| UPPER EXPLOSIVE LIMIT (%): | 7.5 |

FIRE AND EXPLOSION HAZARDS

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

EXTINGUISHING MEDIA

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO₂, water spray, fire fighting foam, or Halon.



MATERIAL SAFETY DATA SHEET

Diesel Fuel (All Types)

MSDS No. 9909

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

FIRE FIGHTING INSTRUCTIONS

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

6. ACCIDENTAL RELEASE MEASURES

ACTIVATE FACILITY'S SPILL CONTINGENCY OR EMERGENCY RESPONSE PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

7. HANDLING and STORAGE

HANDLING PRECAUTIONS

Handle as a combustible liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Diesel fuel, and in particular low and ultra low sulfur diesel fuel, has the capability of accumulating a static electrical charge of sufficient energy to cause a fire/explosion in the presence of lower flashpoint products such as gasoline. The accumulation of such a static charge occurs as the diesel flows through pipelines, filters, nozzles and various work tasks such as tank/container filling, splash loading, tank cleaning; product sampling; tank gauging; cleaning, mixing, vacuum truck operations, switch loading, and product agitation. There is a greater potential for static charge accumulation in cold temperature, low humidity conditions.

Documents such as 29 CFR OSHA 1910.106 "Flammable and Combustible Liquids, NFPA 77 Recommended Practice on Static Electricity, API 2003 "Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents and ASTM D4865 "Standard Guide for Generation and Dissipation of Static



MATERIAL SAFETY DATA SHEET

Diesel Fuel (All Types)

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Electricity in Petroleum Fuel Systems" address special precautions and design requirements involving loading rates, grounding, bonding, filter installation, conductivity additives and especially the hazards associated with "switch loading." ["Switch Loading" is when a higher flash point product (such as diesel) is loaded into tanks previously containing a low flash point product (such as gasoline) and the electrical charge generated during loading of the diesel results in a static ignition of the vapor from the previous cargo (gasoline).]

Note: When conductivity additives are used or are necessary the product should achieve 25 picosiemens/meter or greater at the handling temperature.

STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

8. EXPOSURE CONTROLS and PERSONAL PROTECTION

EXPOSURE LIMITS

| Components (CAS No.) | Source | Exposure Limits | |
|---------------------------|--------|--|----------|
| | | TWA/STEL | Note |
| Diesel Fuel: (68476-34-6) | OSHA | 5 mg/m, as mineral oil mist | |
| | ACGIH | 100 mg/m ³ (as totally hydrocarbon vapor) TWA | A3, skin |
| Naphthalene (91-20-3) | OSHA | 10 ppm TWA | |
| | ACGIH | 10 ppm TWA / 15 ppm STEL | A4, Skin |

ENGINEERING CONTROLS

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

EYE/FACE PROTECTION

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

SKIN PROTECTION

Gloves constructed of nitrile, neoprene, or PVC are recommended. Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

**MATERIAL SAFETY DATA SHEET****Diesel Fuel (All Types)****MSDS No. 9909****RESPIRATORY PROTECTION**

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

9. PHYSICAL and CHEMICAL PROPERTIES**APPEARANCE**

Clear, straw-yellow liquid. Dyed fuel oil will be red or reddish-colored.

ODOR

Mild, petroleum distillate odor

BASIC PHYSICAL PROPERTIES

BOILING RANGE: 320 to 690 oF (160 to 366 °C)
VAPOR PRESSURE: 0.009 psia @ 70 °F (21 °C)
VAPOR DENSITY (air = 1): > 1.0
SPECIFIC GRAVITY (H₂O = 1): 0.83 to 0.88 @ 60 °F (16 °C)
PERCENT VOLATILES: 100 %
EVAPORATION RATE: Slow; varies with conditions
SOLUBILITY (H₂O): Negligible

10. STABILITY and REACTIVITY

STABILITY: Stable. Hazardous polymerization will not occur.

CONDITIONS TO AVOID and INCOMPATIBLE MATERIALS

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Keep away from strong oxidizers; Viton ®; Fluorel ®

HAZARDOUS DECOMPOSITION PRODUCTS

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

11. TOXICOLOGICAL PROPERTIES**ACUTE TOXICITY**

Acute dermal LD50 (rabbits): > 5 ml/kg Acute oral LD50 (rats): 9 ml/kg
Primary dermal irritation: extremely irritating (rabbits) Draize eye irritation: non-irritating (rabbits)
Guinea pig sensitization: negative

CHRONIC EFFECTS AND CARCINOGENICITY

Carcinogenic: OSHA: NO IARC: NO NTP: NO ACGIH: A3

Studies have shown that similar products produce skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation.

MUTAGENICITY (genetic effects)

This material has been positive in a mutagenicity study.



MATERIAL SAFETY DATA SHEET

Diesel Fuel (All Types) **MSDS No. 9909**


12. ECOLOGICAL INFORMATION

Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

13. DISPOSAL CONSIDERATIONS

Consult federal, state and local waste regulations to determine appropriate disposal options.

14. TRANSPORTATION INFORMATION

| | | |
|---------------------------------|-------------------------|---|
| PROPER SHIPPING NAME: | Diesel Fuel | Placard (International Only): |
| HAZARD CLASS and PACKING GROUP: | 3, PG III |  |
| DOT IDENTIFICATION NUMBER: | NA 1993 (Domestic) | |
| | UN 1202 (International) | |
| DOT SHIPPING LABEL: | None | |

Use Combustible Placard if shipping in bulk domestically

15. REGULATORY INFORMATION

U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION

This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other regulations at the state and/or local level. Consult those regulations applicable to your facility/operation.

CLEAN WATER ACT (OIL SPILLS)

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

SARA SECTION 311/312 - HAZARD CLASSES

| <u>ACUTE HEALTH</u> | <u>CHRONIC HEALTH</u> | <u>FIRE</u> | <u>SUDDEN RELEASE OF PRESSURE</u> | <u>REACTIVE</u> |
|---------------------|-----------------------|-------------|-----------------------------------|-----------------|
| X | X | X | -- | -- |

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product may contain listed chemicals below the *de minimis* levels which therefore are not subject to the supplier notification requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372. If you may be required to report releases of chemicals listed in 40 CFR 372.28, you may contact Hess Corporate Safety if you require additional information regarding this product.

CALIFORNIA PROPOSITION 65 LIST OF CHEMICALS

This product contains the following chemicals that are included on the Proposition 65 "List of Chemicals" required by the California Safe Drinking Water and Toxic Enforcement Act of 1986:

| <u>INGREDIENT NAME (CAS NUMBER)</u> | <u>Date Listed</u> |
|--|--------------------|
| Diesel Engine Exhaust (no CAS Number listed) | 10/01/1990 |

CANADIAN REGULATORY INFORMATION (WHMIS)

Class B, Division 3 (Combustible Liquid) and Class D, Division 2, Subdivision B (Toxic by other means)



MATERIAL SAFETY DATA SHEET

Diesel Fuel (All Types) **MSDS No. 9909**

16. OTHER INFORMATION

NFPA® HAZARD RATING HEALTH: 0
FIRE: 2
REACTIVITY: 0

Refer to NFPA 704 "Identification of the Fire Hazards of Materials" for further information

HMIS® HAZARD RATING HEALTH: 1 * * Chronic
FIRE: 2
PHYSICAL: 0

SUPERSEDES MSDS DATED: 02/28/2001

ABBREVIATIONS:

AP = Approximately < = Less than > = Greater than
N/A = Not Applicable N/D = Not Determined ppm = parts per million

ACRONYMS:

| | | | |
|--------|---|-------|--|
| ACGIH | American Conference of Governmental Industrial Hygienists | NTP | National Toxicology Program |
| AIHA | American Industrial Hygiene Association | OPA | Oil Pollution Act of 1990 |
| ANSI | American National Standards Institute (212) 642-4900 | OSHA | U.S. Occupational Safety & Health Administration |
| API | American Petroleum Institute (202) 682-8000 | PEL | Permissible Exposure Limit (OSHA) |
| CERCLA | Comprehensive Emergency Response, Compensation, and Liability Act | RCRA | Resource Conservation and Recovery Act |
| DOT | U.S. Department of Transportation [General info: (800) 467-4922] | REL | Recommended Exposure Limit (NIOSH) |
| EPA | U.S. Environmental Protection Agency | SARA | Superfund Amendments and Reauthorization Act of 1986 Title III |
| HMIS | Hazardous Materials Information System | SCBA | Self-Contained Breathing Apparatus |
| IARC | International Agency For Research On Cancer | SPCC | Spill Prevention, Control, and Countermeasures |
| MSHA | Mine Safety and Health Administration | STEL | Short-Term Exposure Limit (generally 15 minutes) |
| NFPA | National Fire Protection Association (617)770-3000 | TLV | Threshold Limit Value (ACGIH) |
| NIOSH | National Institute of Occupational Safety and Health | TSCA | Toxic Substances Control Act |
| NOIC | Notice of Intended Change (proposed change to ACGIH TLV) | TWA | Time Weighted Average (8 hr.) |
| | | WEEL | Workplace Environmental Exposure Level (AIHA) |
| | | WHMIS | Canadian Workplace Hazardous Materials Information System |

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

MATERIAL SAFETY DATA SHEET

Review Date: 04/23/2007

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT: PENNZOIL™ LONG-LIFE™ Motor Oil (All Grades)

MSDS NUMBER: 614348LU - 1

PRODUCT CODE(S): 5071324, 5071325, 5071326, 5071369, 5071371

MANUFACTURER

SOPUS Products

P.O. Box 4427

Houston, TX. 77210-4427

TELEPHONE NUMBERS

Spill Information: (877) 242-7400

Health Information: (877) 504-9351

MSDS Assistance Number: (877) 276-7285

SECTION 2 PRODUCT/INGREDIENTS

| INGREDIENTS | CAS# | CONCENTRATION |
|-------------------------------|------------|-----------------|
| Heavy Duty Motor Oil | | |
| Highly refined petroleum oils | Mixture | 90 - 99 %volume |
| Zinc Dialkyldithiophosphate | 68649-42-3 | 1 - 5 %volume |
| Proprietary additives | Mixture | 1 - 5 %volume |

SECTION 3 HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Appearance & Odor: Bright and clear liquid. Mild odor.

Health Hazards: No known immediate health hazards.

Physical Hazards: No known physical hazards.

NFPA Rating (Health, Fire, Reactivity): 0, 1, 0

Hazard Rating: Least - 0 Slight - 1 Moderate - 2 High - 3 Extreme - 4

Inhalation:

Inhalation of vapors (generated at high temperatures only) or oil mist may cause mild irritation of the nose, throat, and respiratory tract.

Eye Irritation:

Lubricating oils are generally considered no more than minimally irritating to the eyes.

Skin Contact:

May cause slight irritation of the skin. If irritation occurs, a temporary burning sensation and minor redness and/or swelling may result.

Ingestion:

Lubricating oils are generally no more than slightly toxic if swallowed.

Other Health Effects:

The International Agency for Research on Cancer (IARC) has determined there is sufficient evidence for the carcinogenicity in experimental animals of used gasoline motor oils. Handling procedures and safety precautions in the MSDS should be followed to minimize exposure to the used product.

Signs and Symptoms:

Irritation as noted above.

Aggravated Medical Conditions:

Pre-existing eye, skin and respiratory disorders may be aggravated by exposure to this product.

For additional health information, refer to section 11.

| | |
|------------------|---------------------------|
| SECTION 4 | FIRST AID MEASURES |
|------------------|---------------------------|

Inhalation:

Remove victim to fresh air and provide oxygen if breathing is difficult. Get medical attention. If the victim has difficulty breathing or tightness of the chest, is dizzy, vomiting or unresponsive, give 100% oxygen with rescue breathing or CPR as required and transport to the nearest medical facility.

Skin:

Remove contaminated clothing and shoes and wipe excess from skin. Flush skin with water, then wash with soap and water. If irritation occurs, get medical attention. Do not reuse clothing until cleaned. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.

Eye:

Flush with water. If irritation occurs, get medical attention.

Ingestion:

Do not induce vomiting. In general, no treatment is necessary unless large quantities of product are ingested. However, get medical attention.

Note to Physician:

In general, emesis induction is unnecessary in high viscosity, low volatility products such as oils and greases.

| | |
|------------------|-------------------------------|
| SECTION 5 | FIRE FIGHTING MEASURES |
|------------------|-------------------------------|

Flash Point [Method]: >400 °F/>204.44 °C [Pensky-Martens Closed Cup]

Extinguishing Media:

Material will float and can be re-ignited on surface of water. Use water fog, foam, dry chemical or carbon dioxide (CO₂) to extinguish flames. Do not use a direct stream of water.

Fire Fighting Instructions:

Do not enter confined fire space without full bunker gear (helmet with face shield, bunker coats, gloves and rubber boots), including a positive pressure, NIOSH approved, self-contained breathing apparatus. This material is non-flammable.

Unusual Fire Hazards:

Material may ignite when preheated.

SECTION 6**ACCIDENTAL RELEASE MEASURES****Protective Measures:**

May burn although not readily ignitable.

Wear appropriate personal protective equipment when cleaning up spills. Refer to Section 8.

Spill Management:

FOR LARGE SPILLS: Remove with vacuum truck or pump to storage/salvage vessels.

FOR SMALL SPILLS: Soak up residue with an absorbent such as clay, sand or other suitable material. Place in non-leaking container and seal tightly for proper disposal.

Place in container for proper disposal. Remove contaminated soil to remove contaminated trace residues. Dispose of in same manner as material.

Reporting:

CERCLA: Product is covered by EPA's Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) petroleum exclusion. Releases to air, land, or water are not reportable under CERCLA (Superfund).

CWA: This product is an oil as defined under Section 311 of EPA's Clean Water Act (CWA). Spills into or leading to surface waters that cause a sheen must be reported to the National Response Center, 1-800-424-8802.

SECTION 7**HANDLING AND STORAGE****Precautionary Measures:**

Wash with soap and water before eating, drinking, smoking, applying cosmetics, or using toilet. Launder contaminated clothing before reuse. Properly dispose of contaminated leather articles such as shoes or belts that cannot be decontaminated. Avoid heat, open flames, including pilot lights, and strong oxidizing agents. Use explosion-proof ventilation to prevent vapor accumulation. Ground all handling equipment to prevent sparking.

Storage:

Do not store in open or unlabeled containers. Store in a cool, dry place with adequate ventilation. Keep away from open flames and high temperatures.

Container Warnings:

Keep containers closed when not in use. Containers, even those that have been emptied, can contain explosive vapors. Do not cut, drill, grind, weld or perform similar operations on or near containers.

SECTION 8**EXPOSURE CONTROLS/PERSONAL PROTECTION**

| Chemical | Limit | TWA | STEL | Ceiling | Notation |
|-------------------|-----------|---------|----------|---------|----------|
| Oil mist, mineral | ACGIH TLV | 5 mg/m3 | 10 mg/m3 | | |
| Oil mist, mineral | OSHA PEL | 5 mg/m3 | | | |

Exposure Controls

Provide adequate ventilation to control airborne concentrations below the exposure guidelines/limits.

Personal Protection

Personal protective equipment (PPE) selections vary based on potential exposure conditions such as handling practices, concentration and ventilation. Information on the selection of eye, skin and respiratory protection for use with this material is provided below.

Eye Protection:

Chemical Goggles, or Safety glasses with side shields

Skin Protection:

Use protective clothing which is chemically resistant to this material. Selection of protective clothing depends on potential exposure conditions and may include gloves, boots, suits and other items. The selection(s) should take into account such factors as job task, type of exposure and durability requirements.

Published literature, test data and/or glove and clothing manufacturers indicate the best protection is provided by:
Neoprene, or Nitrile Rubber

Respiratory Protection:

If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, an approved respirator must be worn. Respirator selection, use and maintenance should be in accordance with the requirements of the OSHA Respiratory Protection Standard, 29 CFR 1910.134.

Types of respirator(s) to be considered in the selection process include:

For Mist: Air Purifying, R or P style NIOSH approved respirator.

For Vapors: Air Purifying, R or P style prefilter & organic cartridge, NIOSH approved respirator. Self-contained breathing apparatus for use in environments with unknown concentrations or emergency situations.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance & Odor: Bright and clear liquid. Mild odor.

Substance Chemical Family: Petroleum Hydrocarbon

| | | | |
|------------------------------|---|-------------------------|-----------------|
| Flash Point | > 400 °F [Pensky-Martens Closed Cup] | Pour Point | -20 °F |
| Solubility (in Water) | Insoluble | Specific Gravity | 0.88 - 0.89 |
| Stability | Stable | Viscosity | 103 cSt @ 40 °C |

SECTION 10 REACTIVITY AND STABILITY

Stability:

Material is stable under normal conditions.

Conditions to Avoid:

Avoid heat and open flames.

Materials to Avoid:

Avoid contact with strong oxidizing agents.

Hazardous Decomposition Products:

Thermal decomposition products are highly dependent on combustion conditions. A complex mixture of airborne solids, liquids and gases will evolve when this material undergoes pyrolysis or combustion. Aldehydes, Carbon Monoxide, Carbon Dioxide, Hydrogen Sulfide, Ketones, Nitrogen Oxides and other unidentified organic compounds may be formed upon combustion.

SECTION 11 TOXICOLOGICAL INFORMATION

Acute Toxicity

| TEST | Result | OSHA Classification | Material Tested |
|-------------|-------------------|---------------------|------------------------|
| Dermal LD50 | >5.0 g/kg(Rabbit) | Non-Toxic | Based on components(s) |
| Oral LD50 | >5.0 g/kg(Rat) | Non-Toxic | Based on components(s) |

Carcinogenicity Classification

| Chemical Name | NTP | IARC | ACGIH | OSHA |
|----------------------|-----|----------------------|--------------|------|
| Heavy Duty Motor Oil | No | Not Reviewed by IARC | Not Reviewed | No |

SECTION 12 ECOLOGICAL INFORMATION

Environmental Impact Summary:

There is no ecological data available for this product. However, this product is an oil. It is persistent and does not readily biodegrade. However, it does not bioaccumulate.

SECTION 13 DISPOSAL CONSIDERATIONS

RCRA Information:

Under RCRA, it is the responsibility of the user of the material to determine, at the time of the disposal, whether the material meets RCRA criteria for hazardous waste. This is because material uses, transformations, mixtures, processes, etc. may affect the classification. Refer to the latest EPA, state and local regulations regarding proper disposal.

SECTION 14 TRANSPORT INFORMATION

US Department of Transportation Classification

This material is not subject to DOT regulations under 49 CFR Parts 171-180.

Oil: This product is an oil under 49CFR (DOT) Part 130. If shipped by rail or highway in a tank with a capacity of 3500 gallons or more, it is subject to these requirements. Mixtures or solutions containing 10% or more of this product may also be subject to this rule.

International Air Transport Association

Not regulated under IATA rules.

International Maritime Organization Classification
Not regulated under International Maritime Organization rules.

SECTION 15 REGULATORY INFORMATION

Federal Regulatory Status

OSHA Classification:
Under normal conditions of use or in a foreseeable emergency, this product does not meet the definition of a hazardous chemical when evaluated according to the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Ozone Depleting Substances (40 CFR 82 Clean Air Act):
This material does not contain nor was it directly manufactured with any Class I or Class II ozone depleting substances.

Superfund Amendment & Reauthorization Act (SARA) Title III:
There are no components in this product on the SARA 302 list.

SARA Hazard Categories (311/312):

| Immediate Health | Delayed Health | Fire | Pressure | Reactivity |
|------------------|----------------|------|----------|------------|
| NO | NO | NO | NO | NO |

SARA Toxic Release Inventory (TRI) (313):
Zinc compounds

Toxic Substances Control Act (TSCA) Status:
All component(s) of this material is(are) listed on the EPA/TSCA Inventory of Chemical Substances.

Other Chemical Inventories:
Component(s) of this material is (are) listed on the Australian AICS, Canadian DSL, Chinese Inventory, European EINECS, Korean Inventory, Philippines PICCS,

State Regulation

The following chemicals are specifically listed by individual states; other product specific health and safety data in other sections of the MSDS may also be applicable for state requirements. For details on your regulatory requirements you should contact the appropriate agency in your state.

SECTION 16 OTHER INFORMATION

Revision#: 1
Review Date: 04/23/2007
Revision Date: 12/19/2006
Revisions since last change (discussion): This Material Safety Data Sheet (MSDS) has been reviewed to fully comply with the guidance contained in the ANSI MSDS standard (ANSI Z400.1-2003). We encourage you to take the opportunity to read the MSDS and review the information contained therein.

SECTION 17 LABEL INFORMATION

READ AND UNDERSTAND MATERIAL SAFETY DATA SHEET BEFORE HANDLING OR DISPOSING OF PRODUCT. THIS LABEL COMPLIES WITH THE REQUIREMENTS OF THE OSHA HAZARD COMMUNICATION STANDARD (29 CFR 1910.1200) FOR USE IN THE WORKPLACE. THIS LABEL IS NOT INTENDED TO BE USED WITH PACKAGING INTENDED FOR SALE TO CONSUMERS AND MAY NOT CONFORM WITH THE REQUIREMENTS OF THE CONSUMER PRODUCT SAFETY ACT OR OTHER RELATED REGULATORY REQUIREMENTS.

PRODUCT CODE(S): 5071324, 5071325, 5071326, 5071369, 5071371

PENNZOIL™ LONG-LIFE™ Motor Oil (All Grades)

ATTENTION!

PROLONGED OR REPEATED SKIN CONTACT MAY CAUSE OIL ACNE OR DERMATITIS. USED GASOLINE ENGINE OIL HAS BEEN SHOWN TO CAUSE CANCER IN LABORATORY ANIMALS.

Precautionary Measures:

Avoid prolonged or repeated contact with eyes, skin and clothing. Avoid breathing of vapors, fumes, or mist. Use only with adequate ventilation. Wash thoroughly after handling.

FIRST AID

Inhalation: If the victim has difficulty breathing or tightness of the chest, is dizzy, vomiting or unresponsive, give 100% oxygen with rescue breathing or CPR as required and transport to the nearest medical facility.

Skin Contact: Remove contaminated clothing and shoes and wipe excess from skin. Flush skin with water, then wash with soap and water. If irritation occurs, get medical attention. Do not reuse clothing until cleaned. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.

Eye Contact: Flush with water. If irritation occurs, get medical attention.

Ingestion: Do not induce vomiting. In general, no treatment is necessary unless large quantities of product are ingested. However, get medical attention.

FIRE

In case of fire, Use water fog, 'alcohol foam', dry chemical or carbon dioxide (CO₂) to extinguish flames. Do not use a direct stream of water. Material will float and can be re-ignited on surface of water.

SPILL OR LEAK

Dike and contain spill.

FOR LARGE SPILLS: Remove with vacuum truck or pump to storage/salvage vessels.

FOR SMALL SPILLS: Soak up residue with an absorbent such as clay, sand or other suitable material. Place in non-leaking container and seal tightly for proper disposal.

CONTAINS: Highly refined petroleum oils, Mixture; Zinc Dialkyldithiophosphate, 68649-42-3; Proprietary additives; Mixture

NFPA Rating (Health, Fire, Reactivity): 0, 1, 0

TRANSPORTATION

US Department of Transportation Classification

This material is not subject to DOT regulations under 49 CFR Parts 171-180.

| | |
|-------------------------------|--|
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2A Very Toxic Materials Crystalline silica |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **LE SUPERMUL**

Revision Date: 02-Jan-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: LE SUPERMUL

Synonyms: None

Chemical Family: Blend

Application: Emulsifier

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-----------------------------------|------------|---------|----------------|----------------|
| Diethylene glycol monobutyl ether | 112-34-5 | 1 - 5% | Not applicable | Not applicable |
| Ethylene glycol monobutyl ether | 111-76-2 | 1 - 5% | 20 ppm | 50 ppm |

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye and skin irritation. May cause headache, dizziness, and other central nervous system effects. May be harmful if swallowed.

4. FIRST AID MEASURES

Inhalation If inhaled, remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult give oxygen. Get medical attention.

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention. Remove contaminated clothing and launder before reuse.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion Get medical attention! If vomiting occurs, keep head lower than hips to prevent aspiration.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | > 200 |
| Flash Point/Range (C): | Min: > 200 |
| Flash Point Method: | > 100 |
| Autoignition Temperature (F): | Min: > 93 |
| Autoignition Temperature (C): | PMCC |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Use water spray to cool fire exposed surfaces. Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 2, Flammability 1, Reactivity 0
HMS Ratings: Flammability 1, Reactivity 0, Health 2

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Wash hands after use. Launder contaminated clothing before reuse.

Storage Information Store away from oxidizers. Keep container closed when not in use. Product has a shelf life of 36 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Respiratory Protection Organic vapor respirator.
In high concentrations, supplied air respirator or a self-contained breathing apparatus.

Hand Protection Impervious rubber gloves.

Skin Protection Rubber apron.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Liquid
LE SUPERMUL
Page 2 of 6

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Color: | Amber |
| Odor: | Mild |
| pH: | 2.6 |
| Specific Gravity @ 20 C (Water=1): | 0.924 |
| Density @ 20 C (lbs./gallon): | 7.7 |
| Bulk Density @ 20 C (lbs/ft3): | Not Determined |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | 20 |
| Freezing Point/Range (C): | -6.6 |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | 280-300 |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|---|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None known. |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Oxides of nitrogen. Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness. |
| Skin Contact | May cause skin irritation. |
| Eye Contact | May cause eye irritation. |
| Ingestion | May cause abdominal pain, vomiting, nausea, and diarrhea. May cause headache, dizziness, nausea, vomiting, gastrointestinal irritation and central nervous system depression. |
| Aggravated Medical Conditions | Lung disorders. Skin disorders. |
| Chronic Effects/Carcinogenicity | Prolonged or repeated exposure may cause reproductive system damage. Repeated overexposure may cause liver and kidney effects. |

Other Information None known.

Toxicity Tests

Oral Toxicity: Not determined

Dermal Toxicity: Not determined

Inhalation Toxicity: Not determined

Primary Irritation Effect: Not determined

Carcinogenicity Not determined

Genotoxicity: Not determined

**Reproductive /
Developmental Toxicity:** Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined

Persistence/Degradability Not determined

Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined

Acute Crustaceans Toxicity: Not determined

Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|--|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity For This Product | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2B Toxic Materials |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

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*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BAROID® OIL ABSORBENT**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BAROID® OIL ABSORBENT
Synonyms: None
Chemical Family: Mineral
Application: Suspending Agent

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------|------------|-----------|-------------------------|---|
| Magnesium silicate | 1343-90-4 | 60 - 100% | Not applicable | Not applicable |
| Crystalline silica, quartz | 14808-60-7 | 2-6 | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD

May cause eye and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD

Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|---|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists. |
| Ingestion | Under normal conditions, first aid procedures are not required. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|--|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

NFPA Ratings: Health 1, Flammability 0, Reactivity 0
HMIS Ratings: Flammability 0, Reactivity 0, Health 1*

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2. |
| Respiratory Protection | Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. |
| Hand Protection | Normal work gloves. |
| Skin Protection | Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing. |
| Eye Protection | Wear safety glasses or goggles to protect against exposure. |
| Other Precautions | None known. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Physical State: | Granules |
| Color: | Gray to tan |
| Odor: | Odorless |
| pH: | Not Determined |
| Specific Gravity @ 20 C (Water=1): | 2.6 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 32-38 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Hydrofluoric acid. |
| Hazardous Decomposition Products | Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | None known. |
| Eye Contact | May cause eye irritation. |
| Ingestion | May be harmful if swallowed. |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |
| Chronic Effects/Carcinogenicity | <p>Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.</p> <p>Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).</p> <p>There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.</p> |
| Other Information | For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997). |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

| | |
|---|---|
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997). |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|----------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Not applicable |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|----------------|
| Acute Fish Toxicity: | Not determined |
| Acute Crustaceans Toxicity: | Not determined |
| Acute Algae Toxicity: | Not determined |

| | |
|----------------------------------|----------------|
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Bury in a licensed landfill according to federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard Chronic Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |

Canadian Regulations

| | |
|------------------------|--|
| Canadian DSL Inventory | Product contains one or more components not listed on inventory. |
| WHMIS Hazard Class | D2A Very Toxic Materials Crystalline silica |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **RHEMOD L**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: RHEMOD L
Synonyms: None
Chemical Family: Tall oil fatty acid
Application: Viscosifier

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-----------------------------------|------------|----------|----------------|----------------|
| Fatty acids, C18-unsatd., trimers | 68937-90-6 | 10 - 30% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye and skin irritation. May be harmful if swallowed.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | 518 |
| Flash Point/Range (C): | 270 |
| Flash Point Method: | COC |
| Autoignition Temperature (F): | > 425 |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 1, Reactivity 0
HMS Ratings: Flammability 0, Reactivity 0, Health 1

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Wash hands after use.

Storage Information Store in a cool, dry location. Product has a shelf life of 36 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Organic vapor respirator.

Hand Protection Impervious rubber gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|-----------------|----------------|
| Physical State: | Liquid |
| Color: | Dark |
| Odor: | Fatty acid |
| pH: | Not Determined |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Specific Gravity @ 20 C (Water=1): | 0.96 |
| Density @ 20 C (lbs./gallon): | 8 |
| Bulk Density @ 20 C (lbs/ft3): | 57.30 |
| Boiling Point/Range (F): | > 572 |
| Boiling Point/Range (C): | > 300 |
| Freezing Point/Range (F): | < -4 |
| Freezing Point/Range (C): | < 25 |
| Vapor Pressure @ 20 C (mmHg): | < 0.001 |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | 0 |
| Evaporation Rate (Butyl Acetate=1): | 0 |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | 1849 @ 25C |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|-------------------------------------|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None known. |
| Incompatibility (Materials to Avoid) | None known. |
| Hazardous Decomposition Products | Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|---|
| Principle Route of Exposure | Eye and skin contact. |
| Inhalation | May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness. |
| Skin Contact | May cause skin irritation. |
| Eye Contact | May cause mild eye irritation. |
| Ingestion | Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal. |
| Aggravated Medical Conditions | Skin disorders. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |

Dermal Toxicity: Not determined
Inhalation Toxicity: Not determined
Primary Irritation Effect: Not determined
Carcinogenicity Not determined
Genotoxicity: Not determined
Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Not determined
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: Not determined
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | Does not apply. |

Canadian Regulations

| | |
|------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BAROID® RIG WASH**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BAROID® RIG WASH
Synonyms: None
Chemical Family: Blend
Application: Surfactant

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-------------|------------|---------|---------------|--------------|
| Isopropanol | 67-63-0 | 1 - 5% | 200 ppm | 400 ppm |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye, skin, and respiratory irritation.

4. FIRST AID MEASURES

Inhalation: If inhaled, remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult give oxygen. Get medical attention.

Skin: Wash with soap and water. Get medical attention if irritation persists. Remove contaminated clothing and launder before reuse.

Eyes: In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion: If swallowed dilute with 1-2 glasses of milk or water and then induce vomiting.

Notes to Physician: Not Applicable

5. FIRE FIGHTING MEASURES

| | | |
|---|----------------|------------|
| Flash Point/Range (F): | Not Determined | Min: > 220 |
| Flash Point/Range (C): | Not Determined | Min: > 104 |
| Flash Point Method: | COC | |
| Autoignition Temperature (F): | Not Determined | |
| Autoignition Temperature (C): | Not Determined | |
| Flammability Limits in Air - Lower (%): | Not Determined | |
| Flammability Limits in Air - Upper (%): | Not Determined | |

| | |
|--|--|
| Fire Extinguishing Media | Water fog, carbon dioxide, foam, dry chemical. |
| Special Exposure Hazards | Decomposition in fire may produce toxic gases. |
| Special Protective Equipment for Fire-Fighters | Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel. |
| NFPA Ratings: | Health 1, Flammability 0, Reactivity 0 |
| HMS Ratings: | Flammability 0, Reactivity 0, Health 1 |

6. ACCIDENTAL RELEASE MEASURES

| | |
|--------------------------------------|--|
| Personal Precautionary Measures | Use appropriate protective equipment. |
| Environmental Precautionary Measures | Prevent from entering sewers, waterways, or low areas. |
| Procedure for Cleaning / Absorption | Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove. |

7. HANDLING AND STORAGE

| | |
|----------------------|--|
| Handling Precautions | Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. |
| Storage Information | Store away from oxidizers. Keep container closed when not in use. Product has a shelf life of 60 months. |

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|------------------------|--|
| Engineering Controls | Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation. |
| Respiratory Protection | Organic vapor respirator. |
| Hand Protection | Impervious rubber gloves. |
| Skin Protection | Rubber apron. |
| Eye Protection | Chemical goggles; also wear a face shield if splashing hazard exists. |
| Other Precautions | Eyewash fountains and safety showers must be easily accessible. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|-----------------|----------------|
| Physical State: | Liquid |
| Color: | Clear blue |
| Odor: | Slight Alcohol |
| pH: | 9.5 |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Specific Gravity @ 20 C (Water=1): | 1.025 |
| Density @ 20 C (lbs./gallon): | 8.5 |
| Bulk Density @ 20 C (lbs/ft ³): | 63.6 |
| Boiling Point/Range (F): | > 212 |
| Boiling Point/Range (C): | > 100 |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Soluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|---|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None known. |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Oxides of sulfur. Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause respiratory irritation. May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness. |
| Skin Contact | May cause skin irritation. |
| Eye Contact | May cause eye irritation. |
| Ingestion | May cause headache, dizziness, nausea, vomiting, gastrointestinal irritation and central nervous system depression. |
| Aggravated Medical Conditions | Skin disorders. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |

Dermal Toxicity: Not determined
Inhalation Toxicity: Not determined
Primary Irritation Effect: Not determined
Carcinogenicity Not determined
Genotoxicity: Not determined
Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Not determined
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: Not determined
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard |
| EPA SARA (313) Chemicals | This product contains toxic chemical(s) listed below which is(are) subject to the reporting requirements of Section 313 of Title III of SARA and 40 CFR Part 372: Glycol Ethers//34398-01-1 Isopropanol//67-63-0 |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2B Toxic Materials |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: FWCA CEMENT ADDITIVE

Revision Date: 04-Jan-2010

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: FWCA CEMENT ADDITIVE
Synonyms: None
Chemical Family: Polysaccharide
Application: Free Water Control Additive
Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000
Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------|------------|-----------|----------------------|----------------------|
| Cellulose derivative | | 60 - 100% | 10 mg/m ³ | 15 mg/m ³ |

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye and respiratory irritation. Airborne dust may be explosive.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | 770 |
| Autoignition Temperature (C): | 410 |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0
HMIS Ratings: Health 0, Flammability 0, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid creating or inhaling dust.

Storage information Store away from oxidizers. Store in a cool, dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|-----------------|----------------|
| Physical State: | Solid |
| Color: | White |
| Odor: | Characteristic |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| pH: | 6.5 |
| Specific Gravity @ 20 C (Water=1): | 1.39 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft ³): | 32 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | <5 |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Forms gel |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | >600 |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Aldehydes. Carboxylic acids. Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause mild respiratory irritation. |
| Skin Contact | None known. |
| Eye Contact | May cause mild eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |

| | |
|---|----------------|
| Inhalation Toxicity: | Not determined |
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Not determined |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|-----------------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Readily biodegradable |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|----------------|
| Acute Fish Toxicity: | Not determined |
| Acute Crustaceans Toxicity: | Not determined |
| Acute Algae Toxicity: | Not determined |
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Bury in a licensed landfill according to federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory or are exempt. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | Does not apply. |
| PA Right-to-Know Law | Does not apply. |

Canadian Regulations

| | |
|------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **HALAD® 322 CEMENT ADDITIVE**

Revision Date: 04-Jan-2010

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: HALAD® 322 CEMENT ADDITIVE

Synonyms: None

Chemical Family: Blend

Application: Cement Additive

Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------|------------|----------|----------------------|----------------------|
| Sodium formate | 141-53-7 | 1 - 5% | Not applicable | Not applicable |
| Cellulose derivative | | 10 - 30% | 10 mg/m ³ | 15 mg/m ³ |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye, skin, and respiratory irritation. Airborne dust may be explosive.

4. FIRST AID MEASURES

Inhalation: If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin: Wash with soap and water. Get medical attention if irritation persists.

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion: Under normal conditions, first aid procedures are not required.

Notes to Physician: Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0
HMIS Ratings: Health 0, Flammability 0, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid creating or inhaling dust.

Storage Information Store in a cool, dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|-----------------|----------|
| Physical State: | Solid |
| Color: | Red |
| Odor: | Odorless |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|-------------------|
| pH: | Not Determined |
| Specific Gravity @ 20 C (Water=1): | 1.28 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 35.2 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Partially soluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | >600 |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|---|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Oxides of sulfur. Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause mild respiratory irritation. |
| Skin Contact | None known. |
| Eye Contact | May cause eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |

Inhalation Toxicity: Not determined
Primary Irritation Effect: Not determined
Carcinogenicity Not determined
Genotoxicity: Not determined
**Reproductive /
Developmental Toxicity:** Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Readily biodegradable
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: Not determined
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory or are exempt. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |

Canadian Regulations

| | |
|------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

| | |
|------------------------|--|
| Additional Information | For additional information on the use of this product, contact your local Halliburton representative. For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335. |
|------------------------|--|

| | |
|----------------------|---|
| Disclaimer Statement | This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user. |
|----------------------|---|

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: HALAD® 344 CEMENT ADDITIVE

Revision Date: 04-Jan-2010

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: HALAD® 344 CEMENT ADDITIVE
Synonyms: None
Chemical Family: Polymer
Application: Fluid Loss Additive

Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-------------------------------|------------|-----------|----------------|----------------|
| Modified acrylamide copolymer | | 60 - 100% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye and respiratory irritation.

4. FIRST AID MEASURES

Inhalation: If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin: Wash with soap and water. Get medical attention if irritation persists.

Eyes: Immediately flush eyes with large amounts of water for at least 15 minutes. Get immediate medical attention.

Ingestion: Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician: Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water spray, dry chemical, or foam.

Special Exposure Hazards Decomposition in fire may produce toxic gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 0, Flammability 1, Reactivity 0
HMIS Ratings: Health 1, Flammability 1, Physical Hazard 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid creating or inhaling dust. Do not swallow. Avoid contact with eyes, skin, or clothing.

Storage Information Store in a cool, dry location. Store away from oxidizers. Keep container closed when not in use.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Dust/mist respirator. (95%)

Hand Protection Nitrile gloves. Polyvinylchloride gloves. Neoprene gloves. Rubber gloves. Butyl rubber gloves. Cloth gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Powder

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|--------------------|
| Color: | White to off white |
| Odor: | Odorless |
| pH: | Not Determined |
| Specific Gravity @ 20 C (Water=1): | 1.37 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 25-35 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | 18 |
| Freezing Point/Range (C): | -8 |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | <5 |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Soluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | >600 |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|---|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | None known. |
| Hazardous Decomposition Products | Oxides of nitrogen. Carbon monoxide and carbon dioxide. Oxides of sulfur. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause respiratory irritation. |
| Skin Contact | Prolonged or repeated contact may cause skin irritation. |
| Eye Contact | May cause eye irritation. |
| Ingestion | No adverse health effects are expected from swallowing. |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |

| | |
|---|----------------|
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Not determined |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|------------------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | BOD(28 Day): 3% of COD |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|--|
| Acute Fish Toxicity: | TLM48: 2000 mg/l (Arcatia tonsa) |
| Acute Crustaceans Toxicity: | TLM48: > 1000 mg/l (Daphnia magna) |
| Acute Algae Toxicity: | EC50: 3300 mg/l (Skeletonema costatum) |

| | |
|----------------------------------|----------------|
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Bury in a licensed landfill according to federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG

Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION**US Regulations**

| | |
|--|--|
| US TSCA Inventory | All components listed on inventory or are exempt. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |

Canadian Regulations

| | |
|-------------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION**The following sections have been revised since the last issue of this MSDS**

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **HR-5**

Revision Date: 04-Jan-2010

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: HR-5
Synonyms: None
Chemical Family: Lignosulfonate
Application: Cement Retarder

Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-------------------------|------------|-----------|----------------|----------------|
| Modified lignosulfonate | | 60 - 100% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye and respiratory irritation.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 0, Reactivity 0
HMIS Ratings: Health 1, Flammability 0, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.

Storage Information Store in a cool, dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|------------------------------------|----------|
| Physical State: | Solid |
| Color: | Black |
| Odor: | Molasses |
| pH: | 9.5-10.3 |
| Specific Gravity @ 20 C (Water=1): | 1.32 |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 29.8 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | 25 |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|-------------------|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Oxides of sulfur. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause mild respiratory irritation. |
| Skin Contact | None known. |
| Eye Contact | May cause mechanical irritation to eye. |
| Ingestion | None known |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

Primary Irritation Effect: Not determined
Carcinogenicity Not determined
Genotoxicity: Not determined
**Reproductive /
Developmental Toxicity:** Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Readily biodegradable
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: TLM96: > 1000 ppm (Crangon crangon)
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory or are exempt. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | Does not apply. |
| PA Right-to-Know Law | Does not apply. |

Canadian Regulations

| | |
|------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

| | |
|------------------------|--|
| Additional Information | For additional information on the use of this product, contact your local Halliburton representative. For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335. |
|------------------------|--|

| | |
|----------------------|---|
| Disclaimer Statement | This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user. |
|----------------------|---|

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **HR-601**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: HR-601
Synonyms: None
Chemical Family: Lignosulfonate
Application: Cement Retarder

Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-------------------------|------------|-----------|----------------|----------------|
| Modified lignosulfonate | | 60 - 100% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye and respiratory irritation.

4. FIRST AID MEASURES

Inhalation: If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin: Wash with soap and water. Get medical attention if irritation persists.

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion: Under normal conditions, first aid procedures are not required.

Notes to Physician: Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Lower (oz./ft3): | 0.2 |
| Flammability Limits in Air - Upper (%): | Not Determined |
| Flammability Limits in Air - Upper (oz./ft3): | 3.5 |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 1, Reactivity 0
HMIS Ratings: Health 1, Flammability 1, Physical Hazard 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.

Storage Information Store away from oxidizers. Store in a cool, dry location. Product has a shelf life of 24 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Physical State: | Solid |
| Color: | Brown |
| Odor: | Woody |
| pH: | 7.8 |
| Specific Gravity @ 20 C (Water=1): | 1.08 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 30.5 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Soluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|---|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Oxides of sulfur. Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause mild respiratory irritation. |
| Skin Contact | None known. |
| Eye Contact | May cause mechanical irritation to eye. |
| Ingestion | None known |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |

| | |
|---|--------------------------|
| Oral Toxicity: | LD50: > 5000 mg/kg (Rat) |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Not determined |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|-----------------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Readily biodegradable |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|------------------------------------|
| Acute Fish Toxicity: | Not determined |
| Acute Crustaceans Toxicity: | TLM48: > 1000 mg/l (Daphnia magna) |
| Acute Algae Toxicity: | Not determined |
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Bury in a licensed landfill according to federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | Does not apply. |
| PA Right-to-Know Law | Does not apply. |

Canadian Regulations

| | |
|------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: KCL POTASSIUM CHLORIDE

Revision Date: 04-Jan-2010

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: KCL POTASSIUM CHLORIDE
Synonyms: None
Chemical Family: Inorganic Salt
Application: Additive
Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000
Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|--------------------|------------|-----------|----------------|----------------|
| Potassium chloride | 7447-40-7 | 60 - 100% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory irritation.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 0, Reactivity 0
HMIS Ratings: Health 1, Flammability 0, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Avoid breathing vapors.

Storage Information Store in a cool, dry location. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Dust proof goggles.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Physical State: | Solid |
| Color: | White to gray |
| Odor: | Odorless |
| pH: | 9.2 |
| Specific Gravity @ 20 C (Water=1): | 1.99 |
| Density @ 20 C (lbs./gallon): | Not Determined |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Bulk Density @ 20 C (lbs/ft ³): | 72.8 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | 25.5 |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | 74.55 |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|------------------|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | None known. |
| Hazardous Decomposition Products | None known. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause respiratory irritation. |
| Skin Contact | May cause moderate skin irritation. |
| Eye Contact | May cause severe eye irritation. |
| Ingestion | Irritation of the mouth, throat, and stomach. May cause abdominal pain, vomiting, nausea, and diarrhea. |
| Aggravated Medical Conditions | Skin disorders. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | LD50: > 5000 mg/kg (Rat) |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

Primary Irritation Effect: Not determined
Carcinogenicity Not determined
Genotoxicity: Not determined
**Reproductive /
Developmental Toxicity:** Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Not determined
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: TLM96: 100-330 ppm (Crangon crangon)

Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory or are exempt. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | Does not apply. |
| PA Right-to-Know Law | Does not apply. |

Canadian Regulations

| | |
|------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2B Toxic Materials |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **POZ STANDARD CEMENT 50/50**

Revision Date: 05-Jan-2009

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: POZ STANDARD CEMENT 50/50
Synonyms: None
Chemical Family: Cement
Application: Cement

Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------|------------|----------|-------------------------|---|
| Fly ash | 68131-74-8 | 30 - 60% | Not applicable | Not applicable |
| Bentonite | 1302-78-9 | 1 - 5% | Not applicable | Not applicable |
| Portland cement | 65997-15-1 | 30 - 60% | 10 mg/m ³ | 15 mg/m ³ |
| Crystalline silica, quartz | 14808-60-7 | 1 - 5% | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD
May cause eye, skin, and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|---|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing. |
| Ingestion | Under normal conditions, first aid procedures are not required. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|--|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media None - does not burn.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

NFPA Ratings: Health 1, Flammability 0, Reactivity 0
HMIS Ratings: Health 1*, Flammability 0, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Product has a shelf life of 24 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2. |
| Respiratory Protection | Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. |
| Hand Protection | Normal work gloves. |
| Skin Protection | Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing. |
| Eye Protection | Wear safety glasses or goggles to protect against exposure. |
| Other Precautions | Eyewash fountains and safety showers must be easily accessible. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Physical State: | Solid |
| Color: | Gray |
| Odor: | Odorless |
| pH: | 12.4 |
| Specific Gravity @ 20 C (Water=1): | Not Determined |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft³): | Not Determined |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Not Determined |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Hydrofluoric acid. |
| Hazardous Decomposition Products | Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | Can dry skin. May cause an allergic skin reaction. May cause alkali burns with confined contact. |
| Eye Contact | May cause severe eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |
| Chronic Effects/Carcinogenicity | <p>Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.</p> <p>Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, <u>Silica, Some Silicates and Organic Fibres</u> (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).</p> <p>There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.</p> |
| Other Information | For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997). |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

| | |
|---|---|
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997). |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|----------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Not applicable |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|----------------|
| Acute Fish Toxicity: | Not determined |
| Acute Crustaceans Toxicity: | Not determined |
| Acute Algae Toxicity: | Not determined |

| | |
|----------------------------------|----------------|
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Bury in a licensed landfill according to federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|--|--|
| US TSCA Inventory | All components listed on inventory or are exempt. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard Chronic Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |

Canadian Regulations

| | |
|-------------------------------|--|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | E Corrosive Material D2A Very Toxic Materials Crystalline silica |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **CEMENT - CLASS H - PREMIUM**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: CEMENT - CLASS H - PREMIUM
Synonyms: None
Chemical Family: Cement
Application: Cement

Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------|------------|-----------|-------------------------|---|
| Portland cement | 65997-15-1 | 60 - 100% | 10 mg/m ³ | 15 mg/m ³ |
| Crystalline silica, quartz | 14808-60-7 | <3 | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD
May cause eye, skin, and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|---|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing. |
| Ingestion | Under normal conditions, first aid procedures are not required. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|---|---|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |
| Fire Extinguishing Media | None - does not burn. |
| Special Exposure Hazards | Not applicable. |
| Special Protective Equipment for Fire-Fighters | Not applicable. |
| NFPA Ratings: | Health 1, Flammability 0, Reactivity 0 |
| HMIS Ratings: | Flammability 0, Reactivity 0, Health 1* |

6. ACCIDENTAL RELEASE MEASURES

| | |
|---|---|
| Personal Precautionary Measures | Use appropriate protective equipment. Avoid creating and breathing dust. |
| Environmental Precautionary Measures | None known. |
| Procedure for Cleaning / Absorption | Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal. |

7. HANDLING AND STORAGE

| | |
|-----------------------------|--|
| Handling Precautions | Avoid contact with eyes, skin, or clothing. This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet. |
| Storage Information | Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Product has a shelf life of 24 months. |

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2. |
| Respiratory Protection | Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. |
| Hand Protection | Normal work gloves. |
| Skin Protection | Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing. |
| Eye Protection | Wear safety glasses or goggles to protect against exposure. |
| Other Precautions | Eyewash fountains and safety showers must be easily accessible. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Physical State: | Solid |
| Color: | Gray |
| Odor: | Odorless |
| pH: | 12.4 |
| Specific Gravity @ 20 C (Water=1): | 3.15 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 94 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | 0 |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | 0.5 |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | Keep away from any contact with water. |
| Incompatibility (Materials to Avoid) | Hydrofluoric acid. |
| Hazardous Decomposition Products | Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | Can dry skin. May cause an allergic skin reaction. May cause alkali burns with confined contact. |
| Eye Contact | May cause severe eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |
| Chronic Effects/Carcinogenicity | <p>Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.</p> <p>Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).</p> <p>There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.</p> |
| Other Information | For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997). |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

| | |
|---|---|
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997). |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|----------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Not applicable |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|----------------|
| Acute Fish Toxicity: | Not determined |
| Acute Crustaceans Toxicity: | Not determined |
| Acute Algae Toxicity: | Not determined |

| | |
|----------------------------------|----------------|
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Bury in a licensed landfill according to federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|--|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard Chronic Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |

Canadian Regulations

| | |
|-------------------------------|--|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | E Corrosive Material D2A Very Toxic Materials Crystalline silica |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BARACARB® 25**

Revision Date: 02-Jan-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BARACARB® 25
Synonyms: None
Chemical Family: Mineral
Application: Bridging Agent

Manufacturer/Supplier Baroid Drilling Fluids
a Product Service Line of Halliburton Energy Services, Inc.
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By Chemical Compliance
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------|------------|-----------|-------------------------|---|
| Crystalline silica, quartz | 14808-60-7 | 0 - 1% | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |
| Limestone | 1317-65-3 | 60 - 100% | 10 mg/m ³ | 15 mg/m ³ |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD
May cause eye, skin, and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|---|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists. |
| Ingestion | Under normal conditions, first aid procedures are not required. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|--|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0
HMIS Ratings: Flammability 0, Reactivity 0, Health 1*

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information Store away from acids. Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use in a well ventilated area. Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2. |
| Respiratory Protection | Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. |
| Hand Protection | Normal work gloves. |
| Skin Protection | Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing. |
| Eye Protection | Wear safety glasses or goggles to protect against exposure. |
| Other Precautions | None known. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Physical State: | Solid Powder |
| Color: | White |
| Odor: | Odorless |
| pH: | 8-9 |
| Specific Gravity @ 20 C (Water=1): | 2.7 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft³): | 168 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong acids. |
| Hazardous Decomposition Products | Carbon monoxide and carbon dioxide. Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | May cause skin irritation. |
| Eye Contact | May cause eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |
| Chronic Effects/Carcinogenicity | <p>Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.</p> <p>Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).</p> <p>There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.</p> |
| Other Information | For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997). |
| Toxicity Tests | |
| Oral Toxicity: | LD50: > 5000 mg/kg (Rat) |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

| | |
|---|---|
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997). |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|----------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Not determined |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|--|
| Acute Fish Toxicity: | Not determined |
| Acute Crustaceans Toxicity: | TLM96: >1,000,000 ppm (Mysidopsis bahia) SPP @ 178.5 ppb |
| Acute Algae Toxicity: | Not determined |

| | |
|----------------------------------|----------------|
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Bury in a licensed landfill according to federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard Chronic Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity For This Product | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |

Canadian Regulations

| | |
|------------------------|--|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2A Very Toxic Materials Crystalline silica |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BARACARB® 50**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BARACARB® 50
Synonyms: None
Chemical Family: Mineral
Application: Bridging Agent

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------|------------|-----------|-------------------------|---|
| Limestone | 1317-65-3 | 60 - 100% | 10 mg/m ³ | 15 mg/m ³ |
| Crystalline silica, quartz | 14808-60-7 | 0 - 1% | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD

May cause eye, skin, and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD

Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|---|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists. |
| Ingestion | Under normal conditions, first aid procedures are not required. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|--|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0
HMS Ratings: Flammability 0, Reactivity 0, Health 1*

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information Store away from acids. Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use in a well ventilated area. Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2. |
| Respiratory Protection | Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. |
| Hand Protection | Normal work gloves. |
| Skin Protection | Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing. |
| Eye Protection | Wear safety glasses or goggles to protect against exposure. |
| Other Precautions | None known. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Physical State: | Solid Powder |
| Color: | White |
| Odor: | Odorless |
| pH: | 8-9 |
| Specific Gravity @ 20 C (Water=1): | 2.7 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 72-112 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong acids. |
| Hazardous Decomposition Products | Carbon monoxide and carbon dioxide. Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | May cause skin irritation. |
| Eye Contact | May cause eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |
| Chronic Effects/Carcinogenicity | <p>Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.</p> <p>Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).</p> <p>There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.</p> |
| Other Information | For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997). |
| Toxicity Tests | |
| Oral Toxicity: | LD50: > 5000 mg/kg (Rat) |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

| | |
|---|--|
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997)</u> . |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|----------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Not determined |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|--|
| Acute Fish Toxicity: | Not determined |
| Acute Crustaceans Toxicity: | TLM96: >1,000,000 ppm (Mysidopsis bahia) SPP @ 178.5 ppb |
| Acute Algae Toxicity: | Not determined |

| | |
|----------------------------------|----------------|
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Bury in a licensed landfill according to federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard Chronic Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2A Very Toxic Materials Crystalline silica |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BAROID®**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BAROID®
Synonyms: None
Chemical Family: Mineral
Application: Weight Additive

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------|------------|-----------|-------------------------|---|
| Barium sulfate | 7727-43-7 | 60 - 100% | 10 mg/m ³ | 15 mg/m ³ |
| Crystalline silica, quartz | 14808-60-7 | 1 - 5% | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD

May cause eye, skin, and respiratory irritation. May be harmful if swallowed.

DANGER! - CHRONIC HEALTH HAZARD

Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|--|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists. |
| Ingestion | Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|--|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

NFPA Ratings: Health 1, Flammability 0, Reactivity 0
HMS Ratings: Flammability 0, Reactivity 0, Health 1*

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2. |
| Respiratory Protection | Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. |
| Hand Protection | Normal work gloves. |
| Skin Protection | Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing. |
| Eye Protection | Wear safety glasses or goggles to protect against exposure. |
| Other Precautions | None known. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|---------------------|
| Physical State: | Solid |
| Color: | Pink to tan to gray |
| Odor: | Odorless |
| pH: | 8-9- |
| Specific Gravity @ 20 C (Water=1): | 4.2 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 100- 155 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | 233.4 |

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | None known. |
| Hazardous Decomposition Products | Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | None known. |
| Eye Contact | May cause mild eye irritation. |
| Ingestion | May produce nervous system effects such as feeling of weakness, unsteady walk, and dilation of blood vessels. May affect the heart and cardiovascular system. |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |
| Chronic Effects/Carcinogenicity | <p>Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.</p> <p>Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).</p> <p>There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.</p> |
| Other Information | For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997). |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

| | |
|---|---|
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997). |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|----------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Not applicable |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|---|
| Acute Fish Toxicity: | TLM96: 7500 ppm (Oncorhynchus mykiss) |
| Acute Crustaceans Toxicity: | TLM96: > 1,000,000 ppm (Mysidopsis bahia) SPP @ 132.6 ppb |
| Acute Algae Toxicity: | Not determined |

| | |
|----------------------------------|----------------|
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Bury in a licensed landfill according to federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard Chronic Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |

Canadian Regulations

| | |
|------------------------|--|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2A Very Toxic Materials Crystalline silica |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **LIME**

Revision Date: 02-Jan-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: LIME
Synonyms: None
Chemical Family: Inorganic
Application: pH Control

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-------------------|------------|-----------|---------------------|----------------------|
| Calcium hydroxide | 1305-62-0 | 60 - 100% | 5 mg/m ³ | 15 mg/m ³ |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye and skin burns. May cause respiratory irritation. May be harmful if swallowed.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists. Remove contaminated clothing and launder before reuse.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not Determined

NFPA Ratings: Health 1, Flammability 0, Reactivity 0
HMS Ratings: Flammability 0, Reactivity 0, Health 1

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.

Storage Information Store away from acids. Store in a cool, dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Dust/mist respirator. (95%)

Hand Protection Impervious rubber gloves.

Skin Protection Rubber apron.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Physical State: | Solid |
| Color: | White |
| Odor: | Odorless |
| pH: | 12.2 |
| Specific Gravity @ 20 C (Water=1): | 2.24 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 75 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | 0.2 |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | 74.1 |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|------------------|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong acids. |
| Hazardous Decomposition Products | None known. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause respiratory irritation. |
| Skin Contact | Causes severe skin irritation. May cause skin burns on prolonged contact. |
| Eye Contact | Causes severe eye irritation May cause eye burns. |
| Ingestion | Irritation of the mouth, throat, and stomach. |
| Aggravated Medical Conditions | Skin disorders. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | LD50: 7340 mg/kg (Rat) |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Not determined |

Genotoxicity: Not determined
Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Not determined
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: TLM96: 100-500 ppm (Oncorhynchus mykiss)
Acute Crustaceans Toxicity: TLM96: 478,520 ppm (Mysidopsis bahia) SPP @ 8 ppb
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Empty container completely. Transport with all closures in place. Return for reuse or dispose in a sanitary landfill according to national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

15. REGULATORY INFORMATION

US Regulations

| | |
|--|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity For This Product | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2B Toxic Materials |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: WALNUT HULLS

Revision Date: 02-Jan-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: WALNUT HULLS
Synonyms: None
Chemical Family: Nut Hulls
Application: Loss Circulation Material

Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|--------------|------------|-----------|----------------|----------------|
| Walnut hulls | Mixture | 60 - 100% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye irritation.

4. FIRST AID MEASURES

Inhalation: Under normal conditions, first aid procedures are not required.

Skin: Under normal conditions, first aid procedures are not required.

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion: Under normal conditions, first aid procedures are not required.

Notes to Physician: Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|--|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Lower (oz./ft ³): | 0.07 |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0
HMS Ratings: Flammability 0, Reactivity 0, Health 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid creating or inhaling dust.

Storage Information Store away from oxidizers. Store in a dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Safety glasses.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Solid
Color: Brown
Odor: Characteristic

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| pH: | Not Determined |
| Specific Gravity @ 20 C (Water=1): | 1.1 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | Not Determined |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|-------------------|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None known. |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | None known. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause mild respiratory irritation. |
| Skin Contact | None known. |
| Eye Contact | May cause mild eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |

Inhalation Toxicity: Not determined
Primary Irritation Effect: Not determined
Carcinogenicity Not determined
Genotoxicity: Not determined
Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined

Persistence/Degradability Biodegradable

Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined

Acute Crustaceans Toxicity: TLM96: > 1,000,000 ppm (Mysidopsis bahia) SPP @ 10 ppb

Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity For This Product | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | Does not apply. |
| PA Right-to-Know Law | Does not apply. |

Canadian Regulations

| | |
|------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

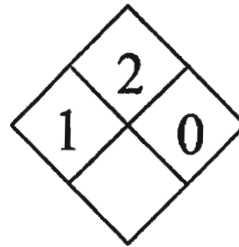
Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS



MATERIAL SAFETY DATA SHEET

SECTION I - MANUFACTURER

Integrity Industries, Inc.
2710 E. Corral St.
Kingsville, Texas 78363
Emergency Phone: (361) 595-5561

Revised Date: 06/05/2008
Supercedes: new

THIS DOCUMENT IS PREPARED PURSUANT TO THE OSHA HAZARDOUS COMMUNICATION STANDARD (29 CFR 1910.1200). ALSO, OTHER SUBSTANCE NOT DEEMED "HAZARDOUS" PER THIS MSDS MAY BE LISTED.

SECTION II - MATERIAL IDENTIFICATION

Trade Name: **SYNVERT Base Oil**
Synonyms/Other Designations: Synthetic Drilling Fluid / Polymer Suspension Base
Placard: Not Applicable
Hazard(s): non-hazardous

| <u>Component</u> | <u>CAS Number</u> | <u>Weight</u> |
|-----------------------|-------------------|---------------|
| Paraffin/Olefin blend | Mixture | 100% |

SECTION III - PHYSICAL & CHEMICAL DATA

| | |
|---------------------------------|---------------------------------------|
| Boiling Point: IBP > 300 °F | Pour Point: ND |
| Specific Gravity (H2O=1): 0.766 | Vapor Pressure (mm Hg @ 68 °F): 0.135 |
| Vapor Density (Air=1): n/a | Solubility in H2O: Insoluble |
| Appearance: Clear, oily liquid | Viscosity (cSt @104 °F): 1.4 |

SECTION IV - REACTIVITY

Stability: Stable
Incompatibility: Heat, sparks, open flame. May react with strong acids/strong oxidizing agents, chlorates, nitrates, peroxides.
Hazardous Decomposition Products: Oxides of carbon. Hazardous Polymerizations: will not occur

SECTION V - FIRE & EXPLOSION DATA

Flash Point (ASTM D-93): > 200 °F
Autoignition: n/a
Extinguishing Media: Water spray, Dry Chemical, Foam, CO2
Special Fire Fighting Procedures: Respirators/eye protection and full firefighting protective gear.
Unusual Fire Hazards: Remove containers from source of heat.

SECTION VI - EMERGENCY & FIRST AID DATA

Inhalation: Move to well ventilated area; if breathing difficulties persist after 15 minutes seek medical assistance.

Eye Contact: Wash eye thoroughly for 15 minutes; if irritation persists seek medical assistance.

Skin Contact: Wash affected area with soap & water for 15 minutes; if irritation persists seek medical assistance.

Ingestion: Do not induce vomiting and seek medical advice.

SECTION VII - HEALTH HAZARDS DATA

Acute: May irritate eyes, skin, respiratory, & gastrointestinal tract. **Chronic:** Repeated/prolonged skin contact may irritate/redden skin, progressing to dermatitis.

SECTION VIII - SPILL & DISPOSAL DATA

Accidental Spill Procedures: Absorb in inert material and dispose of according to local, state & federal regulations. Spill into water should be contained to avoid runoff into waterways.

Handling & Storage: Keep container closed and store in cool dry place. Emptied container still contains material which may ignite with explosive violence if exposed to open flame.

SECTION IX - SPECIAL PROTECTION DATA

Respiratory Protection: Respirator in confined areas.

Ventilation: Desired

Exhaust: Mechanical

Protective Gloves: Solvent/chemical resistant gloves

Eye Protection: Safety glasses, goggles.

Other Protection: As required to avoid skin contact.

SECTION X - TRANSPORT INFORMATION

The following may not apply to all shipping situations. Consult 49 CFR for more mode-specific or quantity-specific data.

DOT Proper Shipping Name: Not regulated

DOT Hazard Class or Division: Not regulated

DOT Identification Number: N/A

DOT Packaging Group: III

Type Label(s) Required: none

Placard: Not applicable

***For Limited Quantity requirements see DOT regulation 49 CFR.**

SECTION XI - DISCLAIMERS

*** SOME INFORMATION PROVIDED HEREIN WAS DRAWN FROM SOURCES OTHER THAN INTEGRITY INDUSTRIES.**

THE INFORMATION PROVIDED HEREIN IS BELIEVED BY INTEGRITY INDUSTRIES, INC. TO BE CORRECT & RELIABLE; NO EXPRESSED OR IMPLIED WARRANTY IS PROVIDED HOWEVER.

*** INTEGRITY INDUSTRIES, INC. ASSUMES NO RESPONSIBILITY AND DENIES ALL LIABILITY FOR ANY LOSS, DAMAGE, OR EXPENSE CONNECTED WITH CUSTOMERS' METHOD OF HANDLING, STORAGE, USE, AND DISPOSAL OF THIS PRODUCT.**

*** THE MSDS INFORMATION PROVIDED HEREIN IS APPLICABLE ONLY TO THIS PRODUCT.**

**TABLE 3
AGENCY NOTIFICATION LIST**

The following agencies are to be contacted, as appropriate, in the event of an emergency, accident, or chemical release.

| <u>Agency</u> | <u>Telephone No.</u> |
|---|----------------------|
| PADEP Northeast Regional Office | 570-826-2511 |
| PADEP Southcentral Office (Harrisburg) | 877-333-1904 |
| Pennsylvania Emergency Management Agency | 717-651-2001 |
| Police Department | 9-1-1 |
| Volunteer Fire Department | 9-1-1 |
| U.S. Environmental Protection Agency | 215-814-5700 |
| U.S. Coast Guard National Response Center | 800-424-8802 |
| U.S. Coast Guard (local) | 570-421-1191 |
| Pennsylvania Fish and Boat Commission | 814-445-8974 |
| Chemical Transportation Emergency Center: | |
| * Chemical Exposure Information | 800-424-9300 |

LOCAL EMERGENCY RESPONSE:

| | |
|---|--------------|
| Fire Department – | 9-1-1 |
| Wayne County Company #3, 13, 21, 28, 43, and 65 | |
| Police Department – | 9-1-1 |
| PSP, Honesdale, Pennsylvania | |
| Hospitals/Ambulances- | |
| Damascus Township Ambulance, Pennsylvania | 9-1-1 |
| MT Pleasant Ambulance | |
| Northern Wayne Ambulance | |
| Mobile 504 | |
| Wayne County Memorial Hospital, Honesdale, Pennsylvania | 570-251-6672 |
| CMC – Trauma Center, Scranton, Pennsylvania | 570-969-8128 |
| Catskill Regional Medical Hospital in Callicoon, New York | 845-887-5530 |
| Local Emergency Management | |
| Wayne County EMA | 570-253-1622 |

Exhibit 5



COPY

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

CORRECTED WELL PERMIT

| DEP USE ONLY | |
|---------------------------------|-------------------|
| Permittee's eFACTS ID 277879 | Auth ID 825419 |
| Watershed Name | Quality |

| | | | |
|---|---|---|---|
| Permittee NEWFIELD APPALACHIA PA LLC | OGO.# OGO-67425 | Permit Number 37-127-20012- | Date Issued 04/29/2010 |
| Address 363 N SAM HOUSTON PKWY E STE 2020 | | Farm Name & Well Number HL RUTLEDGE 1 1 | Well Serial # |
| | | Municipality Damascus | County Wayne |
| HOUSTON, TX 77060-2424 | | 7½' Quadrangle Name Galilee | Map Section # 2 |
| Phone (281) 847-6031 | Project # | Latitude 41-43-43.2000 | Longitude -75-11-32.1000 |
| Surf Elev at Site 1440 feet | Anticipated Total Depth 8350 feet | Well Type TE | Offset distances referenced to NE corner of map section. South 7820 feet West 6983 feet |

This permit covering the well operator and well location shown above is evidence of permission granted to conduct activities in accordance with the Oil and Gas Act and the Oil and Gas Conservation Law, if the well is subject to that act and any rules and regulations promulgated thereunder, subject to the conditions contained herein and in accordance with the application submitted for this permit. This permit does not convey any property rights.

This permit and the permittee's authority to conduct the activities authorized by this permit are conditioned upon operator's compliance with applicable law and regulations.

Notification must be given to the district oil and gas inspector, the surface landowner and political subdivision of the date well drilling will begin at least 24 hours prior to commencement of drilling activities.

The permittee hereby authorizes and consents to allow, without delay, employees or agents of the Department to have access to and to inspect all areas upon presentation of appropriate credentials, without advance notice or a search warrant. This includes any property, facility, operation or activity governed by the Oil and Gas Act, the Oil and Gas Conservation Law, the Coal and Gas Resource Coordination Act and other statutes applicable to oil and gas activities administered by the Department. The authorization and consent shall include consent to the Department to collect samples of wastewaters or gases, to take photographs, to perform measurements, surveys, and other tests, to inspect any monitoring equipment, to inspect the methods of operation and disposal, and to inspect and copy documents required by the Department to be maintained. The authorization and consent includes consent to the Department to examine books, papers, and records pertinent to any matter under investigation pursuant to the Oil and Gas Act or pertinent to a determination of whether the operator is in compliance with the above referenced statutes. This condition in no way limits any other powers granted to the Department under the Oil and Gas Act and other statutes, rules and regulations applicable to these activities as administered by the Department.

This permit does not relieve the operator from the obligation to comply with the Clean Streams Law and all statutes, rules and regulations administered by the Department.

Special Permit Conditions:

This permit expires **04/29/2011** unless drilling is commenced on or before that date and prosecuted with due diligence.

Regional Oil and Gas Program Manager

Stephen Watson
Oil & Gas Inspector

2 Public Square
Wilkes-Barre, PA 18711-0790

570-826-2320
Telephone



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

| DEP USE ONLY | |
|--|-------------------|
| Permittee's eFACTS ID 277879 | Auth ID 825419 |
| Watershed Name N. Branch Culkins Creek | Quality HQ |

WELL PERMIT **COPY**

| | | | |
|---|---|---|---|
| Permittee NEWFIELD APPALACHIA PA LLC | OGO.# OGO-67425 | Permit Number 37-127-20012- | Date issued 04/29/2010 |
| Address 363 N SAM HOUSTON PKWY E STE 2020 | | Farm Name & Well Number HL RUTLEDGE 1 1 | Well Serial # |
| | | Municipality Damascus | County Wayne |
| HOUSTON, TX 77060-2424 | | 7½' Quadrangle Name Galilee | Map Section # 2 |
| Phone (281) 847-6031 | Project # | Latitude 41-43-43.2000 | Longitude -75-11-32.1000 |
| Surf Elev at Site 1440 feet | Anticipated Total Depth 8350 feet | Well Type GS | Offset distances referenced to NE corner of map section. South 7820 feet West 6983 feet |

This permit covering the well operator and well location shown above is evidence of permission granted to conduct activities in accordance with the Oil and Gas Act and the Oil and Gas Conservation Law, if the well is subject to that act and any rules and regulations promulgated thereunder, subject to the conditions contained herein and in accordance with the application submitted for this permit. This permit does not convey any property rights.

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The permittee hereby authorizes and consents to allow, without delay, employees or agents of the Department to have access to and to inspect all areas upon presentation of appropriate credentials, without advance notice or a search warrant. This includes any property, facility, operation or activity governed by the Oil and Gas Act, the Oil and Gas Conservation Law, the Coal and Gas Resource Coordination Act and other statutes applicable to oil and gas activities administered by the Department. The authorization and consent shall include consent to the Department to collect samples of wastewaters or gases, to take photographs, to perform measurements, surveys, and other tests, to inspect any monitoring equipment, to inspect the methods of operation and disposal, and to inspect and copy documents required by the Department to be maintained. The authorization and consent includes consent to the Department to examine books, papers, and records pertinent to any matter under investigation pursuant to the Oil and Gas Act or pertinent to a determination of whether the operator is in compliance with the above referenced statutes. This condition in no way limits any other powers granted to the Department under the Oil and Gas Act and other statutes, rules and regulations applicable to these activities as administered by the Department.

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Special Permit Conditions:

This permit expires **04/29/2011** unless drilling is commenced on or before that date and prosecuted with due diligence.

Staci Gustafson for *S. Craig Labins*
Regional Oil and Gas Program Manager

Stephen Watson
Oil & Gas Inspector

2 Public Square
Wilkes-Barre, PA 18711-0790

570-826-2320
Telephone



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

COPY

| | |
|---------------------|--------------------------|
| DEP USE ONLY | |
| Site ID | Primary Fac ID 728266 |
| Client Id 277879 | Subfacility Id |

Well Record and Completion Report

| | | | | | |
|--|--------------------|--|---|---------------------------------|-------|
| Operator NEWFIELD APPALACHIA PA LLC | | DEP ID# 277879 | Well API # (Permit / Reg) 37-127-20012- | Project Number | Acres |
| Address 363 N SAM HOUSTON PKWY E STE 2020, | | | Well Farm Name & Well # HL RUTLEDGE 1 1 | Serial # | |
| City HOUSTON | State TX | Zip Code 77060-2424 | County Wayne | Municipality Damascus | |
| Phone (281) 847-6031 | Fax | USGS 7.5 min. quadrangle map Galilee | | | |

Check all that apply: Original Well Record Original Completion Report Amended Well Record Amended Completion Report

WELL RECORD Also complete the Log of Formations on back (page 2)

| | | | | | | |
|-----------------------|---------------------------------------|---------------------------------------|--|------------------------------------|----------------------------------|-----------------------------------|
| Well Type | <input type="checkbox"/> Gas | <input type="checkbox"/> Oil | <input type="checkbox"/> Combination Oil & Gas | <input type="checkbox"/> Injection | <input type="checkbox"/> Storage | <input type="checkbox"/> Disposal |
| Drilling Method | <input type="checkbox"/> Rotary - Air | <input type="checkbox"/> Rotary - Mud | <input type="checkbox"/> Cable Tool | | | |
| Date Drilling Started | Date Drilling Completed | Surface Elevation | Total Depth - Driller | Total Depth - Logger | | |
| | | ft. | ft. | ft. | | |

Casing and Tubing

Cement returned on surface casing? Yes No
Cement returned on coal protective casing? Yes No N/A

| Hole Size | Pipe Size | Wt. | Thread / Weld | Amount in Well (ft) | Material Behind Pipe Type and Amount | Packer / Hardware / Centralizers Type Size Depth | Date Run |
|-----------|-----------|-----|---------------|---------------------|---|---|----------|
| | | | | | | | |
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| | | | | | | | |

COMPLETION REPORT

Perforation Record

Stimulation Record

| Date | Interval Perforated | | Date | Interval Treated | Fluid | | Propping Agent | | Average Injection |
|------|---------------------|----|------|------------------|-------|--------|----------------|--------|-------------------|
| | From | To | | | Type | Amount | Type | Amount | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
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| | | | | | | | | | |
| | | | | | | | | | |

| | | | |
|---------------------------|-------------------------------|-------|------|
| Natural Open Flow | Natural Rock Pressure | Hours | Days |
| After Treatment Open Flow | After Treatment Rock Pressure | Hours | Days |

Well Service Companies -- Provide the name, address, and phone number of all well service companies involved.

| Name | Name | Name |
|--------------------|--------------------|--------------------|
| Address | Address | Address |
| City - State - Zip | City - State - Zip | City - State - Zip |
| Phone | Phone | Phone |

LOG OF FORMATIONS

Well API#: 37-127-20012--

(If you will need more space than this page, please photocopy the blank form before filling it in.)

| Formation Name or Type | Top (feet) | Bottom (feet) | Gas at (feet) | Oil at (feet) | Water at (fresh / brine; ft.) | Source of Data |
|------------------------|---------------|------------------|------------------|------------------|----------------------------------|----------------|
| | | | | | | |

I do hereby certify to the best of my knowledge, information and belief that the well identified on this Well Record and Completion Report has been properly cased and cemented in accordance with the requirements of 25 Pa. Code Chapter 78 and any conditions contained in the permit for this well. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Well Operator's Signature

Title:

Date:

DEP USE ONLY

Reviewed by:

Date:

Comments:



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

| | |
|---------------------|--------------------------|
| DEP USE ONLY | |
| Site ID | Primary Fac ID 728266 |
| Client Id 277879 | Subfacility Id |

Well Site Restoration Report

| | | | |
|--|---|--|---|
| A. Operator and Well Information | | <i>Please read instructions on back before completing this form.</i> | |
| Well Operator NEWFIELD APPALACHIA PA LLC | | DEP ID# 277879 | Well API # (Permit / Reg) 37-127-20012- |
| Address 363 N SAM HOUSTON PKWY E STE 2020, | | Well Farm Name & Well # HL RUTLEDGE 1 1 | |
| City HOUSTON | State TX | Zip Code 77060-2424 | Serial # |
| County Wayne | | Municipality Damascus | |
| Phone (281) 847-6031 | | Fax | |
| B. Land Application of Tophole Water | | E. Pit Disposal | |
| Date applied | pH | Describe pit closure procedures. | |
| Volume (bbls) | Spec. cond. (µmhos/cm) | | |
| C. Off-site Waste Disposal | | | |
| Type: <input type="checkbox"/> Drilling Fluid (803) | Amount: bbls | | |
| <input type="checkbox"/> Fracing Fluid (804) | bbls | | |
| <input type="checkbox"/> Other, specify: | Qty: bbls or tons | | |
| Method of disposal or reuse | | Subbase, material: Thickness: inches | |
| <input type="checkbox"/> Sewage Treatment Plant (10) | <input type="checkbox"/> Brine Treatment Plant (12) | Pit liner, material: Thickness: mils | |
| <input type="checkbox"/> Disposal Well (04) | <input type="checkbox"/> Other (08) | Pit dimensions (feet) Length: Width: Depth: | |
| <input type="checkbox"/> Landfill (05) | | | |
| Facility Information | | F. Land Application | |
| Name | Permit # | Area: Length: feet Width: feet | |
| Hauler Information | | Waste-to-soil ratio (by volume): | |
| Name | | Chemical analysis of waste | |
| Address | | Cadmium (Cd) ppm Nickel (Ni) ppm | |
| City | State Zip Code | Copper (Cu) ppm Zinc (Zn) ppm | |
| D. On-site Disposal – Drill Cuttings or Waste | | Chromium (Cr) ppm Oil and Grease % | |
| Location of center of disposal area in relation to the well: | | Lead (Pb) ppm Spec. Cond. µmhos/cm | |
| Course | Distance | Mercury (Hg) ppm | |
| degrees | | feet | |
| Describe the material disposed, including additives. | | Well Operator's Signature | |
| | | Title: Date: | |
| | | DEP USE ONLY | |
| | | Reviewed by: Date: | |
| Specify disposal method | | Comments: | |
| <input type="checkbox"/> Unlined pit, complete Section E. | <input type="checkbox"/> Dusting | | |
| <input type="checkbox"/> Lined pit, complete Section E. | <input type="checkbox"/> Solidification | | |
| <input type="checkbox"/> Land application, complete Section F. | <input type="checkbox"/> Other | | |

Instructions for Well Site Restoration Report

Form 5500-FM-OG0075

Use this form to file the Well Site Restoration Report as required under 25 Pa. Code § 78.65(3). This report is to be filed with the department within 60 days after the restoration of the well site.

Section A. Operator and Well Information

Enter the name, address and telephone number of the well operator/permittee.

Provide the requested well information.

Section B. Land Application Of Tophole Water

Land application of tophole water must be performed in accordance with 25 Pa. Code § 78.60.

Provide the date(s) when tophole water was applied to the land, the estimated volume discharged, and the pH and specific conductance readings of the tophole water.

Section C. Off-site Waste Disposal

If disposing of residual waste off-site, complete this section.

Check the box next to each type of waste taken off-site for disposal. More than one box may be checked. Identify the number of barrels of drilling or fracing fluid removed. If checking "other", identify the waste and show the amount in either barrels or tons. Circle the appropriate unit of measurement.

Check the box next to the type of facility or site receiving the waste. Provide the name and permit number of the facility.

Provide the name and address of the person or company hauling the waste.

Section D. On-site Disposal – Drill Cuttings or Waste

If disposing of drill cuttings and/or residual waste on-site in accordance with 25 Pa. Code § 78.61 (Disposal of drill cuttings), § 78.62 (Disposal of residual waste—pits), or § 78.63 (Disposal of residual waste—land application), complete this section.

Locate the approximate center of the disposal area by giving the course in degrees and the distance in feet from the wellhead.

Describe the types of materials that were disposed on-site. Include drill cuttings above the surface casing seat, drill cuttings below the surface casing seat, cement returns, drilling muds, frac sands, and any other material that is being disposed on-site. Indicate any additives that were in the materials being disposed.

Additives are usually present to modify the performance of cement, drilling muds or frac sands. An example might be salt or oil in drilling muds.

Check the box next to the on-site disposal methods used. If "other" is checked, briefly describe the method of disposal.

Section E. Pit Disposal

If disposing of drill cuttings under 25 Pa. Code § 78.61 (Disposal of drill cuttings) complete the pit dimensions part of this section. If disposing of drill cuttings and/or residual waste under 25 Pa. Code § 78.62 (Disposal of residual waste—pits), complete all of this section.

Describe the procedures used to close the pit. The procedures should conform to requirements in 25 Pa. Code § 78.62.

Describe the type of material and thickness used for the subbase and pit liner. The manufacturer should be identified when describing the type of material used for the pit liner.

Provide the dimensions of the pit, giving the appropriate length, width, and depth in feet.

Section F. Land Application

If disposing of drill cuttings and/or residual waste including contaminated drill cuttings under 25 Pa. Code § 78.63, complete this section.

Provide the approximate length and width of the land application area in feet. Indicate the ratio of waste to soil by volume. As an example, if a 3-inch layer of waste was mixed into a 6-inch layer of soil the ratio would be 1/2. In no case may the ratio exceed 1/1.

Complete the chemical analysis information if it is requested by the department. The analysis is to be performed on the waste soil mixture after land application has occurred. See the guidelines for land application in the "Oil and Gas Operators Manual" for taking samples and for analysis methods.

If more room is needed to complete any section, provide the information on 8 ½" by 11" sheets of paper and attach to this form. Indicate the sections the information applies to.



pennsylvania

DEPARTMENT OF ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

Dear Operator:

Enclosed please find well permit(s) issued for drilling or altering a well. Developing this resource in a safe and environmentally protective manner is of utmost importance. As you may be aware, there have been several recent incidences where water supplies have been affected by natural gas migration. In order to prevent future impacts to the Commonwealth's water resources and provide a mechanism for ensuring public safety, the Department is providing the following information as a reminder of the cementing requirements for oil and gas wells.

Cementing

Properly cementing the casing of a well is critical to protecting water resources, preventing gas migration, and ensuring well integrity. If the casing is improperly cemented or if insufficient cement is used, such as when cement is not returned to the surface, the operator should notify the Department pursuant to 25 Pa. Code § 78.86.

In addition, when cementing surface casing, 25 Pa. Code § 78.85 states that the cement must be allowed to set for at least 8 hours *and* until the cement attains a compressive strength of at least 350 psi. While the cement is setting, the casing must not be disturbed. This includes any activity that may cause movement or pressure changes to the casing or the cement sheath surrounding the casing. After the cement is set, care must be taken when drilling through the plug to prevent damaging the seal at the casing seat.

Disturbing the casing while cement is setting or damaging the seal at the casing seat may provide a mechanism for gas and other fluids to escape from the well and contaminate groundwater and water supplies. If this occurs, the operator must notify the Department.

In addition, the Department also reminds you of the following reporting requirements for oil and gas wells.

Reporting

1. Pursuant to Section 212(b) of the Oil and Gas Act and Section 78.122(a) of Chapter 78 of the Oil and Gas Regulations, a **Well Record** must be submitted to the Department within thirty (30) days of cessation of drilling or altering a well.
2. Pursuant to Section 212(b) of the Oil and Gas Act and Section 78.122(b) of Chapter 78 of the Oil and Gas Regulations, a **Completion Report** must be submitted to the Department within thirty (30) days of completion of the well. A copy of the Well Record and Completion Report is enclosed with this letter. This is a newly revised form which requires the operator to certify that the well has been cased and cemented according to the requirements of 25 Pa. Code Chapter 78. Well Record and Completion Report forms that do not contain this certification will not be accepted by the Department. Additional copies of this form can be obtained from the Department's eLibrary at <http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-9841>

3. Pursuant to Section 212(a) of the Oil and Gas Act, a report specifying the well status and production on the most well-specific basis available is to be provided to the Department. Section 78.121 of Chapter 78 details the reporting time frames required for various well types, waste reporting, and the acceptable format for the **Well and Waste Production Report** submissions.
4. Also note that pursuant to Section 212(b) of the Oil and Gas Act, the Department has the authority to request and does hereby request you submit a digital copy on CD of **ALL Well Logs** (temperature, electrical, radioactive, gamma ray, neutron, induction, resistivity, multi-arm caliper, acoustic, optical, etc.) that have been run on this well.

The above records and logs are to be submitted to the Department of Environmental Protections, Oil and Gas Management, 230 Chestnut St., Meadville, Pa 16335-3481 to the attention of the Regional Oil and Gas Manager.

Thank you for your cooperation in this matter.

Sincerely,



S. Craig Lobins
Regional Manager
Oil and Gas Management

Please note that the most recent revision of the Application for Drilling or Altering a Well must be submitted with all drilling applications. Please check the website below for the most recent revisions for all forms.
http://www.dep.state.pa.us/dep/depurate/minutes/oilgas/o_iforms.htm

The Erosion, Sediment & Storm Water Control Module is no longer being accepted for ESCGP-1 applications. Please submit the complete ESCGP-1 application for any projects. The most recent revisions must be submitted along with the application fee of \$500.00

RUTLEDGE WELL PAD
 NEWFIELD APPALACHIA PA LLC.

DAMASCUS TOWNSHIP, WAYNE COUNTY, PENNSYLVANIA

EROSION & SEDIMENT CONTROL PLAN

MAY 2010

| DRAWING INDEX | |
|---------------|---------------------------------------|
| No. | DRAWING TITLE |
| C-1 | EROSION & SEDIMENT CONTROL PLAN |
| C-2 | CONSTRUCTION DETAILS |
| C-3 | EROSION & SEDIMENT CONTROL DETAILS |
| C-4 | STAKEOUT & SITE ELEVATION PLAN |
| C-5 | SITE SECTIONS |
| C-6 | CONSTRUCTION DETAILS & EQ. QUANTITIES |
| C-7 | CONSTRUCTION SPECIFICATIONS |



TETRA TECH

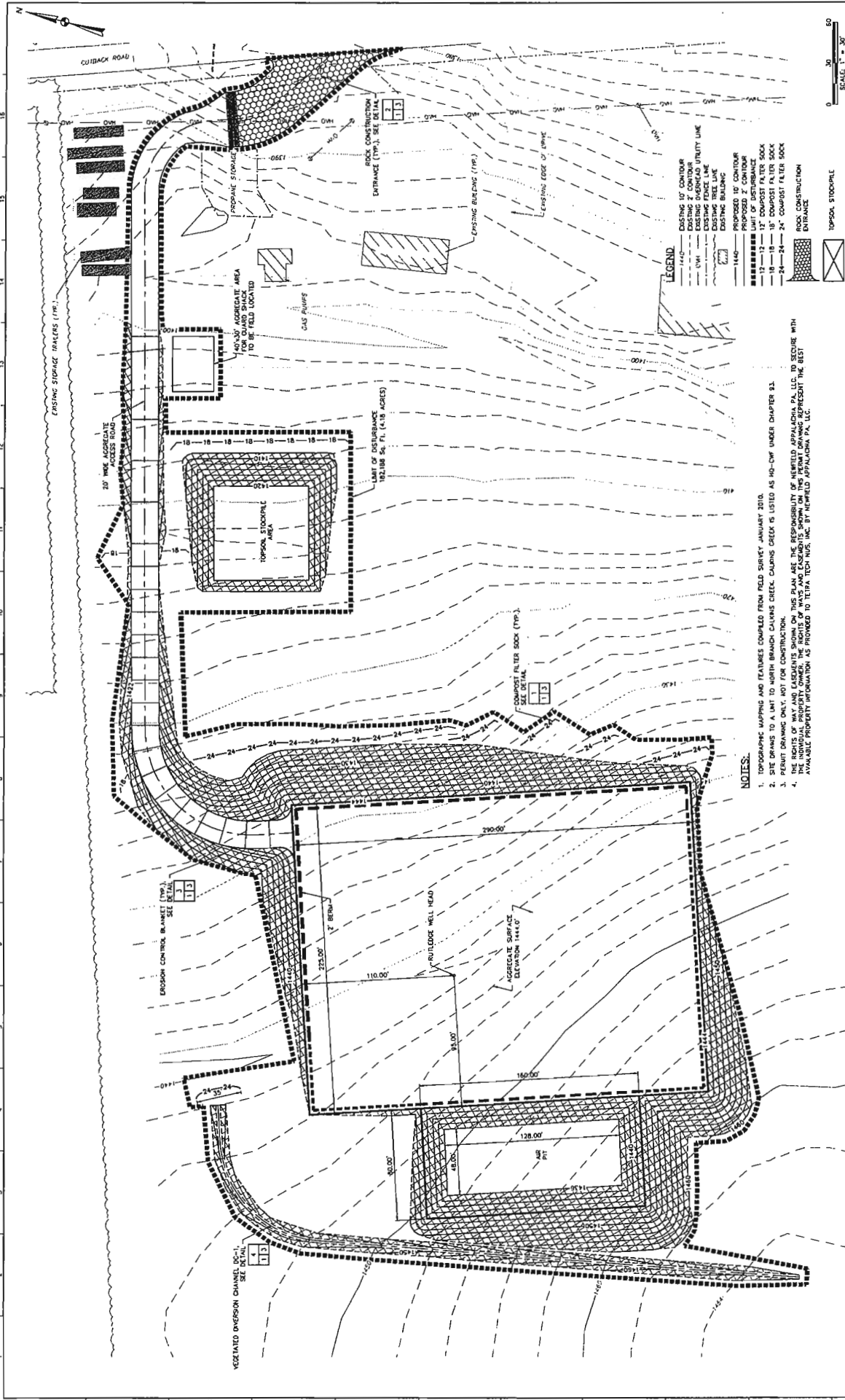
complex world | CLEAR SOLUTIONS™

661 ANDERSEN DRIVE - FOSTER PLAZA VI, PITTSBURGH, PA 15220
 TEL: (412) 921-7090 | FAX: (412) 921-4040



LOCATION MAP
 GAULEE, PA. - USGS 7.5' QUADRANGLE
 RUTLEDGE WELL PAD
 WAYNE COUNTY, PENNSYLVANIA
 SCALE: 1" = 2000'

0 2000 4000
 SCALE: 1" = 2000'



LEGEND

- EXISTING 10' CONTOUR
- EXISTING 2' CONTOUR
- EXISTING OVERHEAD UTILITY LINE
- EXISTING FENCE LINE
- EXISTING BUILDING
- PROPOSED 10' CONTOUR
- PROPOSED 2' CONTOUR
- LIMIT OF DISTURBANCE
- 18" - 18" COMPOSITE FILTER SOCK
- 24" - 24" - 24" COMPOSITE FILTER SOCK
- NON-CONSTRUCTION ENTRANCE
- TOPSOIL STOCKPILE

- NOTES:**
1. TOPOGRAPHIC MAPPING AND FEATURES COMPILED FROM FIELD SURVEY JANUARY 2010.
 2. SITE DRAINS TO A LIFT TO NORTH BRANCH CALKINS CREEK. CALKINS CREEK IS LISTED AS HQ-CW UNDER CHAPTER 83.
 3. PERMIT DRAWING ONLY, NOT FOR CONSTRUCTION.
 4. THE RIGHTS OF WAY AND EASEMENTS SHOWN ON THIS PLAN ARE THE RESPONSIBILITY OF NEWFIELD APPALACHIA PA, LLC TO SECURE WITH THE INDIVIDUAL PROPERTY OWNER. THE RIGHTS OF WAY AND EASEMENTS SHOWN ON THIS PERMIT DRAWING REPRESENT THE BEST AVAILABLE PROPERTY INFORMATION AS PROVIDED TO TETRA TECH, INC. BY NEWFIELD APPALACHIA PA, LLC.

SCALE: 1" = 30'

| | |
|--------------|-----------|
| DATE: | 3/6/10 |
| PROJECT NO.: | 115202978 |
| DESIGNED BY: | BAL |
| DRAWN BY: | BAL |
| CHECKED BY: | MB |
| SHEET: | 1 OF 7 |
| APPARATUS: | TOP-10 |

NEWFIELD APPALACHIA PA LLC,
WAYNE COUNTY, PENNSYLVANIA

**RUTLEDGE WELL PAD
EROSION & SEDIMENT CONTROL PLAN**

SCALE: 1" = 30'

| MARK | DATE | DESCRIPTION |
|------|------|-------------|
| | | |
| | | |
| | | |
| | | |
| | | |

TETRA TECH

641 ANDERSON DRIVE
PITTSBURGH, PA 15220
T: (412) 921-7990 | F: (412) 921-6040



DATE: 3/6/10
PROJECT NO.: 115202978
DESIGNED BY: BAL
DRAWN BY: BAL
CHECKED BY: MB
SHEET: 1 OF 7
APPARATUS: TOP-10
SCALE: 1" = 30'

STANDARD EROSION AND SEDIMENT CONTROL PLAN NOTES

1. STODPOLE HEIGHTS MUST NOT EXCEED 35 FEET. STODPOLE SLOPES MUST BE 2:1 OR FLATTER.
2. THE OPERATOR SHALL ASSURE THAT THE APPROVED EROSION AND SEDIMENT CONTROL PLAN IS PROPERLY IMPLEMENTED.
3. UNLESS OTHERWISE SPECIFIED, THE OPERATOR SHALL ASSURE THAT THE BEST MANAGEMENT PRACTICES ARE IMPLEMENTED, OPERATED, AND MAINTAINED. THE OPERATOR SHALL MAINTAIN AND MAKE AVAILABLE TO DEPARTMENT OF ENVIRONMENTAL PROTECTION, PUNJIC CONSTRUCTION, INC., RECORDS OF THE EROSION AND SEDIMENT CONTROL PLAN. RECORDS SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION AND SHALL BE MADE AVAILABLE TO THE DEPARTMENT OF ENVIRONMENTAL PROTECTION UPON REQUEST.
4. ALL BANKING OF SEDIMENT LAGOON WATER SHALL BE THROUGH A SEDIMENT CONTROL BMP, SUCH AS A PUMPED WATER FILTER BAG DISCHARGING OVER NON-DISTURBED AREAS.
5. THE CONTRACTOR SHALL REVIEW THE PROVISIONS OF THE APPROXIMATE 84, EROSION CONTROL RULES AND REGULATIONS, TITLE 25, PART 1. DEPARTMENT OF ENVIRONMENTAL PROTECTION, SUBPART C, PROTECTION OF NATURAL RESOURCES, APPROXIMATE 84, WATER RESOURCES, CHAPTER 101, EROSION CONTROL.
6. A COPY OF THE EROSION AND SEDIMENT CONTROL PLAN MUST BE ON THE PROJECT SITE AT ALL TIMES.
7. EROSION AND SEDIMENT BMPs MUST BE CONSTRUCTED, STABILIZED, AND FUNCTIONAL BEFORE SITE DISTURBANCE BEGINS WITHIN THE PROJECT AREA(S) OF THESE AREAS.
8. EROSION AND SEDIMENT BMPs MUST BE MAINTAINED THROUGHOUT CONSTRUCTION AND SHALL BE REMOVED, AREAS DISTURBED DURING REMOVAL OF THE BMPs MUST BE STABILIZED IMMEDIATELY.
9. AN AREA SHALL BE CONSIDERED TO HAVE ACHIEVED FINAL STABILIZATION WHEN IT HAS A UNIFORM THICKNESS PERMANENT VEGETATIVE COVER OR OTHER PERMANENT NON-VEGETATIVE COVER WITH A DENSITY SUFFICIENT TO RESIST ACCELERATED SURFACE EROSION AND SURFACE CHARACTERISTICS SUFFICIENT TO RESIST SOIL AND OTHER INCIDENTS.
10. ALL EROSION AND SEDIMENT CONTROL BMPs SHALL BE CONSTRUCTED AND MAINTAINED THROUGHOUT CONSTRUCTION AND SHALL BE REMOVED IMMEDIATELY UPON COMPLETION OF CONSTRUCTION ACTIVITIES IN THOSE AREAS INVOLVED IN THOSE ACTIVITIES SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION.
11. ALL BUFFER AREAS SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION. BUFFER AREAS SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION AND SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION. BUFFER AREAS SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION AND SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION.
12. AT STREAM CROSSINGS, 50' BUFFER AREAS SHOULD BE MAINTAINED ON BOTH SIDES. CLEARINGS, SOIL DISTURBANCES, EXCAVATION, AND EROSION SHOULD BE LIMITED TO THE BUFFER AREAS. BUFFER AREAS SHOULD BE MAINTAINED THROUGHOUT CONSTRUCTION AND SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION.
13. MULCH OR EROSION CONTROL BARNETS MUST BE INSTALLED ON ALL SLOPES 2:1 AND STEEPER.
14. BRUSHPILE MULCH AND EROSION CONTROL BARNETS MUST BE USED TO STABILIZE AREAS OUTSIDE OF STEEP SLOPES, WETLANDS, FLOODPLAINS OR OTHER AREAS.
15. THE OPERATOR SHALL REMOVE FROM THE SITE, RECYCLE OR REUSE OR ALL BUILDING MATERIALS AND WASTES IN ACCORDANCE WITH THE DEPARTMENT'S SOLID WASTE MANAGEMENT REGULATIONS AT 25 PA CODE 260.1 ET SEQ., 271.1 ET SEQ., AND 267.1 ET SEQ. THE CONTRACTOR SHALL NOT ILLEGALLY BURN, DUMP, OR DISCHARGE ANY BUILDING MATERIAL, OR WASTES AT THE SITE.

| BU | TEMPORARY EROSION AND SEDIMENT CONTROLS INSPECTION AND MAINTENANCE SCHEDULE | MAINTENANCE TO BE PERFORMED |
|-----|---|---|
| BU1 | WEEDS AND AFTER RAINFALL EVENTS | WEEDS SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION AND SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION. WEEDS SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION AND SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION. |
| BU2 | ROCK CONSTRUCTION ENTRANCE | CONTRACTOR SHALL MAINTAIN/SUPPLY MATERIAL AS NEEDED THROUGHOUT CONSTRUCTION AND SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION. WEEDS SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION AND SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION. |
| BU3 | MULCH STABILIZATION REG AND TIME | REPLACE MULCH, REGS AND TIME AS REQUIRED. RESTORE SEEDING IN AFFECTED AREA, IF NECESSARY. |

REVEGETATION

- A. TEMPORARY GRASS COVER SHALL BE ESTABLISHED IN THE FOLLOWING AREAS:**
1. THE EROSION CONTROL AREAS TO BE EXPOSED FOR A PERIOD GREATER THAN THIRTY (30) DAYS.
 2. WATER VEGETATIVE FILTER BAGS MUST BE ESTABLISHED BELOW FILTER BAGS. A MINIMUM DISTANCE OF 10 FT SHALL BE MAINTAINED FROM THE TRAP OUTLET. TEMPORARY COVER - SEED SHALL BE APPLIED TO THE TEMPORARY COVER SHALL BE ESTABLISHED IMMEDIATELY UPON COMPLETION OF CONSTRUCTION. SUPPLIES APPROVED BY THE OWNER'S REPRESENTATIVE PRIOR TO SEEDING. APPLY 1 TON OF COMPOSTED MANURE PER ACRE PLUS FERTILIZER AT THE RATE OF 15-30-30 LB. PER ACRE AND WORK INTO SOIL.

B. PERMANENT COVER:

RECOMMENDED PERMANENT SEED MIXTURES

| MIXTURE NUMBER | SEASON (SEEDING RATE LB/AC.) | SEASON (SEEDING RATE LB/AC.) |
|----------------|--|--|
| 1 | COOL (BROODFOOT REF[10], PLUS TALL FESCUE[4], OR PERENNIAL RYEGRASS[15], PLUS BROODFOOT REF[10]) | COOL (BROODFOOT REF[10], PLUS TALL FESCUE[4], OR PERENNIAL RYEGRASS[15], PLUS BROODFOOT REF[10]) |
| 2 | COOL (BROODFOOT REF[10], PLUS TALL FESCUE[4], OR PERENNIAL RYEGRASS[15], PLUS BROODFOOT REF[10]) | COOL (BROODFOOT REF[10], PLUS TALL FESCUE[4], OR PERENNIAL RYEGRASS[15], PLUS BROODFOOT REF[10]) |
| 3 | COOL (BROODFOOT REF[10], PLUS TALL FESCUE[4], OR PERENNIAL RYEGRASS[15], PLUS BROODFOOT REF[10]) | COOL (BROODFOOT REF[10], PLUS TALL FESCUE[4], OR PERENNIAL RYEGRASS[15], PLUS BROODFOOT REF[10]) |
| 4 | WARM (BERNARDINE[5], PLUS BROODFOOT REF[10], PLUS BROWN TOP FESCUE[25], OR PERENNIAL RYEGRASS[15], PLUS BROODFOOT REF[10]) | WARM (BERNARDINE[5], PLUS BROODFOOT REF[10], PLUS BROWN TOP FESCUE[25], OR PERENNIAL RYEGRASS[15], PLUS BROODFOOT REF[10]) |
| 5 | WARM (BERNARDINE[5], PLUS BROODFOOT REF[10], PLUS BROWN TOP FESCUE[25], OR PERENNIAL RYEGRASS[15], PLUS BROODFOOT REF[10]) | WARM (BERNARDINE[5], PLUS BROODFOOT REF[10], PLUS BROWN TOP FESCUE[25], OR PERENNIAL RYEGRASS[15], PLUS BROODFOOT REF[10]) |
| 6 | WARM (BERNARDINE[5], PLUS BROODFOOT REF[10], PLUS BROWN TOP FESCUE[25], OR PERENNIAL RYEGRASS[15], PLUS BROODFOOT REF[10]) | WARM (BERNARDINE[5], PLUS BROODFOOT REF[10], PLUS BROWN TOP FESCUE[25], OR PERENNIAL RYEGRASS[15], PLUS BROODFOOT REF[10]) |

RECOMMENDED PERMANENT SEED MIXTURES FOR STABILIZING DISTURBED AREAS

| SITE CONDITION | SEED MIXTURE |
|--|--------------|
| COOL (BROODFOOT REF[10], PLUS TALL FESCUE[4], OR PERENNIAL RYEGRASS[15], PLUS BROODFOOT REF[10]) | 2, 4 OR 6 |
| COOL (BROODFOOT REF[10], PLUS TALL FESCUE[4], OR PERENNIAL RYEGRASS[15], PLUS BROODFOOT REF[10]) | 2 |
| COOL (BROODFOOT REF[10], PLUS TALL FESCUE[4], OR PERENNIAL RYEGRASS[15], PLUS BROODFOOT REF[10]) | 1, 2 OR 3 |
| COOL (BROODFOOT REF[10], PLUS TALL FESCUE[4], OR PERENNIAL RYEGRASS[15], PLUS BROODFOOT REF[10]) | 2 OR 6 |
| COOL (BROODFOOT REF[10], PLUS TALL FESCUE[4], OR PERENNIAL RYEGRASS[15], PLUS BROODFOOT REF[10]) | 1 OR 2 |
| COOL (BROODFOOT REF[10], PLUS TALL FESCUE[4], OR PERENNIAL RYEGRASS[15], PLUS BROODFOOT REF[10]) | 2 OR 6 |
| COOL (BROODFOOT REF[10], PLUS TALL FESCUE[4], OR PERENNIAL RYEGRASS[15], PLUS BROODFOOT REF[10]) | 2 |
| COOL (BROODFOOT REF[10], PLUS TALL FESCUE[4], OR PERENNIAL RYEGRASS[15], PLUS BROODFOOT REF[10]) | 4 OR 6 |
| COOL (BROODFOOT REF[10], PLUS TALL FESCUE[4], OR PERENNIAL RYEGRASS[15], PLUS BROODFOOT REF[10]) | 2 |
| COOL (BROODFOOT REF[10], PLUS TALL FESCUE[4], OR PERENNIAL RYEGRASS[15], PLUS BROODFOOT REF[10]) | 2, 4 OR 5 |
| COOL (BROODFOOT REF[10], PLUS TALL FESCUE[4], OR PERENNIAL RYEGRASS[15], PLUS BROODFOOT REF[10]) | 2, 3 OR 6 |

CONSTRUCTION SEQUENCE

REFER TO THE BASIC PLAN DRAWINGS FOR THE LOCATION OF THE PROPOSED WORK AND THE ASSOCIATED BMPs. A GENERALIZED CONSTRUCTION SEQUENCE IS PROVIDED BELOW. THE CONSTRUCTION SEQUENCE IS INTENDED TO PROVIDE A GENERAL COURSE OF ACTION IN ORDER TO CONFORM TO THE APPLICABLE REGULATORY AGENCY REQUIREMENTS FOR TEMPORARY AND PERMANENT SOIL EROSION AND SEDIMENTATION CONTROL. ALL NECESSARY PARTS FOR PROPER AND COMPLETE EXECUTION OF WORK REMAINING TO THIS PLAN, WHETHER SPECIFICALLY MENTIONED OR NOT, ARE TO BE PROVIDED BY THE CONTRACTOR. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS, PRICES OF MATERIAL OR EQUIPMENT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS, PRICES OF MATERIAL OR EQUIPMENT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS, PRICES OF MATERIAL OR EQUIPMENT.

1. LOCATE STAGING AREAS AND ACCESS POINTS INCLUDING CONSTRUCTION ENTRANCES. INSTALL COMPOST FILTER BAGS AND SEDIMENT CONTROL BARNETS TO THE ROCK CONSTRUCTION ENTRANCE DETAIL ON DRAWINGS FOR PROPOSED CONSTRUCTION ENTRANCE. REFER TO THE ROCK CONSTRUCTION ENTRANCE DETAIL ON DRAWINGS FOR PROPOSED CONSTRUCTION ENTRANCE.
2. INSTALL COMPOST FILTER SOCKS ALONG THE PERIMETER OF THE SITE AS SHOWN ON THE CONSTRUCTION DRAWINGS. DISCHARGE LOCATION, LOCATIONS ARE SHOWN ON PLAN SHEET C-1.
3. INSTALL EROSION CONTROL BARNETS ON ALL SLOPES GREATER THAN 2:1 AS SHOWN ON THE CONSTRUCTION DRAWINGS.
4. CHASE SURFACE TO FINISHED GRADE ELEVATIONS AS SOON AS PRACTICABLE.
5. INSTALL EROSION CONTROL BARNETS ON ALL SLOPES GREATER THAN 2:1 AS SHOWN ON THE CONSTRUCTION DRAWINGS.
6. MAINTAIN TOTAL AREA OF DISTURBANCE. MAINTAIN ALL TEMPORARY SOIL STODPOLES WITHIN EXISTING SOIL EROSION CONTROL BARNETS.
7. MAINTAIN ALL EROSION AND SEDIMENTATION CONTROL DEVICES UNTIL SITE WORK IS COMPLETE AND A MINIMUM 70% PERMANENT VEGETATIVE COVER AND AGGREGATE STABILIZATION IS ESTABLISHED.
8. MAINTAIN ALL EROSION AND SEDIMENTATION CONTROL DEVICES UNTIL SITE WORK IS COMPLETE AND A MINIMUM 70% PERMANENT VEGETATIVE COVER AND AGGREGATE STABILIZATION IS ESTABLISHED.
9. MAINTAIN ALL EROSION AND SEDIMENTATION CONTROL DEVICES UNTIL SITE WORK IS COMPLETE AND A MINIMUM 70% PERMANENT VEGETATIVE COVER AND AGGREGATE STABILIZATION IS ESTABLISHED.
10. MAINTAIN ALL EROSION AND SEDIMENTATION CONTROL DEVICES UNTIL SITE WORK IS COMPLETE AND A MINIMUM 70% PERMANENT VEGETATIVE COVER AND AGGREGATE STABILIZATION IS ESTABLISHED.
11. MAINTAIN ALL EROSION AND SEDIMENTATION CONTROL DEVICES UNTIL SITE WORK IS COMPLETE AND A MINIMUM 70% PERMANENT VEGETATIVE COVER AND AGGREGATE STABILIZATION IS ESTABLISHED.
12. MAINTAIN ALL EROSION AND SEDIMENTATION CONTROL DEVICES UNTIL SITE WORK IS COMPLETE AND A MINIMUM 70% PERMANENT VEGETATIVE COVER AND AGGREGATE STABILIZATION IS ESTABLISHED.
13. THIS TASK PLAN.

SITE RESTORATION

AREAS AT FINAL GRADE ARE TO BE SEED, MULCHED AND STABILIZED IMMEDIATELY AS SPECIFIED ABOVE. WITHIN NINE MONTHS AFTER COMPLETION OF DRILLING THE WELL, THE OIL AND GAS WELL OWNER OR OPERATOR MUST RESTORE THE LAND SURFACE WITHIN THE AREA DISTURBED IN DRILLING, COMPLETING AND PRODUCING THE WELL. THIS INCLUDES:

- REWORKING OR FILLING THE PIT USED TO CONTAIN PRODUCED FLUIDS OR INDUSTRIAL WASTES AND DRILL CUTTINGS. PROCEDURES FOR PROPER WASTE HANDLING AND DISPOSAL SHALL BE IN ACCORDANCE WITH DEP ACCEPTED PRACTICES AND STANDARDS.
- REWORKING ALL DRILLING SUPPLIES NOT NEEDED FOR PRODUCTION. DRILLING SUPPLIES AND EQUIPMENT NOT NEEDED FOR PRODUCTION MAY BE STORED AT THE WELL SITE IF THE EXPRESS WRITTEN CONSENT OF THE SURFACE LANDOWNER IS OBTAINED.
- REWORKING ALL DRILLING SUPPLIES NOT NEEDED FOR PRODUCTION. DRILLING SUPPLIES AND EQUIPMENT NOT NEEDED FOR PRODUCTION MAY BE STORED AT THE WELL SITE IF THE EXPRESS WRITTEN CONSENT OF THE SURFACE LANDOWNER IS OBTAINED.
- REWORKING ALL DRILLING SUPPLIES NOT NEEDED FOR PRODUCTION. DRILLING SUPPLIES AND EQUIPMENT NOT NEEDED FOR PRODUCTION MAY BE STORED AT THE WELL SITE IF THE EXPRESS WRITTEN CONSENT OF THE SURFACE LANDOWNER IS OBTAINED.

EROSION AND SEDIMENTATION DUE TO EARLY DISTURBANCES NECESSARY FOR SITE RESTORATION. THESE AREAS ARE TO BE SEED AND MULCHED UPON COMPLETION.



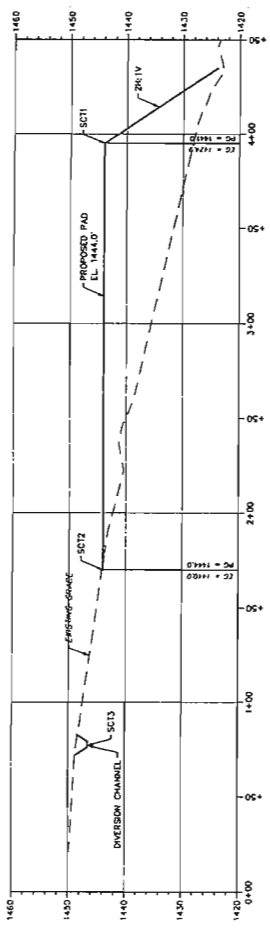
TETRA TECH
 Environmental Services, Inc.
 881 ANKERSON DRIVE - FOSTER TOWER
 PITTSBURGH, PA 15220
 T: (412) 921-7990 | F: (412) 921-6040

| | |
|--------------|----------|
| DATE: | 5/6/09 |
| PROJECT NO.: | 11202928 |
| DRAWN BY: | ARS |
| CHECKED BY: | ARS |
| APPROVED BY: | ARS |

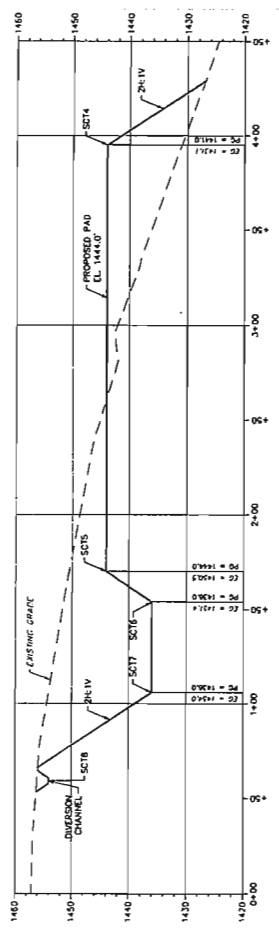
**NEWFIELD APPALACHIA PA LLC,
 WAYNE COUNTY, PENNSYLVANIA
 RUTLEDGE WELL PAD
 EROSION & SEDIMENT CONTROL NOTES**

SCALE: NOT TO SCALE
 C-2

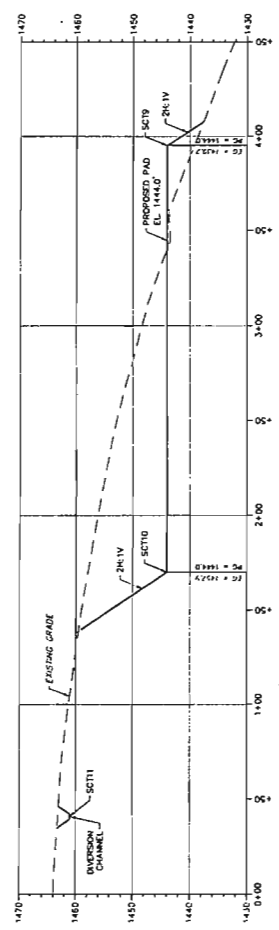
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SECTION 1
SCALE: HORIZ. 1" = 30'
VERT. 1" = 10'



SECTION 2
SCALE: HORIZ. 1" = 30'
VERT. 1" = 10'



SECTION 3
SCALE: HORIZ. 1" = 30'
VERT. 1" = 10'



DATE: 5/6/20
PROJECT NO.: 132027B
DESIGNED BY: B4
DRAWN BY: B4
CHECKED BY: JWB
SHEET: 5 OF 7
APPROPRIATE TO: C-5

NEWFIELD APPALACHIA PA LLC.
WAYNE COUNTY, PENNSYLVANIA
RUTLEDGE WELL PAD
SITE SECTIONS

| MARK | DATE | DESCRIPTION | BY: |
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TETRA TECH
www.tetra-tech.com
600 ANDERSON DRIVE - FOSTER PALAZZ 3
PITTSBURGH, PA 15270
P: (412) 281-1001 F: (412) 281-4646

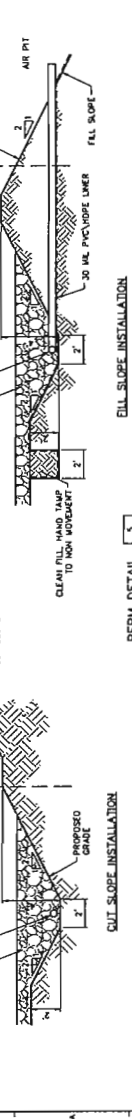
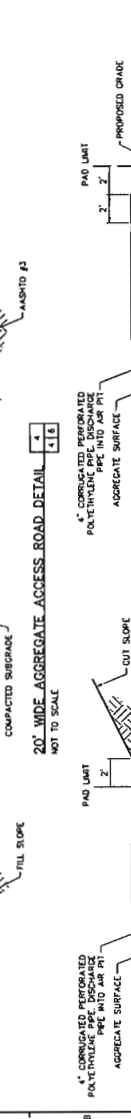
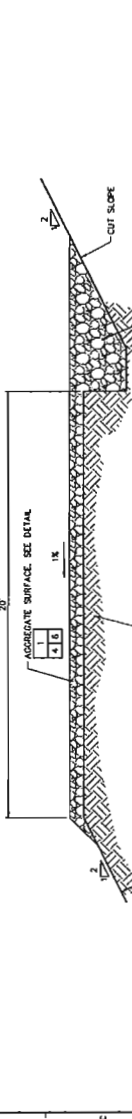
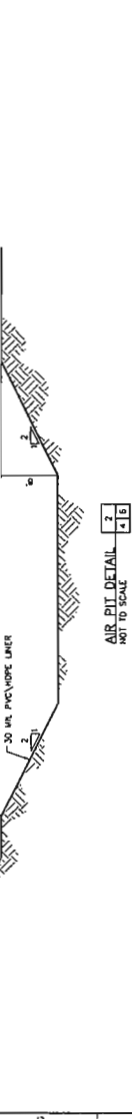
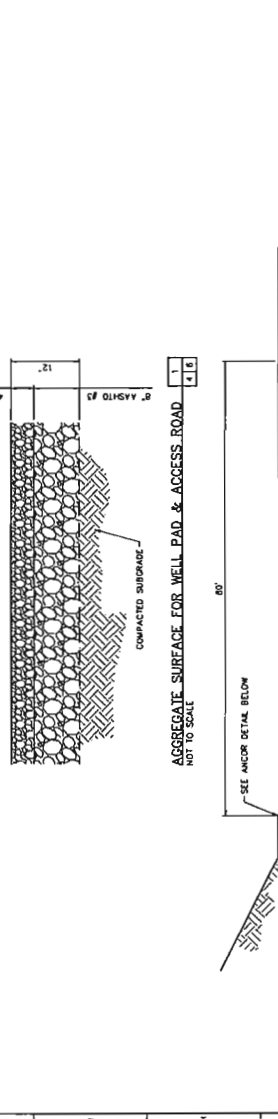


SCALE: AS NOTED
DATE: 5/6/20

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

PROJECT BID QUANTITIES

| ITEM | DESCRIPTION | UNITS | QUANTITY |
|------|---|-------------|----------|
| 1 | UTILIZATION/DECOMMISSIONIZATION | LUMP SUM | 1 |
| 2 | CLEARING & GRUBBING | ACRE | 4.98 |
| 3 | EXCAVATION | CUBIC YARD | 2,000 |
| 4 | CONCRETE FILLER SOCK - 12" DIAMETER | LINEAR FOOT | 700 |
| 5 | COMPOST FILLER SOCK - 18" DIAMETER | LINEAR FOOT | 300 |
| 6 | COMPOST FILLER SOCK - 24" DIAMETER | LINEAR FOOT | 300 |
| 7 | CONCRETE FILLER SOCK - 36" DIAMETER | LINEAR FOOT | 300 |
| 8 | ROCK CONSTRUCTION ENTRANCE | EACH | 1 |
| 9 | EARTHWORK (INCLUDES ACCESS ROAD, WELL PAD & TRAPSPONGE BIDDIES) | CUBIC YARD | 15,750 |
| 10 | CONCRETE | CU YD | 11.1 |
| 11 | TEMPORARY SED. SUPPLEMENTS & MASH | ACRE | 11.1 |
| 12 | REPAIR | CUBIC YARD | 10 |
| 13 | CONCRETE | CU YD | 11.1 |
| 14 | TEMPORARY BLANKET | SOQAUE YARD | 5,400 |
| 15 | 30 ML PVC/VDPE LINER | SOQAUE YARD | 3,000 |
| 16 | 2" CORRUGATED POLY ETHYLENE PIPE | LINEAR FOOT | 1,000 |
| 17 | 2" CORRUGATED POLY ETHYLENE PIPE | LINEAR FOOT | 1,000 |
| 18 | TEMPORARY CHAIN LINK FENCE DURING CONSTRUCTION | LINEAR FOOT | N/A |
| 19 | VALVE PIPE FOR ACCESS ROAD CROSSING | LINEAR FOOT | N/A |
| 20 | MAINTENANCE AND REPAIR OF EROSION CONTROL DEVICES | LUMP SUM | 1 |



DATE: 5/9/10
 PROJECT NO.: 11222273
 DRAWING NO.: 20
 CHECKED BY: ASB
 SHEETS: 6 OF 7
 CUSTOMER: TETRA TECH

NEWFIELD APPALACHIA PA LLC.
 WAYNE COUNTY, PENNSYLVANIA

RUTLEDGE WELL PAD
 CONSTRUCTION DETAILS & BID QUANTITIES

SCALE: AS NOTED

MARK: DATE: DESCRIPTION

TETRA TECH
 www.tetratech.com
 661 ANDERSON BLDG. P. FOSTER PLAZA 7
 FORT WORTH, TX 76102
 T: (412) 831-7000 | F: (412) 821-4040

AUDIT CONTROL NO.

711723

COMMONWEALTH OF PENNSYLVANIA

HIGHWAY OCCUPANCY PERMIT



M-40P (1/200)

Permit No: 04016278
 Organization: 016
 Date Issued: 090195
 Permit Fees: 25.00
 Account No.: _____
 County: 63
 Township/Boro: 206

PERMITTEE
 HAROLD & JEANNE RUTLEDGE
 ADDRESS
 R R 1 BOX 220
 POST OFFICE ZIP CODE
 EQUINUNK PA 18417-

County: WAYNE
 Township/Boro: DAMASCUS

Description: 511 ①
 State Route No.: 1025
 Segment(s): 0050 0050
 Offset To Offset: 1584 1584

Bond/Agreement Number: _____
 ALL WORK UNDER THIS PERMIT MAY BE STARTED ON 09/01/95
 AND SHALL BE COMPLETED ON OR BEFORE 09/01/96

Immediately upon completion of the work, Permittee shall notify the permit office where application was made. Subject to all the conditions, restrictions, and regulations prescribed by the Pennsylvania Department of Transportation, (see in particular 87 Pa. Code, Chapter 203, 441 and 466) and subject to the plans, special conditions, or restrictions herein set forth or attached hereto. This permit shall be located at the work site and shall be available for inspection by any police officer or department representative.

Description: _____ ②
 State Route No.: _____
 Segment(s): _____
 Offset To Offset: _____

DESCRIPTION OF WORK
 INSTALL MINIMUM USE DRIVEWAY AT SR 1025 SEG 0050 OFFSET 1584 TO SFG 0050 OFFSET 1584 RIGHT OF WAY. SURFACE DRAINAGE MAY NOT BE DIRECTED ONTO STATE RIGHT OF WAY.

Description: _____ ③
 State Route No.: _____
 Segment(s): _____
 Offset To Offset: _____

IT IS THE PERMITTEE'S RESPONSIBILITY TO KEEP VEGETATION TRIMMED IN ORDER TO MAINTAIN MINIMUM SIGHT DISTANCE. NO OBJECTS MAY BE PLACED WITHIN THE LINE OF SIGHT. MINIMUM WORK ZONE TRAFFIC CONTROL TO BE IN ACCORDANCE WITH PUB 208 FIGURE(S) 5, 7, 10A. PLANS DEPICTING THE HIGHWAY OCCUPANCY ARE FILED AS PUBLIC DOCUMENTS IN THE DEPARTMENT OF TRANSPORTATION, ENGINEERING DISTRICT 4-0 PERMIT OFFICE.

Township/Boro: _____ ④
 Description: _____
 State Route No.: _____
 Segment(s): _____
 Offset To Offset: _____

ALL DISTURBED AREAS OUTSIDE THE PAVEMENT OR SHOULDER SHALL BE RESTORED TO A CONDITION AT LEAST EQUAL TO THAT WHICH EXISTED BEFORE THE START OF WORK. SHOULDERS MUST BE RESTORED IN ACCORDANCE WITH APPROPRIATE SECTION OF PUB. 408 AND ROADWAY CONSTRUCTION STANDARD RC-25. DEPARTMENT MUST BE NOTIFIED IN WRITING UPON COMPLETION OF WORK.
 X
 X
 X

THIS PERMIT IS NOT VALID UNTIL SIGNED BY THE DISTRICT ENGINEER OR HIS AUTHORIZED REPRESENTATIVE

Acknowledgment of Completion
 Permitted work has been completed
 Date 9-10-96 By [Signature]

FOR [Signature]
 BRADLEY L. MALLORY
 SECRETARY OF TRANSPORTATION
 BY CHARLES M. MATTEI, P.E.
 DISTRICT ENGINEER

RECORDING COPY/COUNTY COMPLETION REPORT

M-945A (10/93)
Central Forms Office



APPLICATION FOR MINIMUM USE DRIVEWAY

A Minimum Use Driveway is a Residential or Other Driveway Which is Expected to Be Used By Not More Than 25 Vehicles Per Day (i.e. 50 A.D.T.)

APPL. NO. 840205

READ INSTRUCTIONS ON REVERSE

Applicant / Property Owner
Harold + Jeanne Rutledge
 Address
RR 1 Box 228 Equinunk Pa
 Post Office
Equinunk Zip Code
18417
 Phone
224-4776 Fax
25.00 Check No.
919

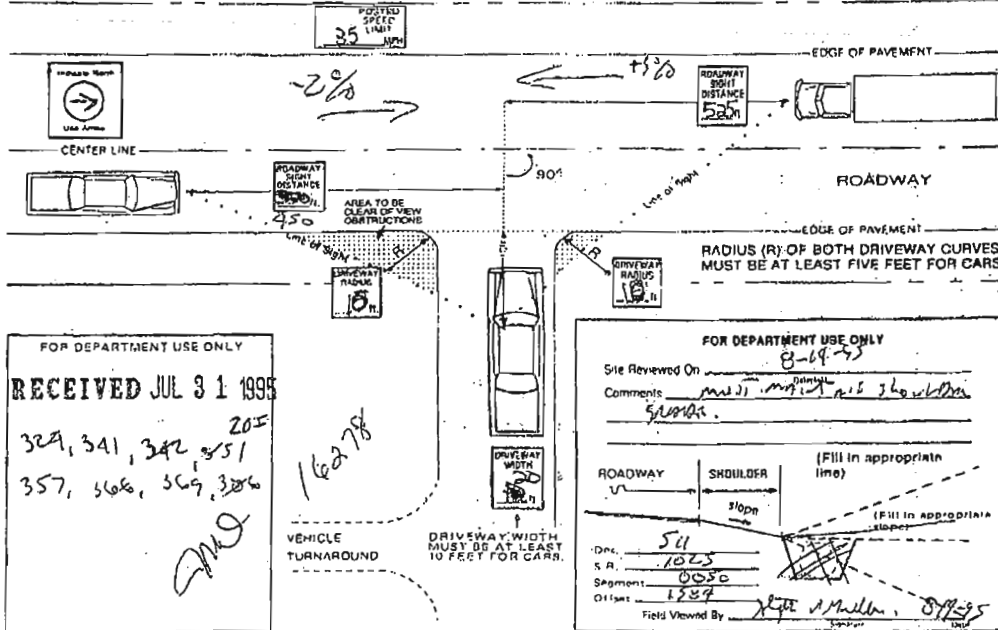
LOCATION OF PROPOSED DRIVEWAY
 County **Wayne (631)**
 Township/Boro **Damascus (206)**
 Route No. **SR 1025**
 Name of Nearest Intersection **SR 1012 / SR 1025**
 Distance to Nearest Intersection in Feet **1705**

APPLICATION IS MADE TO

CONSTRUCT A NEW DRIVEWAY ALTER AN EXISTING DRIVEWAY

DATE WORK SCHEDULED TO BEGIN 9-95
 DATE WORK SCHEDULED TO BE COMPLETED 10-95

For the purpose of measuring sight distance, the drivers' eye height shall be 3.50 feet above the proposed access surface and highway pavement surface and the vehicles' height shall be 4.25 feet above the proposed access surface and highway pavement surface.



Under and subject to all the conditions, restrictions and regulations prescribed by the Pennsylvania Department of Transportation and on the issued Permit, Form M-945P.

The applicant certifies that all statements contained herein are true and correct

By X Jeanne Rutledge
 SIGNATURE(S)

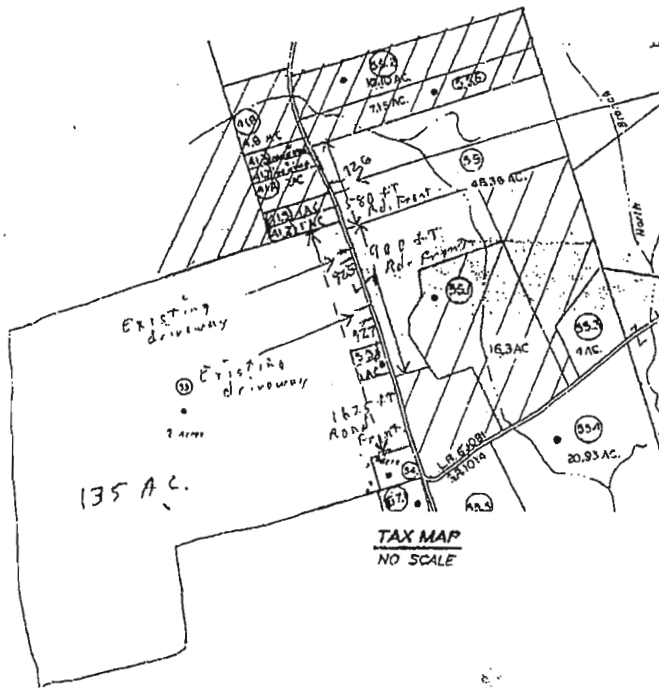
7/25/95
 DATE

HAVE YOU READ INSTRUCTIONS ON REVERSE?
 HAVE YOU COMPLETED ALL BLANKS?

ENCLOSURE(S) MUST BE ATTACHED TO THE FRONT OF THIS APPLICATION



~~SOCIAL MAP~~
SCALE: 1"=1000'



Proposed driveway
driveway will be
245 FT from North
boundary and 330 FT from
southern boundary of
subdivided Lot.

[Handwritten signature]

AUDIT CONTROL NO.

711724

M-940P (12/93)

COMMONWEALTH OF PENNSYLVANIA



HIGHWAY OCCUPANCY PERMIT

Permit No. 04016279
 Organization 046
 Date Issued 090195
 Permit Fees 25.00
 Account No. _____
 County 43
 Township/Boro 206

PERMITTEE
 HAROLD A JEANNE RUTLEDGE
 ADDRESS
 R R 1 BOX 228
 POST OFFICE ERLJUNK PA ZIP CODE 18417-

County WAYNE
 Township/Boro DANABCUS

Description 512 ①
 State Route No. 1025
 Segment(s) 0050 0050
 Offset To Offset 1056 1056

Bond/Agreement Number _____
 ALL WORK UNDER THIS PERMIT MAY BE STARTED ON 09/01/95
 AND SHALL BE COMPLETED ON OR BEFORE 09/01/96

Immediately upon completion of the work, Permittee shall notify the permit office where application was made. Subject to all the conditions, restrictions, and regulations prescribed by the Pennsylvania Department of Transportation, (see in particular 67 Pa. Code, Chapter 205, 441 and 458) and subject to the plans, special conditions, or restrictions herein set forth or attached hereto. This permit shall be located at the work site and shall be available for inspection by any police officer or department representative.

Description _____ ②
 State Route No. _____
 Segment(s) _____
 Offset To Offset _____

DESCRIPTION OF WORK
 INSTALL MINIMUM USE DRIVEWAY WITH DRAINAGE FACILITIES AT SR 1025 SEG 0050 OFFSET 1056 TO SEG 0050 OFFSET 1056 DRAINAGE INSTALLED BY THIS PERMIT IS THE RESPONSIBILITY OF THE PERMITTEE TO CONTINUALLY MAINTAIN OR REPLACE. THIS PERMIT AUTHORIZES WORK ONLY IN DEPARTMENT HIGHWAY RIGHT OF WAY.

Description _____ ③
 State Route No. _____
 Segment(s) _____
 Offset To Offset _____

IT IS THE PERMITTEE'S RESPONSIBILITY TO KEEP VEGETATION TRIMMED IN ORDER TO MAINTAIN MINIMUM SIGHT DISTANCE. NO OBJECTS MAYBE PLACED WITHIN THE LINE OF SIGHT. MINIMUM WORK ZONE TRAFFIC CONTROL TO BE IN ACCORDANCE WITH PUB. 205 FIGURE(S) 5, 7, 10A. PLANS DEPICTING THE HIGHWAY OCCUPANCY ARE FILED AS PUBLIC DOCUMENTS IN THE DEPARTMENT OF TRANSPORTATION, ENGINEERING DISTRICT 4-0 PERMIT OFFICE.

Township/Boro _____ ④
 Description _____
 State Route No. _____
 Segment(s) _____
 Offset To Offset _____

ALL DISTURBED AREAS OUTSIDE THE PAVEMENT OR SHOULDER SHALL BE RESTORED TO A CONDITION AT LEAST EQUAL TO THAT WHICH EXISTED BEFORE THE START OF WORK. SHOULDERS MUST BE RESTORED IN ACCORDANCE WITH APPROPRIATE SECTION OF PUB. 402 AND ROADWAY CONSTRUCTION STANDARD GC-25. DEPARTMENT MUST BE NOTIFIED IN WRITING UPON COMPLETION OF WORK.
 X
 X

THIS PERMIT IS NOT VALID UNTIL SIGNED BY THE DISTRICT ENGINEER OR HIS AUTHORIZED REPRESENTATIVE

Acknowledgment of Completion
 Permitted work has been completed
 Date 9-20-96 By Stephen A. Mallory

Bradley L. Mallory
 FOR BRADLEY L. MALLORY
 SECRETARY OF TRANSPORTATION
 BY CHARLES H. MATTEI, P.E.
 DISTRICT ENGINEER

RECORDING COPY/COUNTY COMPLETION REPORT

AL-880A (10/92)
Central Permit Office



APPLICATION FOR MINIMUM USE DRIVEWAY

A Minimum Use Driveway is a Residential or Other Driveway Which is Expected to Be Used By Not More Than 25 Vehicles Per Day (i.e. 50 A.D.T.)

APPL. NO. 340297

READ INSTRUCTIONS ON REVERSE

Applicant / Property Owner
 Harold + Jeanne Rutledge
 Address
 RR1 Box 228 Equinok Pa
 Equinok
 Post Office
 224-4776
 Zip Code
 18417
 Fee
 25.00
 Check No.
 919

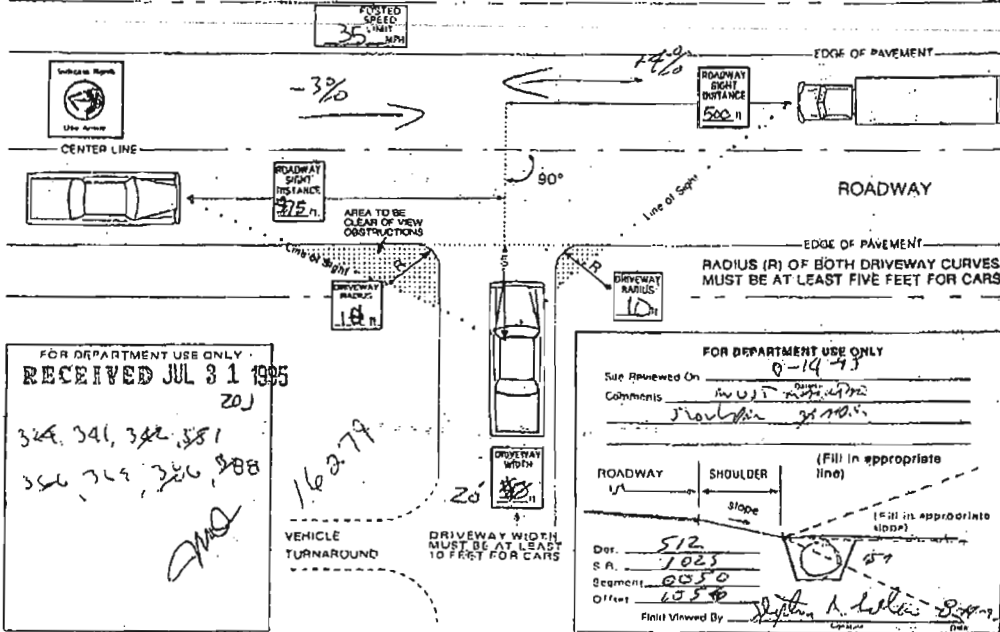
LOCATION OF PROPOSED DRIVEWAY
 County Wayne (63)
 Township/Boro Amascus (206)
 Route No. SR 1025
 Name of Nearest Intersection SR 1014 / SR 1025
 Distance to Nearest Intersection in Feet 925 feet

APPLICATION IS MADE TO

- CONSTRUCT A NEW DRIVEWAY ALTER AN EXISTING DRIVEWAY

DATE WORK SCHEDULED TO BEGIN _____
 DATE WORK SCHEDULED TO BE COMPLETED _____

For the purpose of measuring sight distance, the driver's eye height shall be 3.50 feet above the proposed access surface and highway pavement surface and the vehicle's height shall be 4.25 feet above the proposed access surface and highway pavement surface.



Under and subject to all the conditions, restrictions and regulations prescribed by the Pennsylvania Department of Transportation and on the issued Permit, Form M-945P.

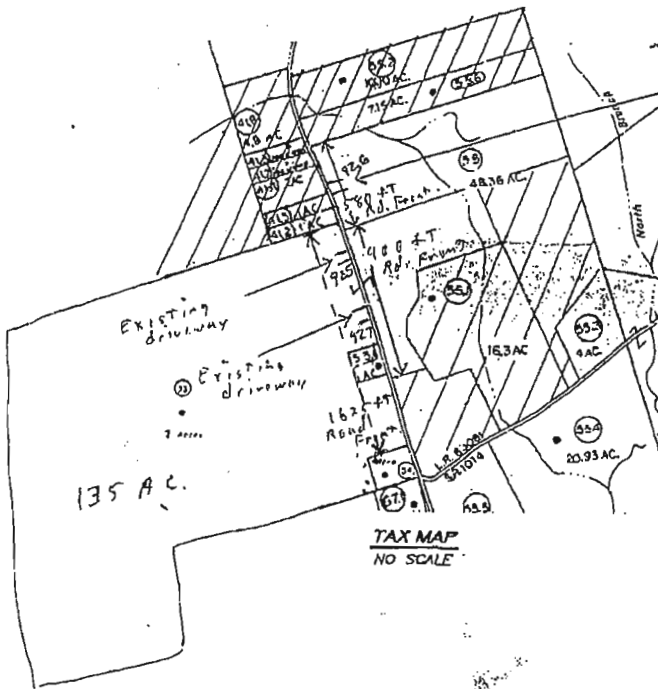
The applicant certifies that all statements contained herein are true and correct.

By X Jeanne Rutledge SIGNATURE(S) DATE 7/25/95
 HAVE YOU READ INSTRUCTIONS ON REVERSE?
 HAVE YOU COMPLETED ALL BLANKS?

DISTRICT PERMIT OFFICE - CENTRAL OFFICE (PHILADELPHIA)



~~TOPOGRAPHIC MAP~~
SCALE: 1" = 100'



Proposed driveway
driveway will be
245 FT from North
boundary and 330 FT from
southern boundary of
subdivided lot.

NOTES

MICROFILM

AUDIT CONTROL NO.

711725

HP-246P (12/93)

COMMONWEALTH OF PENNSYLVANIA



HIGHWAY OCCUPANCY PERMIT

Permit No. 04016280
 Organization 046
 Date Issued 09/01/96
 Permit Fees 25.00
 Account No.
 County 63
 Township/Boro 206

PERMITTEE
 HAROLD & JEANNE RUTLEDGE
 ADDRESS
 R R 1 BOX 226
 POST OFFICE EQUINUNK PA 18417- ZIP CODE

County WAYNE
 Township/Boro DAMASCUS

Bond/Agreement Number

Description 511 ①
 State Route No. 1025
 Segment(s) 0050 0050
 Offset To Offset 2000 2000

ALL WORK UNDER THIS PERMIT MAY BE STARTED ON 09/01/96
 AND SHALL BE COMPLETED ON OR BEFORE 09/01/96

Immediately upon completion of the work, Permittee shall notify the permit office where application was made. Subject to all the conditions, restrictions, and regulations prescribed by the Pennsylvania Department of Transportation (see in particular 37 Pa. Code, Chapter 203, 441 and 459) and subject to the plans, special conditions, or restrictions heretofore set forth or attached hereto. This permit shall be located at the work site and shall be available for inspection by any police officer or department representative.

Description
 State Route No.
 Segment(s)
 Offset To Offset

DESCRIPTION OF WORK
 INSTALL MINIMUM USE DRIVEWAY AT BR 1025 SEG 0050 OFFSET 2000 TO SEG 0050 OFFSET 2000 THIS PERMIT AUTHORIZES WORK ONLY IN DEPARTMENT HIGHWAY RIGHT OF WAY. SURFACE DRAINAGE MAY NOT BE DIRECTED ONTO STATE RIGHT OF WAY.

Description
 State Route No.
 Segment(s)
 Offset To Offset

IT IS THE PERMITTEE'S RESPONSIBILITY TO KEEP VEGETATION TRIMMED IN ORDER TO MAINTAIN MINIMUM SIGHT DISTANCE. NO OBJECTS MAY BE PLACED WITHIN THE LINE OF SIGHT. MINIMUM WORK ZONE TRAFFIC CONTROL TO BE IN ACCORDANCE WITH PUB. 203 FIGURE(S) 5, 7, 10A. PLANS DEPICTING THE HIGHWAY OCCUPANCY ARE FILED AS PUBLIC DOCUMENTS IN THE DEPARTMENT OF TRANSPORTATION, ENGINEERING DISTRICT 4-0 PERMIT OFFICE.

Township/Boro
 Description
 State Route No.
 Segment(s)
 Offset To Offset

ALL DISTURBED AREAS OUTSIDE THE PAVEMENT OR SHOULDER SHALL BE RESTORED TO A CONDITION AT LEAST EQUAL TO THAT WHICH EXISTED BEFORE THE START OF WORK. SHOULDERS MUST BE RESTORED IN ACCORDANCE WITH APPROPRIATE SECTION OF PUB. 408 AND ROADWAY CONSTRUCTION STANDARD RC-25. DEPARTMENT MUST BE NOTIFIED IN WRITING UPON COMPLETION OF WORK.

THIS PERMIT IS NOT VALID UNTIL SIGNED BY THE DISTRICT ENGINEER OR HIS AUTHORIZED REPRESENTATIVE

Acknowledgment of Completion
 Permitted work has been completed
 Date 9-13-96 By Stephen L. Mallory

FOR *Richard D. Cothran*
 BRADLEY L. MALLORY
 SECRETARY OF TRANSPORTATION
 BY CHARLES N. MATTEI, P.E.
 DISTRICT ENGINEER

RECORDING OCCUPANCY CONSTRUCTION REPORT

M-960A (10/93)
General Permit Office



APPLICATION FOR MINIMUM USE DRIVEWAY

A Minimum Use Driveway is a Residential or Other Driveway Which is Expected to Be Used By Not More Than 25 Vehicles Per Day (i.e. 60 A.D.T.)

APPL. NO. 548706

READ INSTRUCTIONS ON REVERSE

Applicant / Property Owner
Harold + Jeanne Rutledge
 Address
RR 1 Box 228 Equinunk Pa.
 Post Office
Equinunk Zip Code
18417
 Phone
224-4776 Fax
25.00 Check No.
919

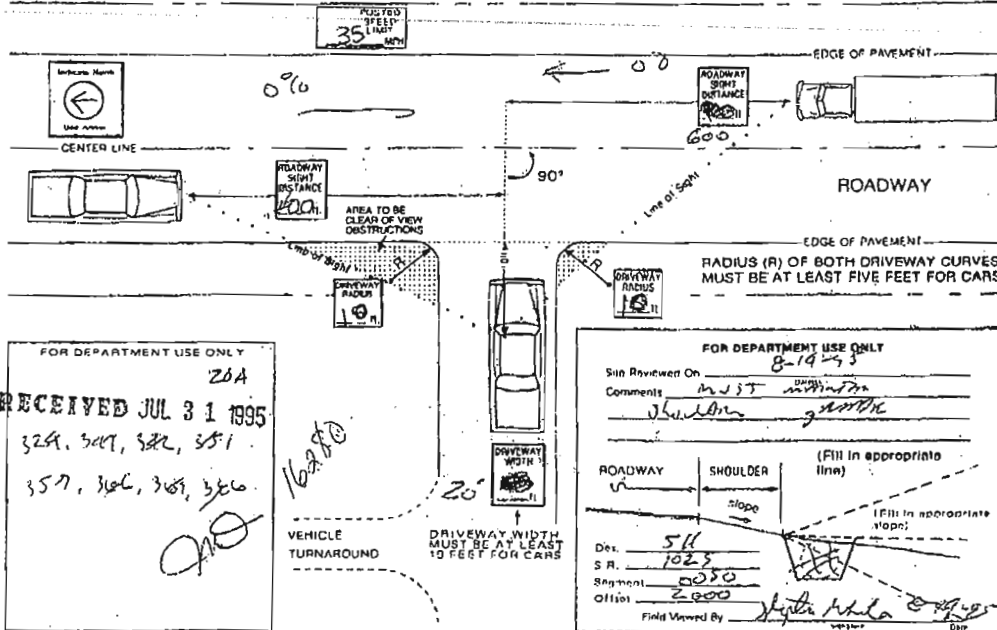
LOCATION OF PROPOSED DRIVEWAY
 County **Wayne (4)**
 Township/Boro **Damascus (26)**
 Route No. **SR 1025**
 Name of Nearest Intersection **SR 1014 / SR 1025**
 Distance to Nearest Intersection in Feet **1325 ft**

APPLICATION IS MADE TO

- CONSTRUCT A NEW DRIVEWAY ALTER AN EXISTING DRIVEWAY

DATE WORK SCHEDULED TO BEGIN _____
 DATE WORK SCHEDULED TO BE COMPLETED _____

For the purpose of measuring sight distance, the driver's eye height shall be 3.50 feet above the proposed access surface and highway pavement surface and the vehicles' height shall be 4.25 feet above the proposed access surface and highway pavement surface.



FOR DEPARTMENT USE ONLY
 204
 RECEIVED JUL 31 1995
 324, 327, 322, 351
 357, 366, 369, 366
 JAD

FOR DEPARTMENT USE ONLY
 Sign Reviewed On **8-19-95**
 Comments **NOT NEEDED**
J. Sullivan **J. AMBK**
 ROADWAY SHOULDER (Fill in appropriate line)
 slope (Fill in appropriate slope)
 Det. **511**
 S.R. **1025**
 Segment **0050**
 Office **2000**
 Field Viewed By **John Sullivan** Date

Under and subject to all the conditions, restrictions and regulations prescribed by the Pennsylvania Department of Transportation and on the issued Permit, Form M-945P.

The applicant certifies that all statements contained herein are true and correct.

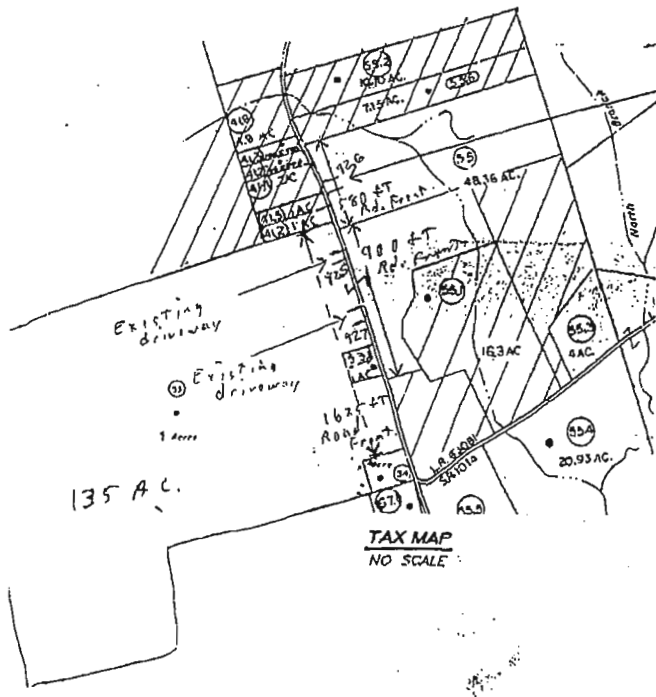
By X Jeanne Rutledge SIGNATURE (R)
 7/25/95 DATE

HAVE YOU READ INSTRUCTIONS ON REVERSE?
 HAVE YOU COMPLETED ALL BLANKS?

CONTACT PERMIT OFFICE - PENNSYLVANIA DEPARTMENT OF TRANSPORTATION



TOPOGRAPHIC MAP
SCALE: 1" = 100'



Proposed driveway
 driveway will be
 245 FT from North
 boundary and 330 FT from
 southern boundary of
 subdivided LOT.

RIGROELLS

NOTED

Driveway Address for the Rutledge 1-1 Well Site

Address was assigned by GIS and is on file with county Emergency Management office and 911 dispatch.

Rutledge 1-1
455 Rutledgedale Rd
Equinunk PA, 18417

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|--|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity For This Product | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | Does not apply. |
| PA Right-to-Know Law | Does not apply. |

Canadian Regulations

| | |
|-------------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

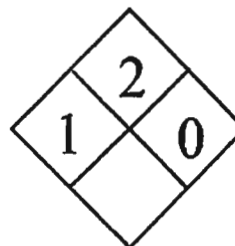
The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS



MATERIAL SAFETY DATA SHEET

SECTION I - MANUFACTURER

Integrity Industries, Inc.
 2710 E. Corral St.
 Kingsville, Texas 78363
 Emergency Phone: (361) 595-5561

Revised Date: 06/05/2008
 Supercedes: new

 THIS DOCUMENT IS PREPARED PURSUANT TO THE OSHA HAZARDOUS COMMUNICATION STANDARD (29 CFR 1910.1200). ALSO, OTHER SUBSTANCE NOT DEEMED "HAZARDOUS" PER THIS MSDS MAY BE LISTED.

SECTION II - MATERIAL IDENTIFICATION

Trade Name: **SYNVERT Base Oil**
 Synonyms/Other Designations: Synthetic Drilling Fluid / Polymer Suspension Base
 Placard: Not Applicable
 Hazard(s): non-hazardous

| Component | CAS Number | Weight |
|-----------------------|-------------------|---------------|
| Paraffin/Olefin blend | Mixture | 100% |

SECTION III - PHYSICAL & CHEMICAL DATA

| | |
|---------------------------------|---------------------------------------|
| Boiling Point: IBP > 300 °F | Pour Point: ND |
| Specific Gravity (H2O=1): 0.766 | Vapor Pressure (mm Hg @ 68 °F): 0.135 |
| Vapor Density (Air=1): n/a | Solubility in H2O: Insoluble |
| Appearance: Clear, oily liquid | Viscosity (cSt @104 °F): 1.4 |

SECTION IV - REACTIVITY

Stability: Stable
 Incompatibility: Heat, sparks, open flame. May react with strong acids/strong oxidizing agents, chlorates, nitrates, peroxides.
 Hazardous Decomposition Products: Oxides of carbon. Hazardous Polymerizations: will not occur

SECTION V - FIRE & EXPLOSION DATA

Flash Point (ASTM D-93): > 200 °F
 Autoignition: n/a
 Extinguishing Media: Water spray, Dry Chemical, Foam, CO2
 Special Fire Fighting Procedures: Respirators/eye protection and full firefighting protective gear.
 Unusual Fire Hazards: Remove containers from source of heat.

SECTION VI - EMERGENCY & FIRST AID DATA

Inhalation: Move to well ventilated area; if breathing difficulties persist after 15 minutes seek medical assistance.

Eye Contact: Wash eye thoroughly for 15 minutes; if irritation persists seek medical assistance.

Skin Contact: Wash affected area with soap & water for 15 minutes; if irritation persists seek medical assistance.

Ingestion: Do not induce vomiting and seek medical advice.

SECTION VII - HEALTH HAZARDS DATA

Acute: May irritate eyes, skin, respiratory, & gastrointestinal tract. **Chronic:** Repeated/prolonged skin contact may irritate/redden skin, progressing to dermatitis.

SECTION VIII - SPILL & DISPOSAL DATA

Accidental Spill Procedures: Absorb in inert material and dispose of according to local, state & federal regulations. Spill into water should be contained to avoid runoff into waterways.

Handling & Storage: Keep container closed and store in cool dry place. Emptied container still contains material which may ignite with explosive violence if exposed to open flame.

SECTION IX - SPECIAL PROTECTION DATA

Respiratory Protection: Respirator in confined areas.

Ventilation: Desired

Exhaust: Mechanical

Protective Gloves: Solvent/chemical resistant gloves

Eye Protection: Safety glasses, goggles.

Other Protection: As required to avoid skin contact.

SECTION X - TRANSPORT INFORMATION

The following may not apply to all shipping situations. Consult 49 CFR for more mode-specific or quantity-specific data.

DOT Proper Shipping Name: Not regulated

DOT Hazard Class or Division: Not regulated

DOT Identification Number: N/A

DOT Packaging Group: III

Type Label(s) Required: none

Placard: Not applicable

*For Limited Quantity requirements see DOT regulation 49 CFR.

SECTION XI - DISCLAIMERS

* SOME INFORMATION PROVIDED HEREIN WAS DRAWN FROM SOURCES OTHER THAN INTEGRITY INDUSTRIES.

THE INFORMATION PROVIDED HEREIN IS BELIEVED BY INTEGRITY INDUSTRIES, INC. TO BE CORRECT & RELIABLE; NO EXPRESSED OR IMPLIED WARRANTY IS PROVIDED HOWEVER.

* INTEGRITY INDUSTRIES, INC. ASSUMES NO RESPONSIBILITY AND DENIES ALL LIABILITY FOR ANY LOSS, DAMAGE, OR EXPENSE CONNECTED WITH CUSTOMERS' METHOD OF HANDLING, STORAGE, USE, AND DISPOSAL OF THIS PRODUCT.

* THE MSDS INFORMATION PROVIDED HEREIN IS APPLICABLE ONLY TO THIS PRODUCT.

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BARACARB® 50**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BARACARB® 50
Synonyms: None
Chemical Family: Mineral
Application: Bridging Agent

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------|------------|-----------|-------------------------|---|
| Limestone | 1317-65-3 | 60 - 100% | 10 mg/m ³ | 15 mg/m ³ |
| Crystalline silica, quartz | 14808-60-7 | 0 - 1% | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD
May cause eye, skin, and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|---|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists. |
| Ingestion | Under normal conditions, first aid procedures are not required. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|---|---|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |
| Fire Extinguishing Media | All standard firefighting media. |
| Special Exposure Hazards | Not applicable. |
| Special Protective Equipment for Fire-Fighters | Not applicable. |
| NFPA Ratings: | Health 0, Flammability 0, Reactivity 0 |
| HMS Ratings: | Flammability 0, Reactivity 0, Health 1* |

6. ACCIDENTAL RELEASE MEASURES

| | |
|---|---|
| Personal Precautionary Measures | Use appropriate protective equipment. Avoid creating and breathing dust. |
| Environmental Precautionary Measures | None known. |
| Procedure for Cleaning / Absorption | Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal. |

7. HANDLING AND STORAGE

| | |
|-----------------------------|---|
| Handling Precautions | Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet. |
| Storage Information | Store away from acids. Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 60 months. |

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use in a well ventilated area. Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2. |
| Respiratory Protection | Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. |
| Hand Protection | Normal work gloves. |
| Skin Protection | Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing. |
| Eye Protection | Wear safety glasses or goggles to protect against exposure. |
| Other Precautions | None known. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Physical State: | Solid Powder |
| Color: | White |
| Odor: | Odorless |
| pH: | 8-9 |
| Specific Gravity @ 20 C (Water=1): | 2.7 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 72-112 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong acids. |
| Hazardous Decomposition Products | Carbon monoxide and carbon dioxide. Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | May cause skin irritation. |
| Eye Contact | May cause eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |
| Chronic Effects/Carcinogenicity | <p>Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.</p> <p>Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).</p> <p>There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.</p> |
| Other Information | For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997). |
| Toxicity Tests | |
| Oral Toxicity: | LD50: > 5000 mg/kg (Rat) |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

Primary Irritation Effect: Not determined
Carcinogenicity Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997).
Genotoxicity: Not determined
Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined

Persistence/Degradability Not determined

Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined

Acute Crustaceans Toxicity: TLM96: >1,000,000 ppm (Mysidopsis bahia) SPP @ 178.5 ppb

Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard Chronic Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2A Very Toxic Materials Crystalline silica |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BAROID®**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BAROID®
Synonyms: None
Chemical Family: Mineral
Application: Weight Additive

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------|------------|-----------|-------------------------|---|
| Barium sulfate | 7727-43-7 | 60 - 100% | 10 mg/m ³ | 15 mg/m ³ |
| Crystalline silica, quartz | 14808-60-7 | 1 - 5% | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD

May cause eye, skin, and respiratory irritation. May be harmful if swallowed.

DANGER! - CHRONIC HEALTH HAZARD

Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|--|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists. |
| Ingestion | Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|---|---|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |
| Fire Extinguishing Media | All standard firefighting media. |
| Special Exposure Hazards | Not applicable. |
| Special Protective Equipment for Fire-Fighters | Not applicable. |
| NFPA Ratings: | Health 1, Flammability 0, Reactivity 0 |
| HMS Ratings: | Flammability 0, Reactivity 0, Health 1* |

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2. |
| Respiratory Protection | Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. |
| Hand Protection | Normal work gloves. |
| Skin Protection | Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing. |
| Eye Protection | Wear safety glasses or goggles to protect against exposure. |
| Other Precautions | None known. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---------------------|
| Physical State: | Solid |
| Color: | Pink to tan to gray |
| Odor: | Odorless |
| pH: | 8-9- |
| Specific Gravity @ 20 C (Water=1): | 4.2 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 100- 155 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | 233.4 |

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | None known. |
| Hazardous Decomposition Products | Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | None known. |
| Eye Contact | May cause mild eye irritation. |
| Ingestion | May produce nervous system effects such as feeling of weakness, unsteady walk, and dilation of blood vessels. May affect the heart and cardiovascular system. |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |
| Chronic Effects/Carcinogenicity | <p>Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.</p> <p>Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).</p> <p>There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.</p> |
| Other Information | For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997). |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

Primary Irritation Effect: Not determined
Carcinogenicity Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997).
Genotoxicity: Not determined
Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined

Persistence/Degradability Not applicable

Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: TLM96: 7500 ppm (Oncorhynchus mykiss)

Acute Crustaceans Toxicity: TLM96: > 1,000,000 ppm (Mysidopsis bahia) SPP @ 132.6 ppb

Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard Chronic Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2A Very Toxic Materials Crystalline silica |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **LIME**

Revision Date: 02-Jan-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: LIME
Synonyms: None
Chemical Family: Inorganic
Application: pH Control

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-------------------|------------|-----------|---------------------|----------------------|
| Calcium hydroxide | 1305-62-0 | 60 - 100% | 5 mg/m ³ | 15 mg/m ³ |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye and skin burns. May cause respiratory irritation. May be harmful if swallowed.

4. FIRST AID MEASURES

Inhalation: If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin: Wash with soap and water. Get medical attention if irritation persists. Remove contaminated clothing and launder before reuse.

Eyes: In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion: Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician: Not Applicable

5. FIRE FIGHTING MEASURES

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not Determined

NFPA Ratings: Health 1, Flammability 0, Reactivity 0

HMIS Ratings: Flammability 0, Reactivity 0, Health 1

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.

Storage Information Store away from acids. Store in a cool, dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Dust/mist respirator. (95%)

Hand Protection Impervious rubber gloves.

Skin Protection Rubber apron.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|------------------------------------|----------------|
| Physical State: | Solid |
| Color: | White |
| Odor: | Odorless |
| pH: | 12.2 |
| Specific Gravity @ 20 C (Water=1): | 2.24 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 75 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | 0.2 |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | 74.1 |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|------------------|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong acids. |
| Hazardous Decomposition Products | None known. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause respiratory irritation. |
| Skin Contact | Causes severe skin irritation. May cause skin burns on prolonged contact. |
| Eye Contact | Causes severe eye irritation May cause eye burns. |
| Ingestion | Irritation of the mouth, throat, and stomach. |
| Aggravated Medical Conditions | Skin disorders. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | LD50: 7340 mg/kg (Rat) |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Not determined |

Genotoxicity: Not determined
Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Not determined
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: TLM96: 100-500 ppm (Oncorhynchus mykiss)
Acute Crustaceans Toxicity: TLM96: 478,520 ppm (Mysidopsis bahia) SPP @ 8 ppb
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Empty container completely. Transport with all closures in place. Return for reuse or dispose in a sanitary landfill according to national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

15. REGULATORY INFORMATION

US Regulations

| | |
|--|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity For This Product | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |

Canadian Regulations

| | |
|-------------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2B Toxic Materials |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: WALNUT HULLS

Revision Date: 02-Jan-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: WALNUT HULLS
Synonyms: None
Chemical Family: Nut Hulls
Application: Loss Circulation Material

Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|--------------|------------|-----------|----------------|----------------|
| Walnut hulls | Mixture | 60 - 100% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye irritation.

4. FIRST AID MEASURES

Inhalation: Under normal conditions, first aid procedures are not required.

Skin: Under normal conditions, first aid procedures are not required.

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion: Under normal conditions, first aid procedures are not required.

Notes to Physician: Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|--|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Lower (oz./ft ³): | 0.07 |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0
HMS Ratings: Flammability 0, Reactivity 0, Health 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid creating or inhaling dust.

Storage Information Store away from oxidizers. Store in a dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Safety glasses.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Solid
Color: Brown
Odor: Characteristic

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| pH: | Not Determined |
| Specific Gravity @ 20 C (Water=1): | 1.1 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | Not Determined |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|-------------------|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None known. |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | None known. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause mild respiratory irritation. |
| Skin Contact | None known. |
| Eye Contact | May cause mild eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |

Inhalation Toxicity: Not determined
Primary Irritation Effect: Not determined
Carcinogenicity Not determined
Genotoxicity: Not determined
Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined

Persistence/Degradability Biodegradable

Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined

Acute Crustaceans Toxicity: TLM96: > 1,000,000 ppm (Mysidopsis bahia) SPP @ 10 ppb

Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

**PREPAREDNESS, PREVENTION,
AND CONTINGENCY PLAN
WAYNE COUNTY FIELD
WAYNE COUNTY, PENNSYLVANIA**

Prepared for:

NEWFIELD APPALACHIA PA LLC
363 N. Sam Houston Pkwy E., Suite 2020
Houston, TX 77060



Prepared by:

TETRA TECH NUS INC
116 N. Washington Avenue
Scranton, PA 18503



May 2010

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LIST OF APPENDICES

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Appendix B Site-Specific Figures

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Figure 2 7.5 Minute USGS Topographic Map

Figure 3 Site Plan

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Table 2 Inspection and Monitoring Activities

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Table 4 List of On-Site Emergency Response Equipment

Table 5 Chain of Command

Appendix D Reporting Form

Appendix E MSDS Sheets

1.0 DESCRIPTION OF FACILITY

1.1 DESCRIPTION OF THE INDUSTRIAL OR COMMERCIAL ACTIVITY

Newfield Appalachia PA LLC (Newfield) is a natural gas exploration company with operations planned for Wayne County, Pennsylvania. Operations will involve natural gas exploration of the Marcellus Shale formation, which will include site preparation, drilling, and well development and production activities. Wastes generated during these activities will be typical for gas drilling operations and will include drill cuttings, produced water, drilling and frac fluids, waste oil, municipal waste and trash. No hazardous waste is expected to be generated at the Newfield sites.

Newfield is currently in the exploratory phase of operations, which will require construction activities for new natural gas well pads and access roads.

This Prevention, Preparedness and Control (PPC) Plan applies to all well sites in Wayne County, Pa.

The attached map (Figure 1) in Appendix B shows the area covered under this PPC Plan. Figure 2 is the required 7.5 topographic map of the specific well site. The proposed Site Plan (Figure 3) shows the site layout, the well site boundaries, material storage areas, waste storage areas, dike drains and drainage that leads away from the well site, and the entrances and exits to the well site.

During the different stages of site preparation, construction, drilling, well development and production, the site will store various fuels, oils and chemicals on-site. A chemical and container inventory for the specific well site is located in Table 1 of Appendix C.

1.2 DESCRIPTION OF EXISTING EMERGENCY RESPONSE PLANS

This is a new facility and this plan has been prepared prior to construction of the well pad. There are no previous emergency response plans.

A separate Spill Prevention Control and Countermeasure (SPCC) Plan will be prepared for each facility meeting the requirements defined in 40 CFR§112.

1.3 MATERIAL AND WASTE INVENTORY

Information in this section is used to evaluate the prevention, containment, mitigation, cleanup, and disposal measures which would be used in the event of a spill, discharge, explosion, or fire. Oils, chemicals and other hazardous materials anticipated to be used and stored at the facility during site preparation and construction, drilling, well development and production are listed in Table 1.

MSDS's will be maintained onsite for chemicals and compounds used at the facility in accordance with the Occupational Safety and Health Administration (OSHA) worker right-to-know requirements, as appropriate.

1.4 POLLUTION INCIDENT HISTORY

Newfield has not had any reportable incidents for this facility.

1.5 IMPLEMENTATION SCHEDULE FOR PLAN ELEMENTS NOT CURRENTLY IN PLACE

All plan elements are in place.

1.6 PURPOSE AND IMPLEMENTATION OF PPC PLAN

Newfield has developed and will implement this PPC Plan for effective action to minimize and abate hazards to human health and the environment from fire, explosion, and emission or discharge of pollutants to air, soil, surface water or groundwater. This plan was prepared to satisfy the requirements set forth in 25 PA Code Section 78.

The Drilling Manager serves as the Primary Emergency Coordinator and is responsible for the preparation and implementation of the PPC Plan. The PPC Plan has been prepared and implemented in general accordance with Pennsylvania Department of Environmental Protection (PADEP) guidelines, and will be submitted to PADEP for approval at such time as the PADEP may prescribe.

This PPC Plan identifies and describes any arrangements with police departments, fire departments, hospitals, contractors, and state, county, and local emergency response teams to coordinate emergency services.

The PPC Plan lists names, addresses and phone numbers of all persons identified to act as Emergency Coordinator. One person is named as the Primary Emergency Coordinator and others are listed in the order in which they will assume responsibility as alternates. The PPC Plan also includes a list of emergency equipment at the facility, the location and a physical description of emergency equipment, and a brief outline of emergency equipment capabilities.

1.7 PLAN REVISIONS

This PPC Plan will be reviewed and amended, annually, or whenever:

- Applicable PADEP regulations are revised;
- The plan fails in an emergency;
- The list of Emergency Coordinators changes;
- The list of emergency equipment changes; and
- Construction, operation, maintenance, or other circumstances change in a manner that materially increases the potential for fires, explosions, or releases of toxic or hazardous constituents; or which changes the response necessary in an emergency.

2.0 IMPLEMENTATION OF PPC PLAN

2.1 ORGANIZATIONAL STRUCTURE OF FACILITY FOR IMPLEMENTATION

The Drilling Manager has been designated as the Primary Emergency Coordinator. The Primary Emergency Coordinator is responsible for the following:

- Coordination of spill cleanup activities;
- Notification of appropriate authorities; and
- Tank and chemical storage area inspections.

The Drilling Manager has administrative responsibility for updating, maintaining, and implementing this PPC Plan. Specifically, these responsibilities include:

- Identification of materials and wastes handled during site operation (inventory);
- Identification of potential spill sources (risk assessment);
- Establishment of spill reporting procedures;
- Coordination of the visual inspection program;
- Review of past incidents, spills, and countermeasures employed;
- Coordination and implementation of the PPC Plan goals;
- Training/educational programs and updates;
- Ensuring periodic review of the PPC Plan for adequacy and appropriateness;
- Administration and institution of appropriate changes at regular intervals;
- Review of new construction and process changes relative to the PPC Plan;
- Evaluation of PPC Plan effectiveness prior to, during and subsequent to its implementation; and
- Instituting improvements to the PPC Plan.

The Production Manager is designated as Secondary Emergency Coordinator, and, in the absence of the Drilling Manager, will assume the role of emergency coordinator for emergencies. The Secondary Emergency Coordinator will report directly to the Primary Emergency Coordinator in matters regarding this plan, and can assist with implementing the above-listed items.

2.2 LIST OF EMERGENCY COORDINATORS

As required by 25 PA Code 265.55, there will be at least one employee, either on the construction site or on call, with the responsibility for coordinating emergency response measures. The Primary and Secondary Emergency Coordinators will be thoroughly familiar with this PPC Plan, site operations and activities, the location and characteristics of materials and wastes, the location of the facility's records, and the layout of the facility. The Emergency Coordinators have the authority to commit the resources necessary to carry out the PPC Plan and for coordinating emergency response measures. In the event of a spill or release, one of the Emergency Coordinators will be immediately notified. The following individuals have been designated to act as Emergency Coordinators:

Primary Emergency Coordinator

Name: Don Sleeth
Title: Drilling Manager
Office: 281-674-2501
Cell: 281-974-0051

Secondary Emergency Coordinator

Name: Jack Cochran
Title: Production Manager
Office: 814-437-2344
Cell: 814-671-1557

2.3 DUTIES AND RESPONSIBILITIES OF THE EMERGENCY COORDINATOR

As required by 25 PA Code 265.56 and the PPC Plan Guidance Documents, whenever there is an imminent or actual emergency situation, the Emergency Coordinator or his designee must immediately:

1. Notify all facility personnel.
2. Notify appropriate state or local agencies with designated response roles and contracted emergency response companies if additional assistance is required.
3. Identify the problem. Is it a physical emergency such as a fire, explosion, or spill? Is it a natural disaster such as a flood, tornado, or other severe weather? Is it a social emergency such as a bomb threat, riot, or vandalism?

4. Assess the health or environmental hazards and how this problem or condition will affect employees or its affect on the surrounding community.
5. Take all reasonable measures to stabilize the situation. The Emergency Coordinator will take all reasonable measures to ensure that the fire, explosion, emission, or discharge does not reoccur or spread to other materials at the site. These measures can include, when appropriate, stopping operations, collecting and containing released materials or wastes, and removing or isolating containers.

Whenever there is an emission, discharge, fire, or explosion, the Emergency Coordinator or his designee must immediately attempt to identify the character, exact source, amount, and aerial extent of emitted or discharged materials. He/she may do this by observation, by review of facility records or manifests, and, if necessary, by instrumental and chemical analysis. Concurrently, the Emergency Coordinator or his designee must assess possible hazards to human health or the environment that may result from emission, discharge, fire, or explosion. This assessment must consider both direct and indirect effects of the emission, discharge, fire, or explosion.

If the Emergency Coordinator determines that the facility has had an emission, discharge, fire, or explosion which would threaten human health or the environment (beyond the limits of the site) and if evacuation of local areas may be advisable, he/she must immediately notify the applicable local authorities (police, fire, etc.); he/she must also immediately notify the PADEP by telephone at (800) 541-2050 (24-hour number), PADEP Northeast Region at (570) 826-2511 (24-hrs), the National Response Center at (800) 424-8802, Wayne County Emergency Management Agency (EMA) at (570) 253-1622, and the Pennsylvania Emergency Management Agency at (717) 651-2001, and report the following information:

- Name of the person reporting the incident;
- Name and location of the facility;
- Telephone number where the person reporting the spill can be reached;
- Date, time, and location of the incident;
- A brief description of the incident, nature of the materials involved, extent of any injuries, and possible hazards to human health or the environment;
- The estimated quantity of the materials spilled; and
- The extent of contamination of land, water, or air, if known.

If spills or discharges of a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) hazardous substance in greater than reportable quantities has occurred, the Emergency Coordinator must notify DEP at (800) 541-2050 and the National Response Center at (800) 424-8802 and report the above information. For an offsite release (spill or discharge) of a reportable quantity of a CERCLA hazardous substance or a Superfund Amendments and Reauthorization Act Extremely Hazardous Substance, the Emergency Coordinator must immediately notify the National Response Center at (800) 424-8802 and report the above information.

If a release occurs from a storage tank which enters a water supply or which threatens the water supply of downstream users, the Emergency Coordinator must immediately notify the Wayne County EMA (570) 253-1622, the Pennsylvania Emergency Management Agency at (717) 651-2001, and DEP at (800) 541-2050. If appropriate, the Emergency Coordinator may assist the Emergency Management Agencies in notifying the downstream water users. The priorities for notification will be by closest proximity to the release site.

During an emergency, the Emergency Coordinator will take all reasonable measures necessary to ensure that fire, explosion, emission, or discharge do not occur, recur, or spread to other materials at the facility. These shall include, where applicable, stopping facility operations, collecting and containing released materials, and removing or isolating containers. If the facility stops operations in response to a fire, explosion, emission, or discharge, the Emergency Coordinator must ensure that adequate monitoring is conducted for leaks, pressure buildup, gas generation, or ruptures in valves, pipes, or other equipment whenever this is appropriate.

The Emergency Coordinator will oversee and direct facility personnel in the performance of their responsibilities for addressing the emergency situation. Immediately following an emergency, the Emergency Coordinator (with PADEP approval) must provide for treating, storing, or disposing residues, contaminated soil, etc., from an emission, discharge, fire, or explosion at the construction site. The Emergency Coordinator must ensure that in the affected areas of the facility, no material incompatible with the emitted or discharged residues is processed, stored, treated, or disposed until cleanup procedures are completed and that all emergency equipment utilized in implementation of the PPC Plan is cleaned and fit for its intended use before operations are resumed. Newfield will notify PADEP and the appropriate State or local

authorities that the facility is in compliance before operations are resumed in the affected areas of the facility. Newfield will note the time, date and details of an incident that requires implementing the PPC Plan.

Within 15 days after the incident, Newfield will submit a written report on the incident to PADEP and the U.S. Environmental Protection Agency regional administrator. The report must be submitted to:

Director - Bureau of Water Quality Management
Pennsylvania Department of Environmental Protection
909 Elmerton Avenue
Harrisburg, PA 17110

Regional Administrator
U.S. Environmental Protection Agency
Region III
1650 Arch Street
Philadelphia, PA 19103

Director - PADEP Northeast Office
Pennsylvania Department of Environmental Protection
2 Public Square
Wilkes-Barre, PA 18711

The report should include the following information:

- Name, address, and telephone number of the individual filing the report;
- Name, address, and telephone number of the facility;
- Date, time, type, and location of incident;
- A brief description of the circumstances causing the incident;
- Description and estimated quantity (by weight) of materials or wastes involved;
- The extent of injuries, if any;
- An assessment of actual or potential threat to human health or the environment and assessment of contamination of land, water, or air, where applicable;
- Estimated quantity and disposition of recovered materials or wastes that resulted from the incident; and
- A description of what actions Newfield intends to take to prevent a similar occurrence in the future.

2.4 CHAIN OF COMMAND

Facility personnel must report emergency situations to the Emergency Coordinators. A Chain of Command flow chart (Table 5, Appendix C) has been developed and should be implemented during an emergency. The Emergency Response Chain of Command flow chart will be posted

next to all telephones onsite, posted in areas where potential emergency situations could arise, and placed in onsite company vehicles, as appropriate.

2.5 DISTRIBUTION OF THIS PPC PLAN

A copy of this PPC Plan and subsequent revisions will be distributed to:

- Drilling Manager (Primary Emergency Coordinator)
- Production Manager (Secondary Emergency Coordinator)

The PPC Plan will be reviewed and amended, if necessary, based on the criteria described earlier in Section 1.7.

3.0 SPILL AND LEAK PREVENTION AND RESPONSE

The site will be maintained and operated to minimize the possibility of a fire, explosion or discharge of oils, hazardous materials or their constituents to air, soil, surface water or groundwater which could threaten human health or the environment, in accordance with the requirements of 25 PA Code Section 265.31.

3.1 PRE-RELEASE PLANNING

The following sections discuss specific locations where the potential exists for accidental spills of oils and/or chemicals. The controls that are in place to minimize the potential for an uncontrolled release to the environment are also discussed. In the event that an uncontrolled spill of hazardous substances occurs, the procedures described in Section 4.0 will be followed.

To enhance spill prevention at the facility, great care will be exercised in handling oil and other materials covered in this PPC Plan. Any unusual conditions observed by any employees or contractors will be reported to one of the Emergency Response Coordinators. Management personnel whose responsibilities include involvement with the materials discussed in this document will also be familiar with this plan and the procedures recommended for spill prevention.

Spill Prevention Measures: Procedures that are to be followed to prevent and/or minimize oil spills at the Newfield facility include:

- ASTs and/or containers will be stored in secondary containment with sufficient volume;
- ASTs and regulated material containers will be visually inspected weekly for leaks;
- Special care will be taken when transferring regulated materials to prevent product loss;
- Regulated materials will be stored in a manner that minimizes the potential for contact with stormwater;
- Absorbent and spill control materials shall be maintained on-site for emergency use;

- Emergency response personnel will be familiar with procedures to follow in the case of a spill; and
- In cases where there may be leaking equipment or operations where oil or oil-related compounds are leaked, spilled, or otherwise released, containment booms or absorbent materials shall be used and equipment shall be repaired.

In the event that an uncontrolled spill of oil or a hazardous material occurs, the procedures described in Section 4.0 will be followed. Responses should be coordinated with federal, state and local agencies as appropriate.

3.2 MATERIAL COMPATIBILITY

The majority of materials received on-site in totes, drums, pails or other small containers are stored in the containers supplied by the manufacturer.

Construction materials used for the ASTs have been selected and designed to be compatible with the materials that are being stored and are typical for the natural gas industry.

3.3 INSPECTIONS AND MONITORING PROGRAM

Operating equipment will be inspected daily, and a copy of the inspection and maintenance form is included in Appendix A. Employees are responsible for detecting and reporting potential problems on the inspection and maintenance form.

Storage tank inspections will be conducted weekly and include evaluation of the following: pumps, valves, and fittings for leaks; the tank condition for evidence of corrosion; secondary containment; evidence of spilled materials; and effectiveness of housekeeping practices.

Completed inspection forms and inspection reports will be maintained in the Primary Emergency Coordinator's office. Noncompliance issues identified during the comprehensive site evaluation will be addressed in a timely manner. If additional control measures are required, implementation of the measures will generally occur within 90 days of the site evaluation. Compliance issues that require revisions to the PPC Plan (description of additional pollutant sources, measures, or controls) will be incorporated into the plan within approximately 15 days of the site evaluation.

Stormwater Management System: Stormwater inspections will include an evaluation of best management practices (BMPs), where appropriate. In accordance with the erosion and sedimentation control plan prepared for the site, erosion and sedimentation control (ESC) measures will be implemented where there is the potential for sediment or soil particles to impact stormwater quality. Repairs will be made, as necessary, following the site inspection.

Storage Tanks and Drum Storage Areas: Tanks and drum storage areas will be accessed daily. Spills or leaks that may occur will be contained by secondary containment and noted as part of routine facility operations. To enhance the daily observations, periodic inspections will be performed for the tank and drum storage areas as described in Table 2. The inspections will include observation of spill and/or leaks and observations of the condition of associated secondary containment structures. Records for the inspections will be maintained in the Primary Emergency Coordinator's office.

3.4 PREVENTIVE MAINTENANCE

Newfield will ensure that preventative maintenance of operating machinery on each construction site is performed regularly.

3.5 HOUSEKEEPING PROGRAM

The Newfield Construction Manager will be responsible for general construction site housekeeping. Specific steps taken under this program will include:

- Debris and/or sediment removal, as necessary.
- Regular refuse pickup and disposal.
- Proper filling and emptying of storage containers, tanks, and equipment to minimize spill potential.
- Periodic review of good housekeeping procedures in the employee-training program.

Once completed, the Production Manager will have overall responsibility for housekeeping at the facility. Newfield currently does not anticipate that bulk quantities of hazardous waste materials will be stored at the facility.

3.6 SECURITY

The facility is not fully fenced but is located in a remote location with limited access except via the site access road. The facility is normally manned during drilling and well development.

Flow and drain valves are locked and in the off position when in non-operational or non-standby status. The starter controls for each oil pump are locked in the off position when in non-operating or non-standby status. Master flow/drain valves are all located on the Facility and monitored by staff.

Any loading/unloading connections of facility piping is capped or blind flanged when not in service or is in standby service for an extended amount of time.

The facility has lighting sufficient for detection of spills during nighttime operations. Consideration has been given to: (a) discovery of spills occurring during hours of darkness, both by operating personnel, if present, and by non-operating personnel, and (b) prevention of spills occurring through acts of vandalism.

3.7 EXTERNAL FACTOR PLANNING

External factors are not anticipated to increase the risk of a spill or release that would impact human safety or the environment. Power outages, adverse weather conditions, or employee strikes could result in discontinuation of earth moving, drilling or well preparation activities. The Emergency Coordinator will monitor operations and initiate their orderly shutdown when necessary.

Access road conditions may be impacted by adverse weather conditions, possibly increasing the risk of a release of materials being delivered or removed. Truck drivers should report poor road conditions to the Construction or Drilling Manager. If conditions deteriorate to where they may impact safe movement of materials, the construction or Drilling Manager will review the conditions and initiate repairs or road closure as deemed necessary.

3.8 EMPLOYEE TRAINING PROGRAM

Newfield's employee training program enables employees to understand the processes and materials with which they are working, the safety and health hazards, the practices for preventing spills, and the procedures for responding properly and rapidly to spills. It also familiarizes personnel with emergency procedures.

All Newfield employees receive job specific training. Emergency Coordinators, Well Tenders, and other oil or hazardous material handling employees receive annual training on the facility's PPC and SPCC plans.

Job specific training includes preventive maintenance, inspection and monitoring activities, shut down procedures and housekeeping practices. PPC training will include spill/release recognition, initial response, initial notifications and follow-up. The training program is designed to ensure that personnel are able to respond effectively to emergencies by familiarizing them with emergency procedures, emergency equipment systems including, where applicable: procedures for using, inspecting, repairing, and replacing emergency and monitoring equipment; key parameters for automatic cut-off systems; communications and alarms systems; response to fires and explosions; site evacuation procedures; and shutdown of operations.

Annual right-to-know training for all facility employees is conducted relevant to the materials present at the facility. Employees will be given detailed instructions regarding the materials and wastes with which they are working; including safety and health hazards, handling methods, proper disposal procedures, and emergency procedures. The location of MSDS's for on-site materials will be identified to all employees.

Training records will be maintained at the facility and in the employee's personnel file.

4.0 COUNTERMEASURES

4.1 COUNTERMEASURES TO BE UNDERTAKEN BY FACILITY

The following sections present general spill response practices to be implemented at the Newfield facility, as appropriate.

4.1.1 Spill Clean-Up Procedures - General

Incidental spills should be contained and cleaned up when discovered per the employees job related training. Clean up material should be placed into a marked container and the Construction or Drilling Manager notified appropriately.

For large spills or spills of oils or hazardous materials which may reach surface water or impact the environment, the employee who first discovers the spill should contact the Emergency Coordinator. He should then work to contain and clean-up the spill.

Spill clean-up involves three steps: containment, removal, and disposal. In the event of a spill, it is very important that the material be contained to the maximum extent possible in order to minimize the effect of the spill and the cost of clean-up. **NOTE: ANY SHEEN ON A WATERBODY (STREAM, RIVER, OR WETLAND) IS A REPORTABLE RELEASE.** Once the spill is contained, the spilled material and contaminated material must be collected and physically removed from the area

4.1.2 Spill Clean-Up Procedures - Specific

The employee should do the following:

- Contain the spill to the smallest area possible using absorbent materials, earthen dikes or other diversion or containment structures. Stormwater collection structures will be either blocked or pumped.
- Block off the area to prevent traffic or employees from entering the area.
- For oils and other organic materials, apply a non-reactive sorbent material, such as Oil-Dri or Kitty Litter, to the spill.
- In the case of a spill of acids hazardous waste, check the MSDS and then neutralize with lime or soda ash if appropriate.
- If a leaking tank is involved, stop liquid flows as appropriate and dike the tank area with earth or absorbent material.

- If a leaking pail, drum or other small container is involved, place it in an over-pack container.
- Clean up spilled material and place it in a marked container.
- Work with the emergency coordinator to properly store the material and arrange for proper disposal

4.1.3 Fire or Explosion

In the case of a fire or explosion, the local fire department should be notified by calling 911. Employees may attempt to extinguish fires using handheld fire extinguishers based upon their job training.

The Emergency Coordinator will determine if evacuation per section 4.4 is required.

4.2 COUNTERMEASURES TO BE UNDERTAKEN BY CONTRACTORS

The following list shows area emergency response contractors to contact should the facility require outside help.

Company: Minuteman Spill Response, Inc.
Address: P.O. Box 10
Mifflinville, PA 18631
Telephone Number: 570-759-3658
Response Time: Approximately 2 to 3 hrs
Equipment and Services: Hazardous Materials Emergency Response

4.3 INTERNAL AND EXTERNAL COMMUNICATIONS AND ALARM SYSTEM

This section describes the internal communications or alarm used to provide immediate emergency instruction (voice or signal) to installation personnel, and the external communications or alarm system used to summon emergency assistance from local police or fire departments.

Newfield facilities in Wayne County are remote and generally do not have land-line telephone systems or alarm systems. The primary means of communication is via voice or mobile telephones. Mobile phones are provided to the Drilling and Production Managers (Primary and Secondary Emergency Coordinators).

Fire, police, and emergency service can be summoned by calling the 911 or per the numbers listed in Table 3.

4.4 EVACUATION PLAN

In the unlikely event that the site must be evacuated, the Emergency Coordinator will alert personnel to re-group at the pre-designated location for attendance taking. The Emergency Coordinator is responsible to verify that all site workers are accounted for during an evacuation. Periodic drills will be conducted, if deemed necessary, to evaluate the effectiveness of this evacuation plan.

If an emergency situation requires evacuation of personnel, the Emergency Coordinator will implement the following evacuation procedures:

1. The Emergency Coordinator will provide evacuation instructions to facility personnel via the construction site communications network, as appropriate.
2. Personnel evacuation will typically proceed as follows:
 - a. If downwind of incident: Evacuate via the most accessible route perpendicular to the prevailing wind direction.
 - b. If upwind of incident: Evacuate in an upwind direction.
3. Personnel will reassemble at the public road at the facility entrance as shown on Figure 3 or an alternate assembly point identified by the Emergency Coordinator, that is upwind of the incident location, and remain at this location until the Emergency Coordinator has accounted for all personnel.
4. The names of employees and the destination of employees transported to hospitals, etc. for treatment will be recorded by the Emergency Coordinator, first aid personnel or fire officials.

Once on public roadways, evacuation routes are left up to the individual.

4.5 EMERGENCY EQUIPMENT AVAILABLE FOR RESPONSE

This section provides a list of available emergency equipment, and procedures for maintenance and decontamination of emergency equipment. Newfield's emergency equipment at the facility will allow personnel to respond safely and quickly to emergency situations. Equipment will be inspected and maintained by Construction Manager to assure recommended quantities are available and its proper operation in time of emergency. After an emergency, equipment will be decontaminated, cleaned, and re-fit for its intended use before normal operations resume.

The Newfield facility will be equipped with the following emergency response equipment:

- (1) Mobile telephones are provided to the Drilling and Production Managers and are immediately available at the scene of operations for summoning emergency assistance from local police departments, fire departments or State or local emergency response teams.
- (2) Portable fire extinguishers, fire control equipment, spill control equipment and decontamination equipment. This equipment is detailed in Table 4 of Appendix C.

5.0 EMERGENCY SPILL CONTROL NETWORK

5.1 ARRANGEMENTS WITH LOCAL EMERGENCY RESPONSE AGENCIES AND HOSPITALS

This section provides a list of local emergency response agencies and hospitals, and associated phone numbers. Arrangements can be made, as appropriate, to inform local emergency response agencies and hospitals concerning the type of materials handled at the Newfield facility and the potential need for services.

If appropriate, arrangements can be made to designate who will be the primary emergency response agency and who will provide support services during emergencies. Efforts can be made to familiarize police, fire departments, emergency response teams, and the Wayne County Emergency Management Agency (EMA) Coordinator with the layout of the site, the properties and dangers associated with any hazardous materials handled, places where personnel would normally be working, entrances to roads inside the site, and potential evacuation routes.

If considered appropriate by Newfield's Emergency Coordinator, agreements with hospitals and emergency response agencies can be made and included in the periodic updating or amending of the PPC Plan. The agreements and/or arrangements include efforts to familiarize area agencies and emergency responders with facility operations and potential emergency operations. The following agencies can be contacted and provided with a copy of this PPC Plan, at the discretion of the Newfield Emergency Coordinator.

- Local fire companies;
- Local county emergency response personnel;
- Local ambulance personnel; and
- Local hospital.

Table 3 lists local emergency response agencies to be contacted in the event of an emergency or reportable spill. In the unlikely event that a widespread emergency exists, the Wayne County EMA would be contacted first, and the Coordinator in turn could contact appropriate emergency response agencies through their communications network.

The Wayne County Emergency Management Agency can be contacted at (570) 253-1622. Routing of injured persons will be performed by emergency medical services personnel based on the number and type of injuries requiring treatment. The emergency medical services coordinator may be provided with a copy of this PPC Plan to assist in planning. The nearest hospitals are Catskill Regional Medical Hospital in Callicoon, New York, and Wayne County Memorial Hospital in Honesdale, Pennsylvania. The nearest fire departments are Callicoon Fire District in Callicoon, New York, Protection Engine Co No. 3 in Honesdale, Pennsylvania, and Narrowsburg Fire Department, in Narrowsburg, New York. The nearest police departments are the Honesdale Police Department, located in Honesdale, Pennsylvania, and Waymart Police Department in Honesdale Pennsylvania. All emergency response departments shall be reached through the 911 system.

5.2 NOTIFICATION LISTS

If the Emergency Coordinator determines that the facility has had an emission, discharge, fire, or explosion that could threaten human health or the environment, he will contact and report as necessary his findings to the appropriate agencies listed in Table 3. When calling any of the agencies listed in Table 3, the following information should be available for reporting to the identified agencies:

- Company name and location;
- Name of person reporting the spill, title, and telephone number;
- The type of material released;
- Estimated or exact (if known) quantity of material released (i.e., gallons, pounds, etc.);
- A brief description of the incident, including type of incident, nature of hazardous material involvement, and possible hazards to human health and the environment outside the facility;
- Probable source and location of the spill source;
- Date and time of the spill;
- Location of entry point into surface water and amount reaching the waterway (if applicable);
- The name of the receiving water and the downstream water bodies of which it is a tributary;
- Confirmation that release has been stopped or, if not, when will it be stopped;
- Mitigation/containment actions initiated;
- Direction of material movement;

- Potential population affected by the release;
- Name of person to contact on behalf of the company who will be at the scene and will be directing response measures;
- Telephone number where the on-scene coordinator can be reached; and
- The extent of injuries, if any.

A reporting form is attached in Appendix D for use by the Emergency Coordinator.

A written report including the above listed information, and other information that may be required by the applicable regulations (see 25 PA Code Section 265.56) regarding the spilled material, will need to be transmitted within 15 days to the following agencies:

U.S. Environmental Protection Agency
Region III
Spill Response Section
1650 Arch Street
Philadelphia, PA 19103

Pennsylvania Department of Environmental Protection
Bureau of Water Quality Management
2 Public Square
Wilkes-Barre, Pennsylvania 18711

6.0 WASTE DISPOSAL PRACTICES

Produced water will be removed periodically from the tanks at each well site and transported by a licensed residual waste hauler to a permitted disposal facility. Other wastes generated onsite will include used hydraulic oil that will be reclaimed from operating equipment and transported offsite for recycling. All wastes will be disposed in accordance with applicable local, state, and federal regulations.

7.0 STORMWATER MANAGEMENT PRACTICES

Newfield implements several Best Management Practices (BMPs) at each well site to reduce the potential for stormwater runoff of suspended solids and other contaminants. These BMPs include routine visual inspections, preventive maintenance, good housekeeping, and management of stormwater run-on and runoff. Routine inspection and monitoring, preventive maintenance, and good housekeeping programs are discussed in Sections 3.3, 3.4, and 3.5 of this PPC Plan. These programs prevent accidental releases of contaminants and reduce contaminant migrations via stormwater discharges. Stormwater management activities are discussed in Section 3.1 of this PPC Plan. The certification statement regarding the evaluation of discharges and confirmation that they will be comprised solely of stormwater is presented at the beginning of this Plan. Potential "significant sources of non-stormwater at the site" may include condensate, brine, hydraulic oil drums and tanks, gasoline and diesel fuel. Storage areas for these significant sources will be inspected on a daily basis.

8.0 SEDIMENT AND EROSION PREVENTION

Erosion and sedimentation controls are managed in accordance with PADEP requirements. Copies of the site E&S Plan are available at the Newfield office in Honesdale, PA and at each well site.

APPENDIX A
INSPECTION FORMS

**NEWFIELD APPALACHIA PA LLC
Weekly Facility Inspection Form**

| | |
|----------------------------|------------------------|
| Facility: | Inspector Name: |
| | |
| Date of Inspection: | |
| | |

Instructions: Indicate yes or no. If no, record observations describing the specific equipment and discrepancy.

| Aboveground Storage Tanks | | |
|---|------------------------------|-----------------------------|
| • Equipment appears adequately supported | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • No evidence of active or past leaks from equipment, piping, connections, vales, vents, etc. | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Coating condition appears satisfactory | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Corrosion appears acceptable | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Level gauages/alarms are operative | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Containers are labeled | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Observations: | | |

| Processing Equipment | | |
|---|------------------------------|-----------------------------|
| • Equipment appears adequately supported | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • No evidence of active or past leaks from equipment, piping, connections, vales, vents, etc. | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Coating condition appears satisfactory | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Corrosion appears acceptable | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Observations: | | |

| Other Facility Equipment is Checked for: | | |
|---|------------------------------|-----------------------------|
| <ul style="list-style-type: none"> ❖ No evidence of active or past leaks ❖ Condition of equipment appears to be satisfactory (i.e., not damaged, deteriorated, or worn), and ❖ Corrosion appears to be acceptable. | | |
| • Wellheads | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Gathering systems | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Well test stations | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Traps/Sumps | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Drainage systems and nearby ditches | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Applicable flowlines including right-of-way areas | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Containment systems | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Facility piping | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Observations: | | |

**NEWFIELD APPALACHIA PA LLC
Weekly Facility Inspection Form**

Secondary Containment

- | | | |
|--|------------------------------|-----------------------------|
| • Passive containment (berm) has adequate capacity and integrity as intended | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Active containment measures are adequate | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • No evidence of active or past leaks (i.e., staining, sheen) | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Any valves are closed and plugged | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Active containment is free from a significant quantity of rain/snow | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

Observations:

Security

- | | | |
|--|------------------------------|-----------------------------|
| • Lighting is adequate to observe leaks, spills, and vandalism | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Pumps, valves, nozzles are locked | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

Observations:

Spill Response

- | | | |
|---|------------------------------|-----------------------------|
| • Spill response kits are stocked and located in readily accessible areas | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
|---|------------------------------|-----------------------------|

Observations:

Signature:

Date:

E&S INSPECTION FORM

The E&S plan contains a maintenance program which provides for inspection of BMPs (Best Management Practices such as filter sock, vegetation, construction entrances, etc.) on a weekly basis and after each measurable rainfall event, including the repair of BMPs to ensure effective and efficient operation. The maintenance program for both the temporary and permanent erosion and sediment control BMPs, including disposal of materials removed from the BMPs or project area, has been included in the narrative. The type of maintenance, such as cleanout, repair, replacement, regrading, re-stabilizing, etc. for each of the BMPs is included in the plan. **NOTE: This inspection report must be kept up to date and onsite.**

| INSPECTION DATE | INITIALS | RAINFALL OR WEEKLY? | LOCATION OF E&S CONTROL(S) | CONDITION NOTED | CORRECTIVE MEASURES TAKEN |
|-----------------|----------|---------------------|----------------------------|-----------------|---------------------------|
| | | | | | |
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| | | | | | |
| | | | | | |

Facility: _____ **Inspector:** _____ **Signed:** _____ **Date:** _____
Print *Signature*

Tank Truck Loading and Unloading Checklist

Date: _____ Material being loaded/unloaded: _____

Driver/Loader present during loading or unloading of material _____
(signature)

- _____ Current volume in storage tank was checked prior to loading.
- _____ Fill hose inspected for condition prior to loading.
- _____ Wheel chocks in place prior to loading.
- _____ Tanker valve(s) were inspected for leakage prior to filling and departure.
- _____ The loading of the tanker was monitored.
- _____ Hoses were replaced and capped after loading.
- _____ No material was spilled onto the containment pad or ground.

- These forms must be completed for every tank truck shipment and must be filed in the facility PPC Plan.
- All spills should be immediately reported to at least one of the following Newfield personnel:

Don Sleeth
Drilling Manager
Office: 281-674-2501
Cell: 281-974-0051

Jack Cochran
Production Manager
Office: 814-437-2344
Cell: 814-671-1557

Burl Eakle
Cell: 918-448-1296

Delivery Information

Invoice No. _____

Load No. _____

Company _____

APPENDIX B
FIGURES



TETRA TECH

Figure 1
Well Field Map
Newfield Exploration Company

Legend

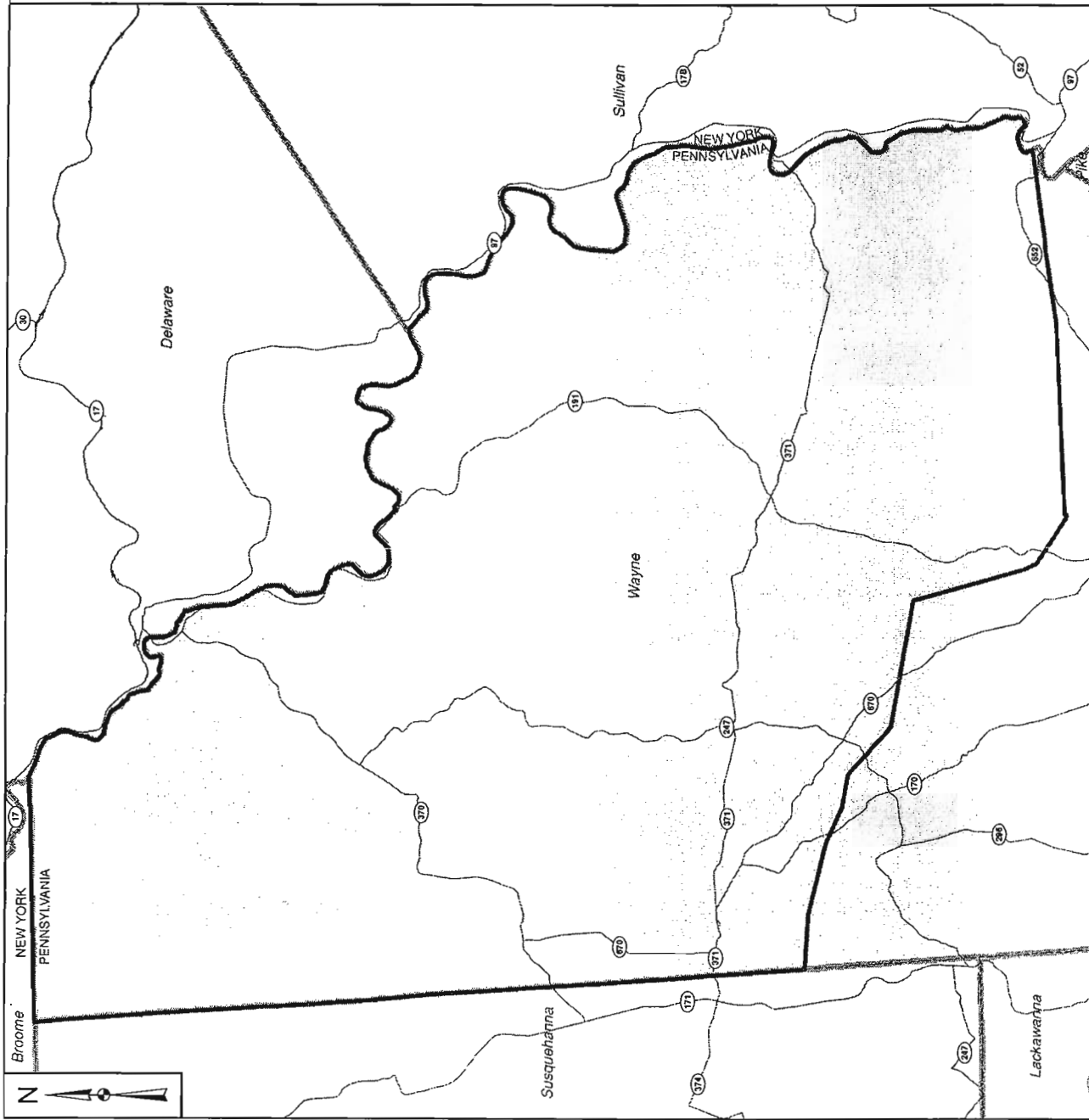
-  Road (E)
-  County (E)
-  Wayne County (E)
-  Lease Area (N)

Sources:
(E) - Indicates the data was provided by ESRI.
(N) - Indicates the data was provided by Newfield Exploration Company

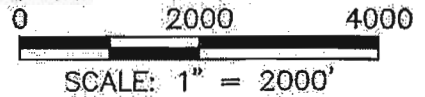


Drawn By: S. PAXTON 04/20/10
Checked By: A. STRASSNER 04/20/10
Approved By:

Contract Number: 112C02679



C:\Documents and Settings\ben.hoppe\My Documents\CAD Work\2558\Rutledge Well\Figures\2558FG001.dwg PIT BEN.HOPPE 3/4/2010 7:46:55 AM



TETRA TECH

WWW.TETRATECH.COM

881 ANDERSEN DRIVE - FOSTER PLAZA 7
PITTSBURGH, PA 15220
T: (412) 921-7090 | F: (412) 921-4040

**NEWFIELD APPALACHIA PA, LLC
WAYNE COUNTY, PENNSYLVANIA**

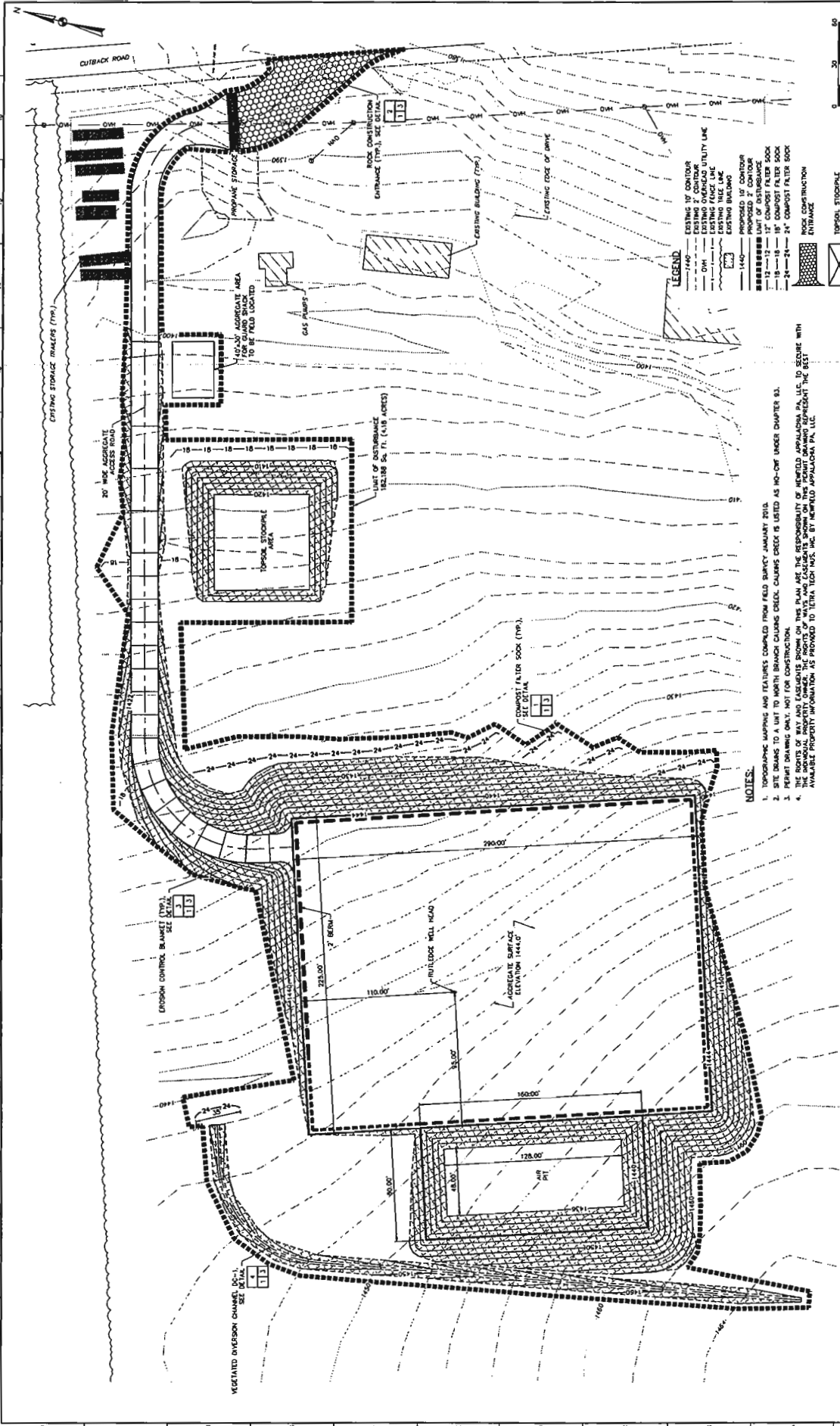
**RUTLEDGE WELL PAD
LOCATION MAP**

SCALE: 1" = 2000'

| | |
|--------------|-----------|
| DATE: | 3/4/10 |
| PROJECT NO.: | 112C02568 |
| DESIGNED BY: | RAL |
| DRAWN BY: | BH |
| CHECKED BY: | RAL |
| SHEET: | 1 OF 2 |

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FIGURE 2



LEGEND

--- EXISTING 10' CONTOUR
 --- EXISTING 2' CONTOUR
 --- EXISTING OVERHEAD UTILITY LINE
 --- EXISTING UNDERGROUND UTILITY LINE
 --- EXISTING TIE LINE
 --- EXISTING BUILDING
 --- PROPOSED 10' CONTOUR
 --- PROPOSED 2' CONTOUR
 --- 12" COMPOST FILTER SOCK
 --- 18" COMPOST FILTER SOCK
 --- 24" COMPOST FILTER SOCK
 --- ROCK CONSTRUCTION ENTRANCE
 --- TOPSOIL STORAGE

NOTES

1. TOPOGRAPHIC MAPS AND FEATURES COMPILED FROM FIELD SURVEY JANUARY 2014.
2. SITE BEARS TO A UNIT TO NORTH BRANCH COLUMBIA CREEK. COLUMBIA CREEK IS LISTED AS 10'-0" UNDER CHAPTER 83.
3. PERMIT DRAWING ONLY. NOT FOR CONSTRUCTION.
4. THE DESIGNER HAS NOT CONDUCTED VISUAL INSPECTIONS OF THE PROPOSED SITES AND CANNOT BE HELD RESPONSIBLE FOR ANY PROPERTY DAMAGE OR LIABILITY INCURRED BY THE USER OF THIS PLAN. THE USER SHALL OBTAIN ALL NECESSARY PERMITS AND LICENSES FROM THE LOCAL, STATE AND FEDERAL GOVERNMENTS. THE USER SHALL OBTAIN ALL NECESSARY PERMITS AND LICENSES FROM THE LOCAL, STATE AND FEDERAL GOVERNMENTS. THE USER SHALL OBTAIN ALL NECESSARY PERMITS AND LICENSES FROM THE LOCAL, STATE AND FEDERAL GOVERNMENTS.

DATE: 5/4/20
 PROJECT NO.: 110202019
 DRAWN BY: J. B. B.
 CHECKED BY: J. B. B.
 SCALE: 1" = 30'
 SHEET: 7
 SHEETS: 7
 CONTRACTOR: TETRA TECH, INC.

SCALE: 1" = 30'
 NEWFIELD APPALACHIA PA LLC
 WAYNE COUNTY, PENNSYLVANIA
 RUTLEDGE WELL PAD
 EROSION & SEDIMENT CONTROL PLAN
 FIGURE 3

| MARK | DATE | DESCRIPTION |
|------|------|-------------|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

TETRA TECH

351 ANDERSON BLVD. SUITE 100
 PITTSBURGH, PA 15220
 PH: (412) 971-1000 FAX: (412) 971-0000



APPENDIX C
TABLES

TABLE 1

LIST OF MATERIALS & WASTES

CONSTRUCTION

| POLLUTIONAL MATERIAL | VOLUME OR QUANTITY | LOCATION ONSITE | SPILL CONTAINMENT MATERIALS ONSITE/LOCATION |
|-----------------------------|---------------------------|------------------------|--|
| Diesel Fuel | 250 gallons | Well Pad | Sorbent pads; shovels/Gang box |
| Lubricants | 180 gallons | Well Pad | Sorbent pads; shovels/Gang box |
| OIL ABSORBANT | 2,500 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Trash & Debris | 2,000 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| | | | |

DRILLING

| POLLUTIONAL MATERIAL | VOLUME OR QUANTITY | LOCATION ONSITE | SPILL CONTAINMENT MATERIALS ONSITE/LOCATION |
|---|---------------------------|------------------------|--|
| Diesel Fuel | 2000 gallons | Well Pad | Sorbent pads; shovels/Gang box |
| Lubricants | 320 gallons | Well Pad | Sorbent pads; shovels/Gang box |
| DURATONE HT | 2,500 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| GELTONE V | 2,500 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Lime | 7,500 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| OIL ABSORBANT | 2,500 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Base Fluid | 300 bbl | Well Pad | Sorbent pads; shovels/Gang box |
| Rig Wash | 2,000 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Calcium Chloride (CaCl ₂) | 4,000 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| RHEMOD L | 1,770 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| LE SUPERMUL | 8,500 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| BARACARB 25, 50 (2 pallets each) | 12,600 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| WALNUT | 2,400 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| DRILTREAT | 1,900 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Liquid Mud | 1,500 bbl | Well Pad | Sorbent pads; shovels/Gang box |
| BAROID REGULAR / **BAROID BULK (barite) | 125,000 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Trash & Debris | 2,000 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Drill Cuttings | 100,000 lbs | Air Pit | Sorbent pads; shovels/Gang box |
| Cement | 130,000 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| | | | |

TABLE 2

INSPECTION AND MONITORING ACTIVITIES

| Activity | Frequency |
|---|--|
| Erosion and Sedimentation Control Measures | Weekly or after a significant rain event |
| Aboveground Storage Tanks | Daily |
| Drum Storage Areas | Daily |
| Best Management Practices (BMPs) | Per BMP requirements |
| Dust Control Measures | Daily |
| Preparedness, Prevention, and Contingency (PPC) Plan Compliance Evaluation Inspections and Update of PPC Plan, as Appropriate | Annually |

**TABLE 3
AGENCY NOTIFICATION LIST**

The following agencies are to be contacted, as appropriate, in the event of an emergency, accident, or chemical release.

| <u>Agency</u> | <u>Telephone No.</u> |
|--|----------------------|
| PADEP Northeast Regional Office | 570-826-2511 |
| PADEP Southcentral Office (Harrisburg) | 877-333-1904 |
| Pennsylvania Emergency Management Agency | 717-651-2001 |
| Police Department | 9-1-1 |
| Volunteer Fire Department | 9-1-1 |
| U.S. Environmental Protection Agency | 215-814-5700 |
| U.S. Coast Guard National Response Center | 800-424-8802 |
| U.S. Coast Guard (local) | 570-421-1191 |
| Pennsylvania Fish and Boat Commission | 814-445-8974 |
| Chemical Transportation Emergency Center: * Chemical Exposure Information | 800-424-9300 |

LOCAL EMERGENCY RESPONSE:

| | |
|---|--------------|
| Fire Department – Wayne County Company #3, 13, 21, 28, 43, and 65 | 9-1-1 |
| Police Department – PSP, Honesdale, Pennsylvania | 9-1-1 |
| Hospitals/Ambulances- Damascus Township Ambulance, Pennsylvania MT Pleasant Ambulance Northern Wayne Ambulance Mobile 504 | 9-1-1 |
| Wayne County Memorial Hospital, Honesdale, Pennsylvania | 570-251-6672 |
| CMC – Trauma Center, Scranton, Pennsylvania | 570-969-8128 |
| Catskill Regional Medical Hospital in Callicoon, New York | 845-887-5530 |
| Local Emergency Management Wayne County EMA | 570-253-1622 |

TABLE 4

On-Site Emergency Response Equipment

| On-Site Emergency Response Equipment |
|---|
| Fire Extinguishers |
| Tyvek Suits |
| Nitrile Gloves |
| Hearing Protection |
| Particulate Adsorbent |
| Absorbent Pads |
| Shovels |
| Earth Moving Equipment |
| Decontamination Equipment |

**TABLE 5
CHAIN OF COMMAND**

Primary Emergency Coordinator

Don Sleeth
Drilling Manager
Office: 281-674-2501
Cell: 281-974-0051

Secondary Emergency Coordinator

Jack Cochran
Production Manager
Office: 814-437-2344
Cell: 814-671-1557

Construction Manager

Burl Eakle
Cell: 918-448-1296

Offsite Emergency Response Contractors

Company: Minuteman Spill Response, Inc.
Telephone Number: 800-905-7788

**APPENDIX D
REPORTING FORM**

Spill Response Notification Form

| | | | |
|---|---------------|---|---------------|
| GENERAL REPORTING INFORMATION | | | |
| Prepared _____ | | | |
| (First) | (M.I.) | (Last) | (Position) |
| Daytime phone: (xxx) xxx-xxxx | | Evening phone: (xxx) xxx-xxxx | |
| Newfield Appalachia PA LLC | | | |
| (Company) | (Address) | (City) | (State) (Zip) |
| Calling for responsible party? Yes | | Were materials discharged? Yes Confidential? No | |
| Meeting Federal obligations to report: Yes | | | |
| INCIDENT DESCRIPTION | | | |
| Source and/or cause: | | | |
| | | | |
| Date of Incident: Time of Incident: | | | |
| Incident Location/Address | | | |
| Nearest City: XXXX, PA XXXXX (XXXXXXXX County) | | | |
| Distance from City: In city limits | | Direction from City: In city limits | |
| Facility Oil Storage Capacity: XXXXXX gallons | | | |
| Container Type: Container Capacity: | | (gals) | |
| Facility Latitude: xx° xx' xx" Longitude xx° xx' xx" | | | |
| MATERIAL | | | |
| Name (or CHRIS Code): | | | |
| Discharged Quantity (Units): | | Discharged to Water (Units): | |
| RESPONSE ACTION | | | |
| Actions taken to correct, control or mitigate incident: | | | |
| | | | |
| IMPACT | | | |
| No. of Injuries: | | No. of Deaths: | Other: |
| Evacuation (Y/N): | Damage (Y/N): | Amount (\$): | |
| Medium Affected: | Description: | Additional Information: | |
| AGENCY NOTIFIED | | | |
| NRC 800-424-8802 | Date: | Time: | Contact: |
| PADEP (570) 826-2511 | Date: | Time: | Contact: |
| USCG | Date: | Time: | Contact: |
| Other | Date: | Time: | Contact: |
| ADDITIONAL INFORMATION: | | | |
| | | | |

APPENDIX E
MSDS SHEETS



MATERIAL SAFETY DATA SHEET

Diesel Fuel (All Types)

MSDS No. 9909

EMERGENCY OVERVIEW

CAUTION!

OSHA/NFPA COMBUSTIBLE LIQUID - SLIGHT TO MODERATE IRRITANT
EFFECTS CENTRAL NERVOUS SYSTEM
HARMFUL OR FATAL IF SWALLOWED

Moderate fire hazard. Avoid breathing vapors or mists. May cause dizziness and drowsiness. May cause moderate eye irritation and skin irritation (rash). Long-term, repeated exposure may cause skin cancer. If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs).



NFPA 704 (Section 16)

1. CHEMICAL PRODUCT AND COMPANY INFORMATION

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

EMERGENCY TELEPHONE NUMBER (24 hrs): CHEMTREC (800) 424-9300
COMPANY CONTACT (business hours): Corporate Safety (732) 750-6000
MSDS INTERNET WEBSITE: www.hess.com (See Environment, Health, Safety & Social Responsibility)

SYNONYMS: Ultra Low Sulfur Diesel (ULSD); Low Sulfur Diesel; Motor Vehicle Diesel Fuel; Diesel Fuel #2; Dyed Diesel Fuel; Non-Road, Locomotive and Marine Diesel Fuel; Tax-exempt Diesel Fuel

See Section 16 for abbreviations and acronyms.

2. COMPOSITION and CHEMICAL INFORMATION ON INGREDIENTS

| INGREDIENT NAME (CAS No.) | CONCENTRATION PERCENT BY WEIGHT |
|---------------------------|---------------------------------|
| Diesel Fuel (68476-34-6) | 100 |
| Naphthalene (91-20-3) | Typically < 0.01 |

A complex mixture of hydrocarbons with carbon numbers in the range C9 and higher. Diesel fuel may be dyed (red) for tax purposes. May contain a multifunctional additive.

3. HAZARDS IDENTIFICATION

EYES

Contact with liquid or vapor may cause mild irritation.

SKIN

May cause skin irritation with prolonged or repeated contact. Practically non-toxic if absorbed following acute (single) exposure. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.

INGESTION

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.



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INHALATION

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

CHRONIC EFFECTS and CARCINOGENICITY

Similar products produced skin cancer and systemic toxicity in laboratory animals following repeated applications. The significance of these results to human exposures has not been determined - see Section 11 Toxicological Information.

IARC classifies whole diesel fuel exhaust particulates as probably carcinogenic to humans (Group 2A). NIOSH regards whole diesel fuel exhaust particulates as a potential cause of occupational lung cancer based on animal studies and limited evidence in humans.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash).

4. FIRST AID MEASURES

EYES

In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

SKIN

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

INGESTION

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

INHALATION

Remove person to fresh air. If person is not breathing provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES:

| | |
|-------------------------------|---------------------------------|
| FLASH POINT: | > 125 °F (> 52 °C) minimum PMCC |
| AUTOIGNITION POINT: | 494 °F (257 °C) |
| OSHA/NFPA FLAMMABILITY CLASS: | 2 (COMBUSTIBLE) |
| LOWER EXPLOSIVE LIMIT (%): | 0.6 |
| UPPER EXPLOSIVE LIMIT (%): | 7.5 |

FIRE AND EXPLOSION HAZARDS

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

EXTINGUISHING MEDIA

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO₂, water spray, fire fighting foam, or Halon.



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LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

FIRE FIGHTING INSTRUCTIONS

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

6. ACCIDENTAL RELEASE MEASURES

ACTIVATE FACILITY'S SPILL CONTINGENCY OR EMERGENCY RESPONSE PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

7. HANDLING and STORAGE

HANDLING PRECAUTIONS

Handle as a combustible liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Diesel fuel, and in particular low and ultra low sulfur diesel fuel, has the capability of accumulating a static electrical charge of sufficient energy to cause a fire/explosion in the presence of lower flashpoint products such as gasoline. The accumulation of such a static charge occurs as the diesel flows through pipelines, filters, nozzles and various work tasks such as tank/container filling, splash loading, tank cleaning; product sampling; tank gauging; cleaning, mixing, vacuum truck operations, switch loading, and product agitation. There is a greater potential for static charge accumulation in cold temperature, low humidity conditions.

Documents such as 29 CFR OSHA 1910.106 "Flammable and Combustible Liquids, NFPA 77 Recommended Practice on Static Electricity, API 2003 "Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents and ASTM D4865 "Standard Guide for Generation and Dissipation of Static



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Electricity in Petroleum Fuel Systems" address special precautions and design requirements involving loading rates, grounding, bonding, filter installation, conductivity additives and especially the hazards associated with "switch loading." ["Switch Loading" is when a higher flash point product (such as diesel) is loaded into tanks previously containing a low flash point product (such as gasoline) and the electrical charge generated during loading of the diesel results in a static ignition of the vapor from the previous cargo (gasoline).]

Note: When conductivity additives are used or are necessary the product should achieve 25 picosiemens/meter or greater at the handling temperature.

STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

8. EXPOSURE CONTROLS and PERSONAL PROTECTION

EXPOSURE LIMITS

| Components (CAS No.) | Source | Exposure Limits | | Note |
|---------------------------|--------|--|--|----------|
| | | TWA/STEL | | |
| Diesel Fuel: (68476-34-6) | OSHA | 5 mg/m, as mineral oil mist | | |
| | ACGIH | 100 mg/m ³ (as totally hydrocarbon vapor) TWA | | A3, skin |
| Naphthalene (91-20-3) | OSHA | 10 ppm TWA | | |
| | ACGIH | 10 ppm TWA / 15 ppm STEL | | A4, Skin |

ENGINEERING CONTROLS

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

EYE/FACE PROTECTION

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

SKIN PROTECTION

Gloves constructed of nitrile, neoprene, or PVC are recommended. Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

**MATERIAL SAFETY DATA SHEET****Diesel Fuel (All Types)****MSDS No. 9909****RESPIRATORY PROTECTION**

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

9. PHYSICAL and CHEMICAL PROPERTIES**APPEARANCE**

Clear, straw-yellow liquid. Dyed fuel oil will be red or reddish-colored.

ODOR

Mild, petroleum distillate odor

BASIC PHYSICAL PROPERTIES

BOILING RANGE: 320 to 690 oF (160 to 366 °C)
VAPOR PRESSURE: 0.009 psia @ 70 °F (21 °C)
VAPOR DENSITY (air = 1): > 1.0
SPECIFIC GRAVITY (H₂O = 1): 0.83 to 0.88 @ 60 °F (16 °C)
PERCENT VOLATILES: 100 %
EVAPORATION RATE: Slow; varies with conditions
SOLUBILITY (H₂O): Negligible

10. STABILITY and REACTIVITY

STABILITY: Stable. Hazardous polymerization will not occur.

CONDITIONS TO AVOID and INCOMPATIBLE MATERIALS

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Keep away from strong oxidizers; Viton ®; Fluorel ®

HAZARDOUS DECOMPOSITION PRODUCTS

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

11. TOXICOLOGICAL PROPERTIES**ACUTE TOXICITY**

Acute dermal LD50 (rabbits): > 5 ml/kg Acute oral LD50 (rats): 9 ml/kg
Primary dermal irritation: extremely irritating (rabbits) Draize eye irritation: non-irritating (rabbits)
Guinea pig sensitization: negative

CHRONIC EFFECTS AND CARCINOGENICITY

Carcinogenic: OSHA: NO IARC: NO NTP: NO ACGIH: A3

Studies have shown that similar products produce skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation.

MUTAGENICITY (genetic effects)

This material has been positive in a mutagenicity study.



MATERIAL SAFETY DATA SHEET

Diesel Fuel (All Types)

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12. ECOLOGICAL INFORMATION

Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

13. DISPOSAL CONSIDERATIONS

Consult federal, state and local waste regulations to determine appropriate disposal options.

14. TRANSPORTATION INFORMATION

| | | |
|---------------------------------|-------------------------|---|
| PROPER SHIPPING NAME: | Diesel Fuel | Placard (International Only): |
| HAZARD CLASS and PACKING GROUP: | 3, PG III | |
| DOT IDENTIFICATION NUMBER: | NA 1993 (Domestic) |  |
| | UN 1202 (International) | |
| DOT SHIPPING LABEL: | None | |

Use Combustible Placard if shipping in bulk domestically

15. REGULATORY INFORMATION

U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION

This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other regulations at the state and/or local level. Consult those regulations applicable to your facility/operation.

CLEAN WATER ACT (OIL SPILLS)

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

SARA SECTION 311/312 - HAZARD CLASSES

| <u>ACUTE HEALTH</u> | <u>CHRONIC HEALTH</u> | <u>FIRE</u> | <u>SUDDEN RELEASE OF PRESSURE</u> | <u>REACTIVE</u> |
|---------------------|-----------------------|-------------|-----------------------------------|-----------------|
| X | X | X | -- | -- |

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product may contain listed chemicals below the de minimis levels which therefore are not subject to the supplier notification requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372. If you may be required to report releases of chemicals listed in 40 CFR 372.28, you may contact Hess Corporate Safety if you require additional information regarding this product.

CALIFORNIA PROPOSITION 65 LIST OF CHEMICALS

This product contains the following chemicals that are included on the Proposition 65 "List of Chemicals" required by the California Safe Drinking Water and Toxic Enforcement Act of 1986:

| <u>INGREDIENT NAME (CAS NUMBER)</u> | <u>Date Listed</u> |
|--|--------------------|
| Diesel Engine Exhaust (no CAS Number listed) | 10/01/1990 |

CANADIAN REGULATORY INFORMATION (WHMIS)

Class B, Division 3 (Combustible Liquid) and Class D, Division 2, Subdivision B (Toxic by other means)



MATERIAL SAFETY DATA SHEET

Diesel Fuel (All Types) **MSDS No. 9909**

16. OTHER INFORMATION

NFPA® HAZARD RATING HEALTH: 0
 FIRE: 2
 REACTIVITY: 0

Refer to NFPA 704 "Identification of the Fire Hazards of Materials" for further information

HMIS® HAZARD RATING HEALTH: 1 * * Chronic
 FIRE: 2
 PHYSICAL: 0

SUPERSEDES MSDS DATED: 02/28/2001

ABBREVIATIONS:

AP = Approximately < = Less than > = Greater than
N/A = Not Applicable N/D = Not Determined ppm = parts per million

ACRONYMS:

| | | | |
|--------|---|-------|--|
| ACGIH | American Conference of Governmental Industrial Hygienists | NTP | National Toxicology Program |
| AIHA | American Industrial Hygiene Association | OPA | Oil Pollution Act of 1990 |
| ANSI | American National Standards Institute (212) 642-4900 | OSHA | U.S. Occupational Safety & Health Administration |
| API | American Petroleum Institute (202) 682-8000 | PEL | Permissible Exposure Limit (OSHA) |
| CERCLA | Comprehensive Emergency Response, Compensation, and Liability Act | RCRA | Resource Conservation and Recovery Act |
| DOT | U.S. Department of Transportation [General info: (800) 467-4922] | REL | Recommended Exposure Limit (NIOSH) |
| EPA | U.S. Environmental Protection Agency | SARA | Superfund Amendments and Reauthorization Act of 1986 Title III |
| HMIS | Hazardous Materials Information System | SCBA | Self-Contained Breathing Apparatus |
| IARC | International Agency For Research On Cancer | SPCC | Spill Prevention, Control, and Countermeasures |
| MSHA | Mine Safety and Health Administration | STEL | Short-Term Exposure Limit (generally 15 minutes) |
| NFPA | National Fire Protection Association (617)770-3000 | TLV | Threshold Limit Value (ACGIH) |
| NIOSH | National Institute of Occupational Safety and Health | TSCA | Toxic Substances Control Act |
| NOIC | Notice of Intended Change (proposed change to ACGIH TLV) | TWA | Time Weighted Average (8 hr.) |
| | | WEEL | Workplace Environmental Exposure Level (AIHA) |
| | | WHMIS | Canadian Workplace Hazardous Materials Information System |

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

MATERIAL SAFETY DATA SHEET

Review Date: 04/23/2007

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT: PENNZOIL™ LONG-LIFE™ Motor Oil (All Grades)

MSDS NUMBER: 614348LU - 1

PRODUCT CODE(S): 5071324, 5071325, 5071326, 5071369, 5071371

MANUFACTURER

SOPUS Products

P.O. Box 4427

Houston, TX. 77210-4427

TELEPHONE NUMBERS

Spill Information: (877) 242-7400

Health Information: (877) 504-9351

MSDS Assistance Number: (877) 276-7285

SECTION 2 PRODUCT/INGREDIENTS

| INGREDIENTS | CAS# | CONCENTRATION |
|-------------------------------|------------|-----------------|
| Heavy Duty Motor Oil | | |
| Highly refined petroleum oils | Mixture | 90 - 99 %volume |
| Zinc Dialkyldithiophosphate | 68649-42-3 | 1 - 5 %volume |
| Proprietary additives | Mixture | 1 - 5 %volume |

SECTION 3 HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Appearance & Odor: Bright and clear liquid. Mild odor.

Health Hazards: No known immediate health hazards.

Physical Hazards: No known physical hazards.

NFPA Rating (Health, Fire, Reactivity): 0, 1, 0

Hazard Rating: Least - 0 Slight - 1 Moderate - 2 High - 3 Extreme - 4

Inhalation:

Inhalation of vapors (generated at high temperatures only) or oil mist may cause mild irritation of the nose, throat, and respiratory tract.

Eye Irritation:

Lubricating oils are generally considered no more than minimally irritating to the eyes.

Skin Contact:

May cause slight irritation of the skin. If irritation occurs, a temporary burning sensation and minor redness and/or swelling may result.

Ingestion:

Lubricating oils are generally no more than slightly toxic if swallowed.

Other Health Effects:

The International Agency for Research on Cancer (IARC) has determined there is sufficient evidence for the carcinogenicity in experimental animals of used gasoline motor oils. Handling procedures and safety precautions in the MSDS should be followed to minimize exposure to the used product.

Signs and Symptoms:

Irritation as noted above.

Aggravated Medical Conditions:

Pre-existing eye, skin and respiratory disorders may be aggravated by exposure to this product.

For additional health information, refer to section 11.

SECTION 4 FIRST AID MEASURES

Inhalation:

Remove victim to fresh air and provide oxygen if breathing is difficult. Get medical attention. If the victim has difficulty breathing or tightness of the chest, is dizzy, vomiting or unresponsive, give 100% oxygen with rescue breathing or CPR as required and transport to the nearest medical facility.

Skin:

Remove contaminated clothing and shoes and wipe excess from skin. Flush skin with water, then wash with soap and water. If irritation occurs, get medical attention. Do not reuse clothing until cleaned. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.

Eye:

Flush with water. If irritation occurs, get medical attention.

Ingestion:

Do not induce vomiting. In general, no treatment is necessary unless large quantities of product are ingested. However, get medical attention.

Note to Physician:

In general, emesis induction is unnecessary in high viscosity, low volatility products such as oils and greases.

SECTION 5 FIRE FIGHTING MEASURES

Flash Point [Method]: >400 °F/>204.44 °C [Pensky-Martens Closed Cup]

Extinguishing Media:

Material will float and can be re-ignited on surface of water. Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames. Do not use a direct stream of water.

Fire Fighting Instructions:

Do not enter confined fire space without full bunker gear (helmet with face shield, bunker coats, gloves and rubber boots), including a positive pressure, NIOSH approved, self-contained breathing apparatus. This material is non-flammable.

Unusual Fire Hazards:

Material may ignite when preheated.

SECTION 6**ACCIDENTAL RELEASE MEASURES****Protective Measures:**

May burn although not readily ignitable.

Wear appropriate personal protective equipment when cleaning up spills. Refer to Section 8.

Spill Management:

FOR LARGE SPILLS: Remove with vacuum truck or pump to storage/salvage vessels.

FOR SMALL SPILLS: Soak up residue with an absorbent such as clay, sand or other suitable material. Place in non-leaking container and seal tightly for proper disposal.

Place in container for proper disposal. Remove contaminated soil to remove contaminated trace residues. Dispose of in same manner as material.

Reporting:

CERCLA: Product is covered by EPA's Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) petroleum exclusion. Releases to air, land, or water are not reportable under CERCLA (Superfund).

CWA: This product is an oil as defined under Section 311 of EPA's Clean Water Act (CWA). Spills into or leading to surface waters that cause a sheen must be reported to the National Response Center, 1-800-424-8802.

SECTION 7**HANDLING AND STORAGE****Precautionary Measures:**

Wash with soap and water before eating, drinking, smoking, applying cosmetics, or using toilet. Launder contaminated clothing before reuse. Properly dispose of contaminated leather articles such as shoes or belts that cannot be decontaminated. Avoid heat, open flames, including pilot lights, and strong oxidizing agents. Use explosion-proof ventilation to prevent vapor accumulation. Ground all handling equipment to prevent sparking.

Storage:

Do not store in open or unlabeled containers. Store in a cool, dry place with adequate ventilation. Keep away from open flames and high temperatures.

Container Warnings:

Keep containers closed when not in use. Containers, even those that have been emptied, can contain explosive vapors. Do not cut, drill, grind, weld or perform similar operations on or near containers.

SECTION 8**EXPOSURE CONTROLS/PERSONAL PROTECTION**

| Chemical | Limit | TWA | STEL | Ceiling | Notation |
|-------------------|-----------|---------------------|----------------------|---------|----------|
| Oil mist, mineral | ACGIH TLV | 5 mg/m ³ | 10 mg/m ³ | | |
| Oil mist, mineral | OSHA PEL | 5 mg/m ³ | | | |

Exposure Controls

Provide adequate ventilation to control airborne concentrations below the exposure guidelines/limits.

Personal Protection

Personal protective equipment (PPE) selections vary based on potential exposure conditions such as handling practices, concentration and ventilation. Information on the selection of eye, skin and respiratory protection for use with this material is provided below.

Eye Protection:

Chemical Goggles, or Safety glasses with side shields

Skin Protection:

Use protective clothing which is chemically resistant to this material. Selection of protective clothing depends on potential exposure conditions and may include gloves, boots, suits and other items. The selection(s) should take into account such factors as job task, type of exposure and durability requirements.

Published literature, test data and/or glove and clothing manufacturers indicate the best protection is provided by:
Neoprene, or Nitrile Rubber

Respiratory Protection:

If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, an approved respirator must be worn. Respirator selection, use and maintenance should be in accordance with the requirements of the OSHA Respiratory Protection Standard, 29 CFR 1910.134.

Types of respirator(s) to be considered in the selection process include:

For Mist: Air Purifying, R or P style NIOSH approved respirator.

For Vapors: Air Purifying, R or P style prefilter & organic cartridge, NIOSH approved respirator. Self-contained breathing apparatus for use in environments with unknown concentrations or emergency situations.

SECTION 9

PHYSICAL AND CHEMICAL PROPERTIES

Appearance & Odor: Bright and clear liquid. Mild odor.

Substance Chemical Family: Petroleum Hydrocarbon

| | | | |
|------------------------------|---|-------------------------|-----------------|
| Flash Point | > 400 °F [Pensky-Martens Closed Cup] | Pour Point | -20 °F |
| Solubility (in Water) | Insoluble | Specific Gravity | 0.88 - 0.89 |
| Stability | Stable | Viscosity | 103 cSt @ 40 °C |

SECTION 10

REACTIVITY AND STABILITY

Stability:

Material is stable under normal conditions.

Conditions to Avoid:

Avoid heat and open flames.

Materials to Avoid:

Avoid contact with strong oxidizing agents.

Hazardous Decomposition Products:

Thermal decomposition products are highly dependent on combustion conditions. A complex mixture of airborne solids, liquids and gases will evolve when this material undergoes pyrolysis or combustion. Aldehydes, Carbon Monoxide, Carbon Dioxide, Hydrogen Sulfide, Ketones, Nitrogen Oxides and other unidentified organic compounds may be formed upon combustion.

| | |
|-------------------|----------------------------------|
| SECTION 11 | TOXICOLOGICAL INFORMATION |
|-------------------|----------------------------------|

Acute Toxicity

| TEST | Result | OSHA Classification | Material Tested |
|-------------|--------------------|---------------------|------------------------|
| Dermal LD50 | >5.0 g/kg (Rabbit) | Non-Toxic | Based on components(s) |
| Oral LD50 | >5.0 g/kg (Rat) | Non-Toxic | Based on components(s) |

Carcinogenicity Classification

| Chemical Name | NTP | IARC | ACGIH | OSHA |
|----------------------|-----|----------------------|--------------|------|
| Heavy Duty Motor Oil | No | Not Reviewed by IARC | Not Reviewed | No |

| | |
|-------------------|-------------------------------|
| SECTION 12 | ECOLOGICAL INFORMATION |
|-------------------|-------------------------------|

Environmental Impact Summary:

There is no ecological data available for this product. However, this product is an oil. It is persistent and does not readily biodegrade. However, it does not bioaccumulate.

| | |
|-------------------|--------------------------------|
| SECTION 13 | DISPOSAL CONSIDERATIONS |
|-------------------|--------------------------------|

RCRA Information:

Under RCRA, it is the responsibility of the user of the material to determine, at the time of the disposal, whether the material meets RCRA criteria for hazardous waste. This is because material uses, transformations, mixtures, processes, etc. may affect the classification. Refer to the latest EPA, state and local regulations regarding proper disposal.

| | |
|-------------------|------------------------------|
| SECTION 14 | TRANSPORT INFORMATION |
|-------------------|------------------------------|

US Department of Transportation Classification

This material is not subject to DOT regulations under 49 CFR Parts 171-180.

Oil: This product is an oil under 49CFR (DOT) Part 130. If shipped by rail or highway in a tank with a capacity of 3500 gallons or more, it is subject to these requirements. Mixtures or solutions containing 10% or more of this product may also be subject to this rule.

International Air Transport Association

Not regulated under IATA rules.

International Maritime Organization Classification

Not regulated under International Maritime Organization rules.

SECTION 15 REGULATORY INFORMATION**Federal Regulatory Status****OSHA Classification:**

Under normal conditions of use or in a foreseeable emergency, this product does not meet the definition of a hazardous chemical when evaluated according to the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Ozone Depleting Substances (40 CFR 82 Clean Air Act):

This material does not contain nor was it directly manufactured with any Class I or Class II ozone depleting substances.

Superfund Amendment & Reauthorization Act (SARA) Title III:

There are no components in this product on the SARA 302 list.

SARA Hazard Categories (311/312):

| Immediate Health | Delayed Health | Fire | Pressure | Reactivity |
|------------------|----------------|------|----------|------------|
| NO | NO | NO | NO | NO |

SARA Toxic Release Inventory (TRI) (313):

Zinc compounds

Toxic Substances Control Act (TSCA) Status:

All component(s) of this material is(are) listed on the EPA/TSCA Inventory of Chemical Substances.

Other Chemical Inventories:

Component(s) of this material is (are) listed on the Australian AICS, Canadian DSL, Chinese Inventory, European EINECS, Korean Inventory, Philippines PICCS,

State Regulation

The following chemicals are specifically listed by individual states; other product specific health and safety data in other sections of the MSDS may also be applicable for state requirements. For details on your regulatory requirements you should contact the appropriate agency in your state.

SECTION 16 OTHER INFORMATION**Revision#:** 1**Review Date:** 04/23/2007**Revision Date:** 12/19/2006**Revisions since last change (discussion):** This Material Safety Data Sheet (MSDS) has been reviewed to fully comply with the guidance contained in the ANSI MSDS standard (ANSI Z400.1-2003). We encourage you to take the opportunity to read the MSDS and review the information contained therein.**SECTION 17 LABEL INFORMATION**

READ AND UNDERSTAND MATERIAL SAFETY DATA SHEET BEFORE HANDLING OR DISPOSING OF PRODUCT. THIS LABEL COMPLIES WITH THE REQUIREMENTS OF THE OSHA HAZARD COMMUNICATION STANDARD (29 CFR 1910.1200) FOR USE IN THE WORKPLACE. THIS LABEL IS NOT INTENDED TO BE USED WITH PACKAGING INTENDED FOR SALE TO CONSUMERS AND MAY NOT CONFORM WITH THE REQUIREMENTS OF THE CONSUMER PRODUCT SAFETY ACT OR OTHER RELATED REGULATORY REQUIREMENTS.

PRODUCT CODE(S): 5071324, 5071325, 5071326, 5071369, 5071371

PENNZOIL™ LONG-LIFE™ Motor Oil (All Grades)

ATTENTION!

PROLONGED OR REPEATED SKIN CONTACT MAY CAUSE OIL ACNE OR DERMATITIS. USED GASOLINE ENGINE OIL HAS BEEN SHOWN TO CAUSE CANCER IN LABORATORY ANIMALS.

Precautionary Measures:

Avoid prolonged or repeated contact with eyes, skin and clothing. Avoid breathing of vapors, fumes, or mist. Use only with adequate ventilation. Wash thoroughly after handling.

FIRST AID

Inhalation: If the victim has difficulty breathing or tightness of the chest, is dizzy, vomiting or unresponsive, give 100% oxygen with rescue breathing or CPR as required and transport to the nearest medical facility.

Skin Contact: Remove contaminated clothing and shoes and wipe excess from skin. Flush skin with water, then wash with soap and water. If irritation occurs, get medical attention. Do not reuse clothing until cleaned. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.

Eye Contact: Flush with water. If irritation occurs, get medical attention.

Ingestion: Do not induce vomiting. In general, no treatment is necessary unless large quantities of product are ingested. However, get medical attention.

FIRE

In case of fire, Use water fog, 'alcohol foam', dry chemical or carbon dioxide (CO2) to extinguish flames. Do not use a direct stream of water. Material will float and can be re-ignited on surface of water.

SPILL OR LEAK

Dike and contain spill.

FOR LARGE SPILLS: Remove with vacuum truck or pump to storage/salvage vessels.

FOR SMALL SPILLS: Soak up residue with an absorbent such as clay, sand or other suitable material. Place in non-leaking container and seal tightly for proper disposal.

CONTAINS: Highly refined petroleum oils, Mixture; Zinc Dialkyldithiophosphate, 68649-42-3; Proprietary additives, Mixture

NFPA Rating (Health, Fire, Reactivity): 0, 1, 0

TRANSPORTATION

US Department of Transportation Classification

This material is not subject to DOT regulations under 49 CFR Parts 171-180.

Oil: This product is an oil under 49CFR (DOT) Part 130. If shipped by rail or highway in a tank with a capacity of 3500 gallons or more, it is subject to these requirements: Mixtures or solutions containing 10% or more of this product may also be subject to this rule.

CAUTION: Misuse of empty containers can be hazardous. Empty containers can be hazardous if used to store toxic, flammable, or reactive materials. Cutting or welding of empty containers might cause fire, explosion or toxic fumes from residues. Do not pressurize or expose to open flames or heat. Keep container closed and drum bungs in place.

Name and Address

SOPUS Products
P.O. Box 4427
Houston, TX 77210-4427

ADMINISTRATIVE INFORMATION

MANUFACTURER ADDRESS: SOPUS Products, P.O. Box 4427, Houston, TX. 77210-4427.

THE INFORMATION CONTAINED IN THIS DATA SHEET IS BASED ON THE DATA AVAILABLE TO US AT THIS TIME, AND IS BELIEVED TO BE ACCURATE BASED UPON THAT IT IS PROVIDED INDEPENDENTLY OF ANY SALE OF THE PRODUCT, FOR PURPOSE OF HAZARD COMMUNICATION. IT IS NOT INTENDED TO CONSTITUTE PRODUCT PERFORMANCE INFORMATION, AND NO EXPRESS OR IMPLIED WARRANTY OF ANY KIND IS MADE WITH RESPECT TO THE PRODUCT, UNDERLYING DATA OR THE INFORMATION CONTAINED HEREIN. YOU ARE URGED TO OBTAIN DATA SHEETS FOR ALL PRODUCTS YOU BUY, PROCESS, USE OR DISTRIBUTE, AND ARE ENCOURAGED TO ADVISE THOSE WHO MAY COME IN CONTACT WITH SUCH PRODUCTS OF THE INFORMATION CONTAINED HEREIN.

TO DETERMINE THE APPLICABILITY OR EFFECT OF ANY LAW OR REGULATION WITH RESPECT TO THE PRODUCT, YOU SHOULD CONSULT WITH YOUR LEGAL ADVISOR OR THE APPROPRIATE GOVERNMENT AGENCY. WE WILL NOT PROVIDE ADVICE ON SUCH MATTERS, OR BE RESPONSIBLE FOR ANY INJURY FROM THE USE OF THE PRODUCT DESCRIBED HEREIN. THE UNDERLYING DATA, AND THE INFORMATION PROVIDED HEREIN AS A RESULT OF THAT DATA, IS THE PROPERTY OF SOPUS PRODUCTS AND IS NOT TO BE THE SUBJECT OF SALE OR EXCHANGE WITHOUT THE EXPRESS WRITTEN CONSENT OF SOPUS PRODUCTS.

44815-10737-100R-04/16/2007

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **CALCIUM CHLORIDE - POWDER**

Revision Date: 02-Jan-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: CALCIUM CHLORIDE - POWDER
Synonyms: None
Chemical Family: Inorganic Salt
Application: Accelerator

Manufacturer/Supplier Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By Chemical Compliance
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|------------------|------------|-----------|----------------|----------------|
| Calcium chloride | | 60 - 100% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory irritation. May be harmful if swallowed.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention. Remove contaminated clothing and launder before reuse.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

NFPA Ratings: Health 1, Flammability 0, Reactivity 0
HMIS Ratings: Flammability 0, Reactivity 0, Health 1

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.

Storage Information Store in a cool, dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Dust proof goggles.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|------------------------------------|----------------|
| Physical State: | Solid |
| Color: | White |
| Odor: | Odorless |
| pH: | 10 |
| Specific Gravity @ 20 C (Water=1): | 0.83 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 51 |
| Boiling Point/Range (F): | Not Determined |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | 42 |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | 147.02 |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|------------------|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | None known. |
| Hazardous Decomposition Products | None known. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause respiratory irritation. |
| Skin Contact | May cause skin irritation. May cause skin burns on prolonged contact. |
| Eye Contact | May cause severe eye irritation. May cause corneal injury. |
| Ingestion | Causes burns of the mouth, throat and stomach. |
| Aggravated Medical Conditions | Skin disorders. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | LD50: 1000 mg/kg (Rat) |
| Dermal Toxicity: | LD50: > 5000 mg/kg (Rabbit) |
| Inhalation Toxicity: | Not determined |
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Not determined |

Genotoxicity: Not determined

**Reproductive /
Developmental Toxicity:** Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined

Persistence/Degradability Not applicable

Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined

Acute Crustaceans Toxicity: Not determined

Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

15. REGULATORY INFORMATION

US Regulations

| | |
|--|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity For This Product | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | Does not apply. |
| PA Right-to-Know Law | Does not apply. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2B Toxic Materials |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **DRILTREAT®**

Revision Date: 09-Mar-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: DRILTREAT®
Synonyms: None
Chemical Family: Lipid
Application: Oil-wetting Agent

Manufacturer/Supplier: Baroid Drilling Fluids
a Product Service Line of Halliburton Energy Services, Inc.
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------------|------------|-----------|----------------|----------------|
| Contains no hazardous substances | Mixture | 60 - 100% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye irritation.

4. FIRST AID MEASURES

Inhalation: Under normal conditions, first aid procedures are not required.

Skin: Wash with soap and water.

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion: Under normal conditions, first aid procedures are not required.

Notes to Physician: Not Applicable

5. FIRE FIGHTING MEASURES

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | 400 |
| Flash Point/Range (C): | 204 |
| Flash Point Method: | PMCC |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0

HMS Ratings: Flammability 0, Reactivity 0, Health 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing.

Storage Information Store away from oxidizers.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally necessary.

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Physical State: | Liquid |
| Color: | Amber |
| Odor: | Bean |
| pH: | 6.4-7 |
| Specific Gravity @ 20 C (Water=1): | 1.03 |
| Density @ 20 C (lbs./gallon): | 8.58 |
| Bulk Density @ 20 C (lbs/ft ³): | Not Determined |
| Boiling Point/Range (F): | Not Determined |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | 32 |
| Freezing Point/Range (C): | 0 |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | 0 |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Disperses |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|-------------------------------------|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None known. |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | None known. |
| Skin Contact | None known. |
| Eye Contact | May cause mild eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Not determined |

Genotoxicity: Not determined
Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Biodegradable
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: TLM96: 497,500 ppm (Mysidopsis bahia) SPP @ 12 ppb
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|--|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity For This Product | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | Does not apply. |
| PA Right-to-Know Law | Does not apply. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **DURATONE® HT**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: DURATONE® HT
Synonyms: None
Chemical Family: Blend
Application: Fluid Loss Additive

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-------------------------------|------------|----------|-------------------------|---|
| Kaolin | 1332-58-7 | 10 - 30% | 2 mg/m ³ | Not applicable |
| Nonylphenol | 25154-52-3 | 5 - 10% | Not applicable | Not applicable |
| Sodium hydroxide | 1310-73-2 | 1 - 5% | 2 mg/m ³ | 2 mg/m ³ |
| Quaternary ammonium compounds | | 10 - 30% | Not applicable | Not applicable |
| Crystalline silica, quartz | 14808-60-7 | 1 - 5% | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD
May cause eye, skin, and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|--|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists. |
| Ingestion | Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|--|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | 608 |
| Autoignition Temperature (C): | 320 |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 2, Flammability 0, Reactivity 0
HMIS Ratings: Flammability 0, Reactivity 0, Health 2*

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption

Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions

Avoid contact with eyes, skin, or clothing. This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information

Store in a dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 12 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls

Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2.

Respiratory Protection

Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product.

Hand Protection

Normal work gloves.

Skin Protection

Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.

Eye Protection

Wear safety glasses or goggles to protect against exposure.

Other Precautions

None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|-----------------------------|
| Physical State: | Solid |
| Color: | Gray to black |
| Odor: | Odorless |
| pH: | Not Determined |
| Specific Gravity @ 20 C (Water=1): | 1.8 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 31 uncompactd; 44 compacted |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | < -1 (OECD117) |

9. PHYSICAL AND CHEMICAL PROPERTIES

Molecular Weight (g/mole): Not Determined

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong alkalis. Strong acids. Aldehydes. Ketones. Acrylates. |
| Hazardous Decomposition Products | Oxides of nitrogen. Carbon monoxide and carbon dioxide. Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--------------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | May cause moderate skin irritation. May cause an allergic skin reaction. |
| Eye Contact | May cause severe eye irritation. |
| Ingestion | Irritation of the mouth, throat, and stomach. |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |

Chronic Effects/Carcinogenicity Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

Other Information

For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997).

Toxicity Tests

- Oral Toxicity:** LD50: > 5000 mg/kg (Rat)
- Dermal Toxicity:** Not determined
- Inhalation Toxicity:** Not determined
- Primary Irritation Effect:** Not determined
- Carcinogenicity** Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997).
- Genotoxicity:** Not determined
- Reproductive / Developmental Toxicity:** Ames Test: Negative

12. ECOLOGICAL INFORMATION

- Mobility (Water/Soil/Air)** Not determined
- Persistence/Degradability** BOD(28 Day): 9% of COD
- Bio-accumulation** Not Determined

Ecotoxicological Information

- Acute Fish Toxicity:** TLM96: 30 ppm (Oncorhynchus mykiss)
- Acute Crustaceans Toxicity:** EC50: 370 mg/l (Daphnia magna)

Acute Algae Toxicity: Not determined
Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory All components listed on inventory.

EPA SARA Title III Extremely Hazardous Substances Not applicable

EPA SARA (311,312) Hazard Class Acute Health Hazard
Chronic Health Hazard

EPA SARA (313) Chemicals This product contains toxic chemical(s) listed below which is(are) subject to the reporting requirements of Section 313 of Title III of SARA and 40 CFR Part 372:
Aluminum Oxide//1344-28-1

EPA CERCLA/Superfund Reportable Spill Quantity Not applicable.

| | |
|--|--|
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Crystalline silica |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **GELTONE® V**

Revision Date: 02-Jun-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: GELTONE® V
Synonyms: None
Chemical Family: Blend
Application: Viscosifier
Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------------|------------|-----------|-------------------------|---|
| Crystalline silica, cristobalite | 14464-46-1 | 0 - 1% | 0.025 mg/m ³ | 1/2 x 10 mg/m ³ %SiO ₂ + 2 |
| Crystalline silica, tridymite | 15468-32-3 | 0 - 1% | 0.05 mg/m ³ | 1/2 x 10 mg/m ³ %SiO ₂ + 2 |
| Crystalline silica, quartz | 14808-60-7 | 2-6 | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |
| Isopropanol | 67-63-0 | 1 - 5% | 200 ppm | 400 ppm |
| Modified bentonite | | 60 - 100% | Not applicable | Not applicable |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD
May cause eye, skin, and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|---|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists. |
| Ingestion | Under normal conditions, first aid procedures are not required. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|--|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

NFPA Ratings: Health 1, Flammability 0, Reactivity 0
HMIS Ratings: Flammability 0, Reactivity 0, Health 1*

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

| | |
|-----------------------------|--|
| Handling Precautions | This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet. |
| Storage Information | Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 24 months. |

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2. |
| Respiratory Protection | Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. |
| Hand Protection | Normal work gloves. |
| Skin Protection | Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing. |
| Eye Protection | Wear safety glasses or goggles to protect against exposure. |
| Other Precautions | None known. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|--------------------------|
| Physical State: | Powder |
| Color: | Tan |
| Odor: | Mild |
| pH: | Not Determined |
| Specific Gravity @ 20 C (Water=1): | 1.6 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 35- 57 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Miscible in hydrocarbons |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Hydrofluoric acid. |
| Hazardous Decomposition Products | Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--------------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | May cause skin irritation. |
| Eye Contact | May cause eye irritation. |
| Ingestion | Irritation of the mouth, throat, and stomach. |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |

Chronic Effects/Carcinogenicity Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

Other Information

For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997).

Toxicity Tests

| | |
|---|---|
| Oral Toxicity: | LD50: > 5000 mg/kg (Rat) |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997). |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|----------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Not determined |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|----------------|
| Acute Fish Toxicity: | Not determined |
| Acute Crustaceans Toxicity: | Not determined |
| Acute Algae Toxicity: | Not determined |

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT

Not restricted

Canadian TDG

Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory All components listed on inventory.

EPA SARA Title III Extremely Hazardous Substances Not applicable

EPA SARA (311,312) Hazard Class Acute Health Hazard
Chronic Health Hazard

EPA SARA (313) Chemicals This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).

EPA CERCLA/Superfund Reportable Spill Quantity For This Product Not applicable.

EPA RCRA Hazardous Waste Classification If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.

California Proposition 65 The California Proposition 65 regulations apply to this product.

| | |
|-------------------------------|--|
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2A Very Toxic Materials Crystalline silica |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **LE SUPERMUL**

Revision Date: 02-Jan-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: LE SUPERMUL

Synonyms: None

Chemical Family: Blend

Application: Emulsifier

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-----------------------------------|------------|---------|----------------|----------------|
| Diethylene glycol monobutyl ether | 112-34-5 | 1 - 5% | Not applicable | Not applicable |
| Ethylene glycol monobutyl ether | 111-76-2 | 1 - 5% | 20 ppm | 50 ppm |

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye and skin irritation. May cause headache, dizziness, and other central nervous system effects. May be harmful if swallowed.

4. FIRST AID MEASURES

Inhalation If inhaled, remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult give oxygen. Get medical attention.

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention. Remove contaminated clothing and launder before reuse.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion Get medical attention! If vomiting occurs, keep head lower than hips to prevent aspiration.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|-----------------|
| Flash Point/Range (F): | > 200Min: > 200 |
| Flash Point/Range (C): | > 100Min: > 93 |
| Flash Point Method: | PMCC |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Use water spray to cool fire exposed surfaces. Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 2, Flammability 1, Reactivity 0

HMIS Ratings: Flammability 1, Reactivity 0, Health 2

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Wash hands after use. Launder contaminated clothing before reuse.

Storage Information Store away from oxidizers. Keep container closed when not in use. Product has a shelf life of 36 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Respiratory Protection Organic vapor respirator.
In high concentrations, supplied air respirator or a self-contained breathing apparatus.

Hand Protection Impervious rubber gloves.

Skin Protection Rubber apron.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Liquid
LE SUPERMUL
Page 2 of 6

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Color: | Amber |
| Odor: | Mild |
| pH: | 2.6 |
| Specific Gravity @ 20 C (Water=1): | 0.924 |
| Density @ 20 C (lbs./gallon): | 7.7 |
| Bulk Density @ 20 C (lbs/ft ³): | Not Determined |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | 20 |
| Freezing Point/Range (C): | -6.6 |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | 280-300 |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|---|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None known. |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Oxides of nitrogen. Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness. |
| Skin Contact | May cause skin irritation. |
| Eye Contact | May cause eye irritation. |
| Ingestion | May cause abdominal pain, vomiting, nausea, and diarrhea. May cause headache, dizziness, nausea, vomiting, gastrointestinal irritation and central nervous system depression. |
| Aggravated Medical Conditions | Lung disorders. Skin disorders. |
| Chronic Effects/Carcinogenicity | Prolonged or repeated exposure may cause reproductive system damage. Repeated overexposure may cause liver and kidney effects. |

Other Information None known.

Toxicity Tests

Oral Toxicity: Not determined

Dermal Toxicity: Not determined

Inhalation Toxicity: Not determined

Primary Irritation Effect: Not determined

Carcinogenicity Not determined

Genotoxicity: Not determined

**Reproductive /
Developmental Toxicity:** Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined

Persistence/Degradability Not determined

Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined

Acute Crustaceans Toxicity: Not determined

Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|--|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity For This Product | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2B Toxic Materials |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BAROID® OIL ABSORBENT**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BAROID® OIL ABSORBENT
Synonyms: None
Chemical Family: Mineral
Application: Suspending Agent

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------|------------|-----------|-------------------------|---|
| Magnesium silicate | 1343-90-4 | 60 - 100% | Not applicable | Not applicable |
| Crystalline silica, quartz | 14808-60-7 | 2-6 | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD

May cause eye and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD

Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|---|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists. |
| Ingestion | Under normal conditions, first aid procedures are not required. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|---|---|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |
| Fire Extinguishing Media | All standard firefighting media. |
| Special Exposure Hazards | Not applicable. |
| Special Protective Equipment for Fire-Fighters | Not applicable. |
| NFPA Ratings: | Health 1, Flammability 0, Reactivity 0 |
| HMIS Ratings: | Flammability 0, Reactivity 0, Health 1* |

6. ACCIDENTAL RELEASE MEASURES

| | |
|---|---|
| Personal Precautionary Measures | Use appropriate protective equipment. Avoid creating and breathing dust. |
| Environmental Precautionary Measures | None known. |
| Procedure for Cleaning / Absorption | Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal. |

7. HANDLING AND STORAGE

| | |
|-----------------------------|--|
| Handling Precautions | This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet. |
| Storage Information | Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 60 months. |

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2. |
| Respiratory Protection | Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. |
| Hand Protection | Normal work gloves. |
| Skin Protection | Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing. |
| Eye Protection | Wear safety glasses or goggles to protect against exposure. |
| Other Precautions | None known. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Physical State: | Granules |
| Color: | Gray to tan |
| Odor: | Odorless |
| pH: | Not Determined |
| Specific Gravity @ 20 C (Water=1): | 2.6 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 32-38 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Hydrofluoric acid. |
| Hazardous Decomposition Products | Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | None known. |
| Eye Contact | May cause eye irritation. |
| Ingestion | May be harmful if swallowed. |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |
| Chronic Effects/Carcinogenicity | <p>Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.</p> <p>Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).</p> <p>There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.</p> |
| Other Information | For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997). |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

Primary Irritation Effect: Not determined
Carcinogenicity Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997).
Genotoxicity: Not determined
Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined

Persistence/Degradability Not applicable

Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined

Acute Crustaceans Toxicity: Not determined

Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory All components listed on inventory.

EPA SARA Title III Extremely Hazardous Substances Not applicable

EPA SARA (311,312) Hazard Class Acute Health Hazard
Chronic Health Hazard

EPA SARA (313) Chemicals This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).

EPA CERCLA/Superfund Reportable Spill Quantity Not applicable.

EPA RCRA Hazardous Waste Classification If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.

California Proposition 65 The California Proposition 65 regulations apply to this product.

MA Right-to-Know Law One or more components listed.

NJ Right-to-Know Law One or more components listed.

PA Right-to-Know Law One or more components listed.

Canadian Regulations

Canadian DSL Inventory Product contains one or more components not listed on inventory.

WHMIS Hazard Class D2A Very Toxic Materials
Crystalline silica

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **RHEMOD L**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: RHEMOD L
Synonyms: None
Chemical Family: Tall oil fatty acid
Application: Viscosifier

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-----------------------------------|------------|----------|----------------|----------------|
| Fatty acids, C18-unsatd., trimers | 68937-90-6 | 10 - 30% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye and skin irritation. May be harmful if swallowed.

4. FIRST AID MEASURES

Inhalation: If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin: Wash with soap and water. Get medical attention if irritation persists.

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion: Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician: Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | 518 |
| Flash Point/Range (C): | 270 |
| Flash Point Method: | COC |
| Autoignition Temperature (F): | > 425 |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 1, Reactivity 0

HMS Ratings: Flammability 0, Reactivity 0, Health 1

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Wash hands after use.

Storage Information Store in a cool, dry location. Product has a shelf life of 36 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Organic vapor respirator.

Hand Protection Impervious rubber gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|-----------------|----------------|
| Physical State: | Liquid |
| Color: | Dark |
| Odor: | Fatty acid |
| pH: | Not Determined |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Specific Gravity @ 20 C (Water=1): | 0.96 |
| Density @ 20 C (lbs./gallon): | 8 |
| Bulk Density @ 20 C (lbs/ft3): | 57.30 |
| Boiling Point/Range (F): | > 572 |
| Boiling Point/Range (C): | > 300 |
| Freezing Point/Range (F): | < -4 |
| Freezing Point/Range (C): | < 25 |
| Vapor Pressure @ 20 C (mmHg): | < 0.001 |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | 0 |
| Evaporation Rate (Butyl Acetate=1): | 0 |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | 1849 @ 25C |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|-------------------------------------|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None known. |
| Incompatibility (Materials to Avoid) | None known. |
| Hazardous Decomposition Products | Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|---|
| Principle Route of Exposure | Eye and skin contact. |
| Inhalation | May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness. |
| Skin Contact | May cause skin irritation. |
| Eye Contact | May cause mild eye irritation. |
| Ingestion | Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal. |
| Aggravated Medical Conditions | Skin disorders. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |

| | |
|---|----------------|
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Not determined |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|----------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Not determined |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|----------------|
| Acute Fish Toxicity: | Not determined |
| Acute Crustaceans Toxicity: | Not determined |
| Acute Algae Toxicity: | Not determined |

| | |
|----------------------------------|----------------|
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Disposal should be made in accordance with federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | Does not apply. |

Canadian Regulations

| | |
|------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BAROID® RIG WASH**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BAROID® RIG WASH
Synonyms: None
Chemical Family: Blend
Application: Surfactant

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-------------|------------|---------|---------------|--------------|
| Isopropanol | 67-63-0 | 1 - 5% | 200 ppm | 400 ppm |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye, skin, and respiratory irritation.

4. FIRST AID MEASURES

Inhalation If inhaled, remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult give oxygen. Get medical attention.

Skin Wash with soap and water. Get medical attention if irritation persists. Remove contaminated clothing and launder before reuse.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion If swallowed dilute with 1-2 glasses of milk or water and then induce vomiting.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Min: > 220 |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Min: > 104 |
| Autoignition Temperature (C): | COC |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 0, Reactivity 0

HMIS Ratings: Flammability 0, Reactivity 0, Health 1

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid breathing vapors.

Storage Information Store away from oxidizers. Keep container closed when not in use. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Respiratory Protection Organic vapor respirator.

Hand Protection Impervious rubber gloves.

Skin Protection Rubber apron.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|-----------------|----------------|
| Physical State: | Liquid |
| Color: | Clear blue |
| Odor: | Slight Alcohol |
| pH: | 9.5 |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Specific Gravity @ 20 C (Water=1): | 1.025 |
| Density @ 20 C (lbs./gallon): | 8.5 |
| Bulk Density @ 20 C (lbs/ft3): | 63.6 |
| Boiling Point/Range (F): | > 212 |
| Boiling Point/Range (C): | > 100 |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Soluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|---|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None known. |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Oxides of sulfur. Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause respiratory irritation. May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness. |
| Skin Contact | May cause skin irritation. |
| Eye Contact | May cause eye irritation. |
| Ingestion | May cause headache, dizziness, nausea, vomiting, gastrointestinal irritation and central nervous system depression. |
| Aggravated Medical Conditions | Skin disorders. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |

| | |
|---|----------------|
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Not determined |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|----------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Not determined |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|----------------|
| Acute Fish Toxicity: | Not determined |
| Acute Crustaceans Toxicity: | Not determined |
| Acute Algae Toxicity: | Not determined |

| | |
|----------------------------------|----------------|
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Disposal should be made in accordance with federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|--|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard |
| EPA SARA (313) Chemicals | This product contains toxic chemical(s) listed below which is(are) subject to the reporting requirements of Section 313 of Title III of SARA and 40 CFR Part 372: Glycol Ethers//34398-01-1 Isopropanol//67-63-0 |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2B Toxic Materials |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **FWCA CEMENT ADDITIVE**

Revision Date: 04-Jan-2010

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: FWCA CEMENT ADDITIVE
Synonyms: None
Chemical Family: Polysaccharide
Application: Free Water Control Additive
Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000
Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------|------------|-----------|----------------------|----------------------|
| Cellulose derivative | | 60 - 100% | 10 mg/m ³ | 15 mg/m ³ |

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye and respiratory irritation. Airborne dust may be explosive.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | 770 |
| Autoignition Temperature (C): | 410 |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0

HMS Ratings: Health 0, Flammability 0, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid creating or inhaling dust.

Storage Information Store away from oxidizers. Store in a cool, dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|-----------------|----------------|
| Physical State: | Solid |
| Color: | White |
| Odor: | Characteristic |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| pH: | 6.5 |
| Specific Gravity @ 20 C (Water=1): | 1.39 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 32 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | <5 |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Forms gel |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | >600 |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Aldehydes. Carboxylic acids. Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause mild respiratory irritation. |
| Skin Contact | None known. |
| Eye Contact | May cause mild eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |

Inhalation Toxicity: Not determined
Primary Irritation Effect: Not determined
Carcinogenicity Not determined
Genotoxicity: Not determined
**Reproductive /
Developmental Toxicity:** Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Readily biodegradable
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: Not determined
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory or are exempt. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | Does not apply. |
| PA Right-to-Know Law | Does not apply. |

Canadian Regulations

| | |
|------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **HALAD® 322 CEMENT ADDITIVE**

Revision Date: 04-Jan-2010

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: HALAD® 322 CEMENT ADDITIVE
Synonyms: None
Chemical Family: Blend
Application: Cement Additive

Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------|------------|----------|----------------------|----------------------|
| Sodium formate | 141-53-7 | 1 - 5% | Not applicable | Not applicable |
| Cellulose derivative | | 10 - 30% | 10 mg/m ³ | 15 mg/m ³ |

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory irritation. Airborne dust may be explosive.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0

HMIS Ratings: Health 0, Flammability 0, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid creating or inhaling dust.

Storage Information Store in a cool, dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|-----------------|----------|
| Physical State: | Solid |
| Color: | Red |
| Odor: | Odorless |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|-------------------|
| pH: | Not Determined |
| Specific Gravity @ 20 C (Water=1): | 1.28 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 35.2 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Partially soluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | >600 |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|---|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Oxides of sulfur. Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause mild respiratory irritation. |
| Skin Contact | None known. |
| Eye Contact | May cause eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |

Inhalation Toxicity: Not determined
Primary Irritation Effect: Not determined
Carcinogenicity Not determined
Genotoxicity: Not determined
**Reproductive /
Developmental Toxicity:** Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Readily biodegradable
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: Not determined
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory or are exempt. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |

Canadian Regulations

| | |
|------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **HALAD® 344 CEMENT ADDITIVE**

Revision Date: 04-Jan-2010

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: HALAD® 344 CEMENT ADDITIVE
Synonyms: None
Chemical Family: Polymer
Application: Fluid Loss Additive

Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-------------------------------|------------|-----------|----------------|----------------|
| Modified acrylamide copolymer | | 60 - 100% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye and respiratory irritation.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes Immediately flush eyes with large amounts of water for at least 15 minutes. Get immediate medical attention.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water spray, dry chemical, or foam.

Special Exposure Hazards Decomposition in fire may produce toxic gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 0, Flammability 1, Reactivity 0
HMS Ratings: Health 1, Flammability 1, Physical Hazard 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid creating or inhaling dust. Do not swallow. Avoid contact with eyes, skin, or clothing.

Storage Information Store in a cool, dry location. Store away from oxidizers. Keep container closed when not in use.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Dust/mist respirator. (95%)

Hand Protection Nitrile gloves. Polyvinylchloride gloves. Neoprene gloves. Rubber gloves. Butyl rubber gloves. Cloth gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Powder

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|--------------------|
| Color: | White to off white |
| Odor: | Odorless |
| pH: | Not Determined |
| Specific Gravity @ 20 C (Water=1): | 1.37 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 25-35 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | 18 |
| Freezing Point/Range (C): | -8 |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | <5 |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Soluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | >600 |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|---|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | None known. |
| Hazardous Decomposition Products | Oxides of nitrogen. Carbon monoxide and carbon dioxide. Oxides of sulfur. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause respiratory irritation. |
| Skin Contact | Prolonged or repeated contact may cause skin irritation. |
| Eye Contact | May cause eye irritation. |
| Ingestion | No adverse health effects are expected from swallowing. |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |

| | |
|---|----------------|
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Not determined |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|------------------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | BOD(28 Day): 3% of COD |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

Acute Fish Toxicity: TLM48: 2000 mg/l (Arcatia tonsa)
Acute Crustaceans Toxicity: TLM48: > 1000 mg/l (Daphnia magna)

Acute Algae Toxicity: EC50: 3300 mg/l (Skeletonema costatum)

| | |
|----------------------------------|----------------|
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Bury in a licensed landfill according to federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG

Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION**US Regulations**

| | |
|--|--|
| US TSCA Inventory | All components listed on inventory or are exempt. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |

Canadian Regulations

| | |
|-------------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **HR-5**

Revision Date: 04-Jan-2010

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: HR-5
Synonyms: None
Chemical Family: Lignosulfonate
Application: Cement Retarder

Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-------------------------|------------|-----------|----------------|----------------|
| Modified lignosulfonate | | 60 - 100% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye and respiratory irritation.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 0, Reactivity 0

HMS Ratings: Health 1, Flammability 0, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.

Storage Information Store in a cool, dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|------------------------------------|----------|
| Physical State: | Solid |
| Color: | Black |
| Odor: | Molasses |
| pH: | 9.5-10.3 |
| Specific Gravity @ 20 C (Water=1): | 1.32 |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 29.8 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | 25 |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|-------------------|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Oxides of sulfur. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause mild respiratory irritation. |
| Skin Contact | None known. |
| Eye Contact | May cause mechanical irritation to eye. |
| Ingestion | None known |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

Primary Irritation Effect: Not determined
Carcinogenicity Not determined
Genotoxicity: Not determined
Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Readily biodegradable

Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: TLM96: > 1000 ppm (Crangon crangon)
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|--|--|
| US TSCA Inventory | All components listed on inventory or are exempt. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | Does not apply. |
| PA Right-to-Know Law | Does not apply. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **HR-601**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: HR-601
Synonyms: None
Chemical Family: Lignosulfonate
Application: Cement Retarder

Manufacturer/Supplier Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-------------------------|------------|-----------|----------------|----------------|
| Modified lignosulfonate | | 60 - 100% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye and respiratory irritation.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Lower (oz./ft3): | 0.2 |
| Flammability Limits in Air - Upper (%): | Not Determined |
| Flammability Limits in Air - Upper (oz./ft3): | 3.5 |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 1, Reactivity 0
HMS Ratings: Health 1, Flammability 1, Physical Hazard 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.

Storage Information Store away from oxidizers. Store in a cool, dry location. Product has a shelf life of 24 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Physical State: | Solid |
| Color: | Brown |
| Odor: | Woody |
| pH: | 7.8 |
| Specific Gravity @ 20 C (Water=1): | 1.08 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 30.5 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Soluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|---|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Oxides of sulfur. Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause mild respiratory irritation. |
| Skin Contact | None known. |
| Eye Contact | May cause mechanical irritation to eye. |
| Ingestion | None known |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |

| | |
|---|--------------------------|
| Oral Toxicity: | LD50: > 5000 mg/kg (Rat) |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Not determined |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|-----------------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Readily biodegradable |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: TLM48: > 1000 mg/l (Daphnia magna)

Acute Algae Toxicity: Not determined

| | |
|----------------------------------|----------------|
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Bury in a licensed landfill according to federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | Does not apply. |
| PA Right-to-Know Law | Does not apply. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: KCL POTASSIUM CHLORIDE

Revision Date: 04-Jan-2010

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: KCL POTASSIUM CHLORIDE
Synonyms: None
Chemical Family: Inorganic Salt
Application: Additive
Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000
Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|--------------------|------------|-----------|----------------|----------------|
| Potassium chloride | 7447-40-7 | 60 - 100% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory irritation.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 0, Reactivity 0
HMIS Ratings: Health 1, Flammability 0, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Avoid breathing vapors.

Storage Information Store in a cool, dry location. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Dust proof goggles.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|------------------------------------|----------------|
| Physical State: | Solid |
| Color: | White to gray |
| Odor: | Odorless |
| pH: | 9.2 |
| Specific Gravity @ 20 C (Water=1): | 1.99 |
| Density @ 20 C (lbs./gallon): | Not Determined |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Bulk Density @ 20 C (lbs/ft ³): | 72.8 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | 25.5 |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | 74.55 |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|------------------|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | None known. |
| Hazardous Decomposition Products | None known. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause respiratory irritation. |
| Skin Contact | May cause moderate skin irritation. |
| Eye Contact | May cause severe eye irritation. |
| Ingestion | Irritation of the mouth, throat, and stomach. May cause abdominal pain, vomiting, nausea, and diarrhea. |
| Aggravated Medical Conditions | Skin disorders. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | LD50: > 5000 mg/kg (Rat) |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

Primary Irritation Effect: Not determined
Carcinogenicity Not determined
Genotoxicity: Not determined
**Reproductive /
Developmental Toxicity:** Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined

Persistence/Degradability Not determined

Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: TLM96: 100-330 ppm (Crangon crangon)

Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory or are exempt. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | Does not apply. |
| PA Right-to-Know Law | Does not apply. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2B Toxic Materials |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **POZ STANDARD CEMENT 50/50**

Revision Date: 05-Jan-2009

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: POZ STANDARD CEMENT 50/50
Synonyms: None
Chemical Family: Cement
Application: Cement

Manufacturer/Supplier Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------|------------|----------|-------------------------|---|
| Fly ash | 68131-74-8 | 30 - 60% | Not applicable | Not applicable |
| Bentonite | 1302-78-9 | 1 - 5% | Not applicable | Not applicable |
| Portland cement | 65997-15-1 | 30 - 60% | 10 mg/m ³ | 15 mg/m ³ |
| Crystalline silica, quartz | 14808-60-7 | 1 - 5% | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD
May cause eye, skin, and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|---|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing. |
| Ingestion | Under normal conditions, first aid procedures are not required. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|--|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

| | |
|---|---|
| Fire Extinguishing Media | None - does not burn. |
| Special Exposure Hazards | Not applicable. |
| Special Protective Equipment for Fire-Fighters | Not applicable. |
| NFPA Ratings: | Health 1, Flammability 0, Reactivity 0 |
| HMS Ratings: | Health 1*, Flammability 0, Reactivity 0 |

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Product has a shelf life of 24 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2. |
| Respiratory Protection | Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. |
| Hand Protection | Normal work gloves. |
| Skin Protection | Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing. |
| Eye Protection | Wear safety glasses or goggles to protect against exposure. |
| Other Precautions | Eyewash fountains and safety showers must be easily accessible. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Physical State: | Solid |
| Color: | Gray |
| Odor: | Odorless |
| pH: | 12.4 |
| Specific Gravity @ 20 C (Water=1): | Not Determined |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | Not Determined |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Not Determined |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Hydrofluoric acid. |
| Hazardous Decomposition Products | Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | Can dry skin. May cause an allergic skin reaction. May cause alkali burns with confined contact. |
| Eye Contact | May cause severe eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |
| Chronic Effects/Carcinogenicity | <p>Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.</p> <p>Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).</p> <p>There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.</p> |
| Other Information | For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997). |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

Primary Irritation Effect: Not determined
Carcinogenicity Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997).
Genotoxicity: Not determined
Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Not applicable
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: Not determined
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|---|
| US TSCA Inventory | All components listed on inventory or are exempt. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard Chronic Health Hazard |

EPA SARA (313) Chemicals This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).

EPA CERCLA/Superfund Reportable Spill Quantity Not applicable.

EPA RCRA Hazardous Waste Classification If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.

California Proposition 65 The California Proposition 65 regulations apply to this product.

MA Right-to-Know Law One or more components listed.

NJ Right-to-Know Law One or more components listed.

PA Right-to-Know Law One or more components listed.

Canadian Regulations

Canadian DSL Inventory All components listed on inventory.

WHMIS Hazard Class
E Corrosive Material
D2A Very Toxic Materials
Crystalline silica

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **CEMENT - CLASS H - PREMIUM**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: CEMENT - CLASS H - PREMIUM
Synonyms: None
Chemical Family: Cement
Application: Cement

Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------|------------|-----------|-------------------------|---|
| Portland cement | 65997-15-1 | 60 - 100% | 10 mg/m ³ | 15 mg/m ³ |
| Crystalline silica, quartz | 14808-60-7 | <3 | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD
May cause eye, skin, and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|---|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing. |
| Ingestion | Under normal conditions, first aid procedures are not required. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|---|---|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |
| Fire Extinguishing Media | None - does not burn. |
| Special Exposure Hazards | Not applicable. |
| Special Protective Equipment for Fire-Fighters | Not applicable. |
| NFPA Ratings: | Health 1, Flammability 0, Reactivity 0 |
| HMS Ratings: | Flammability 0, Reactivity 0, Health 1* |

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Product has a shelf life of 24 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2. |
| Respiratory Protection | Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. |
| Hand Protection | Normal work gloves. |
| Skin Protection | Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing. |
| Eye Protection | Wear safety glasses or goggles to protect against exposure. |
| Other Precautions | Eyewash fountains and safety showers must be easily accessible. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Physical State: | Solid |
| Color: | Gray |
| Odor: | Odorless |
| pH: | 12.4 |
| Specific Gravity @ 20 C (Water=1): | 3.15 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 94 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | 0 |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | 0.5 |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | Keep away from any contact with water. |
| Incompatibility (Materials to Avoid) | Hydrofluoric acid. |
| Hazardous Decomposition Products | Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | Can dry skin. May cause an allergic skin reaction. May cause alkali burns with confined contact. |
| Eye Contact | May cause severe eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |
| Chronic Effects/Carcinogenicity | <p>Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.</p> <p>Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, <i>Silica, Some Silicates and Organic Fibres</i> (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).</p> <p>There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.</p> |
| Other Information | For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, <i>American Journal of Respiratory and Critical Care Medicine</i> , Volume 155, pages 761-768 (1997). |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

Primary Irritation Effect: Not determined
Carcinogenicity Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997).
Genotoxicity: Not determined
Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Not applicable
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: Not determined
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory All components listed on inventory.

EPA SARA Title III Extremely Hazardous Substances Not applicable

EPA SARA (311,312) Hazard Class Acute Health Hazard
Chronic Health Hazard

EPA SARA (313) Chemicals This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).

EPA CERCLA/Superfund Reportable Spill Quantity Not applicable.

EPA RCRA Hazardous Waste Classification If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.

California Proposition 65 The California Proposition 65 regulations apply to this product.

MA Right-to-Know Law One or more components listed.

NJ Right-to-Know Law One or more components listed.

PA Right-to-Know Law One or more components listed.

Canadian Regulations

Canadian DSL Inventory All components listed on inventory.

WHMIS Hazard Class E Corrosive Material
D2A Very Toxic Materials
Crystalline silica

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BARACARB® 25**

Revision Date: 02-Jan-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BARACARB® 25

Synonyms: None

Chemical Family: Mineral

Application: Bridging Agent

Manufacturer/Supplier: Baroid Drilling Fluids
a Product Service Line of Halliburton Energy Services, Inc.
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------|------------|-----------|-------------------------|---|
| Crystalline silica, quartz | 14808-60-7 | 0 - 1% | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |
| Limestone | 1317-65-3 | 60 - 100% | 10 mg/m ³ | 15 mg/m ³ |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD
May cause eye, skin, and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|---|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists. |
| Ingestion | Under normal conditions, first aid procedures are not required. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|---|---|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |
| Fire Extinguishing Media | All standard firefighting media. |
| Special Exposure Hazards | Not applicable. |
| Special Protective Equipment for Fire-Fighters | Not applicable. |
| NFPA Ratings: | Health 0, Flammability 0, Reactivity 0 |
| HMS Ratings: | Flammability 0, Reactivity 0, Health 1* |

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information Store away from acids. Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use in a well ventilated area. Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2. |
| Respiratory Protection | Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. |
| Hand Protection | Normal work gloves. |
| Skin Protection | Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing. |
| Eye Protection | Wear safety glasses or goggles to protect against exposure. |
| Other Precautions | None known. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Physical State: | Solid Powder |
| Color: | White |
| Odor: | Odorless |
| pH: | 8-9 |
| Specific Gravity @ 20 C (Water=1): | 2.7 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 168 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong acids. |
| Hazardous Decomposition Products | Carbon monoxide and carbon dioxide. Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | May cause skin irritation. |
| Eye Contact | May cause eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |
| Chronic Effects/Carcinogenicity | <p>Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.</p> <p>Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).</p> <p>There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.</p> |
| Other Information | For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997). |
| Toxicity Tests | |
| Oral Toxicity: | LD50: > 5000 mg/kg (Rat) |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

Primary Irritation Effect: Not determined
Carcinogenicity Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997).
Genotoxicity: Not determined
Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined

Persistence/Degradability Not determined

Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined

Acute Crustaceans Toxicity: TLM96: >1,000,000 ppm (Mysidopsis bahia) SPP @ 178.5 ppb

Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT

Not restricted

Canadian TDG

Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard Chronic Health Hazard |

| | |
|--------------------------|--|
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
|--------------------------|--|

| | |
|---|-----------------|
| EPA CERCLA/Superfund Reportable Spill Quantity For This Product | Not applicable. |
|---|-----------------|

| | |
|---|--|
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
|---|--|

| | |
|---------------------------|--|
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
|---------------------------|--|

| | |
|----------------------|--------------------------------|
| MA Right-to-Know Law | One or more components listed. |
|----------------------|--------------------------------|

| | |
|----------------------|--------------------------------|
| NJ Right-to-Know Law | One or more components listed. |
|----------------------|--------------------------------|

| | |
|----------------------|--------------------------------|
| PA Right-to-Know Law | One or more components listed. |
|----------------------|--------------------------------|

Canadian Regulations

| | |
|------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
|------------------------|-------------------------------------|

| | |
|--------------------|--|
| WHMIS Hazard Class | D2A Very Toxic Materials Crystalline silica |
|--------------------|--|

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

| | |
|------------------------|---|
| Additional Information | For additional information on the use of this product, contact your local Halliburton representative. |
|------------------------|---|

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

Exhibit 6



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS ANNUAL REPORT PROGRAM

COPY
WELL PERMIT

| DEP USE ONLY | |
|---|--------------------------|
| Permittee's eFACTS ID 277879 | Auth ID 827239 |
| Watershed Name N. Bra Calkins Creek | Quality HQ |

| | | | |
|---|---|---|---|
| Permittee NEWFIELD APPALACHIA PA LLC | OGO.# OGO-67425 | Permit Number 37-127-20016- | Date Issued 04/30/2010 |
| Address 363 N SAM HOUSTON PKWY E STE 2020 | | Farm Name & Well Number VE CRUM 1 1 | Well Serial # |
| HOUSTON, TX 77060-2424 | | Municipality Damascus | County Wayne |
| Phone (281) 847-6031 | | 7 1/2' Quadrangle Name Damascus | Map Section # 5 |
| Surf Elev at Site 904 feet | Anticipated Total Depth 8350 feet | Well Type TE | Offset distances referenced to NE corner of map section. South 11347 feet West 11136 feet |

This permit covering the well operator and well location shown above is evidence of permission granted to conduct activities in accordance with the Oil and Gas Act and the Oil and Gas Conservation Law, if the well is subject to that act and any rules and regulations promulgated thereunder, subject to the conditions contained herein and in accordance with the application submitted for this permit. This permit does not convey any property rights.

This permit and the permittee's authority to conduct the activities authorized by this permit are conditioned upon operator's compliance with applicable law and regulations.

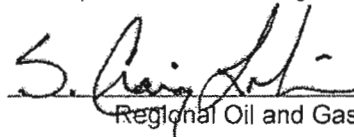
Notification must be given to the district oil and gas inspector, the surface landowner and political subdivision of the date well drilling will begin at least 24 hours prior to commencement of drilling activities.

The permittee hereby authorizes and consents to allow, without delay, employees or agents of the Department to have access to and to inspect all areas upon presentation of appropriate credentials, without advance notice or a search warrant. This includes any property, facility, operation or activity governed by the Oil and Gas Act, the Oil and Gas Conservation Law, the Coal and Gas Resource Coordination Act and other statutes applicable to oil and gas activities administered by the Department. The authorization and consent shall include consent to the Department to collect samples of wastewaters or gases, to take photographs, to perform measurements, surveys, and other tests, to inspect any monitoring equipment, to inspect the methods of operation and disposal, and to inspect and copy documents required by the Department to be maintained. The authorization and consent includes consent to the Department to examine books, papers, and records pertinent to any matter under investigation pursuant to the Oil and Gas Act or pertinent to a determination of whether the operator is in compliance with the above referenced statutes. This condition in no way limits any other powers granted to the Department under the Oil and Gas Act and other statutes, rules and regulations applicable to these activities as administered by the Department.

This permit does not relieve the operator from the obligation to comply with the Clean Streams Law and all statutes, rules and regulations administered by the Department.

Special Permit Conditions:

This permit expires 04/30/2011 unless drilling is commenced on or before that date and prosecuted with due diligence.


Regional Oil and Gas Program Manager

Stephen Watson
Oil & Gas Inspector

2 Public Square
Wilkes-Barre, PA 18711-0790

570-826-2320
Telephone



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

| DEP USE ONLY | |
|---------------------|--------------------------|
| Site ID | Primary Fac ID 728804 |
| Client Id 277879 | Subfacility Id |

Well Record and Completion Report

| | | | | | |
|--|--------------------|---|---|---------------------------------|----------|
| II Operator NEWFIELD APPALACHIA PA LLC | | DEP ID# 277879 | Well API # (Permit / Reg) 37-127-20016- | Project Number | Acres |
| Address 363 N SAM HOUSTON PKWY E STE 2020, | | | Well Farm Name & Well # VE CRUM 1 1 | | Serial # |
| City HOUSTON | State TX | Zip Code 77060-2424 | County Wayne | Municipality Damascus | |
| Phone (281) 847-6031 | Fax | USGS 7.5 min. quadrangle map Damascus | | | |

Check all that apply: Original Well Record Original Completion Report Amended Well Record Amended Completion Report

WELL RECORD Also complete the Log of Formations on back (page 2)

| Well Type <input type="checkbox"/> Gas <input type="checkbox"/> Oil <input type="checkbox"/> Combination Oil & Gas <input type="checkbox"/> Injection <input type="checkbox"/> Storage <input type="checkbox"/> Disposal | | | | | | | |
|---|-------------------------|---|------------------------------|-----------------------------|---|---|----------|
| Drilling Method <input type="checkbox"/> Rotary – Air <input type="checkbox"/> Rotary – Mud <input type="checkbox"/> Cable Tool | | | | | | | |
| Date Drilling Started | Date Drilling Completed | Surface Elevation ft. | Total Depth – Driller ft. | Total Depth - Logger ft. | | | |
| Casing and Tubing | | Cement returned on surface casing? <input type="checkbox"/> Yes <input type="checkbox"/> No Cement returned on coal protective casing? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | | | | | |
| Hole Size | Pipe Size | Wt. | Thread / Weld | Amount in Well (ft) | Material Behind Pipe Type and Amount | Packer / Hardware / Centralizers Type Size Depth | Date Run |
| | | | | | | | |
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COMPLETION REPORT

| Perforation Record | | | | Stimulation Record | | | |
|--------------------|--------------------------------|------|------------------|----------------------|-------------------------------|-------------------|--|
| Date | Interval Perforated From To | Date | Interval Treated | Fluid Type Amount | Propping Agent Type Amount | Average Injection | |
| | | | | | | | |
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| | | | |
|---------------------------|-------------------------------|-------|------|
| Natural Open Flow | Natural Rock Pressure | Hours | Days |
| After Treatment Open Flow | After treatment Rock Pressure | Hours | Days |

Well Service Companies -- Provide the name, address, and phone number of all well service companies involved.

| | | |
|--------------------|--------------------|--------------------|
| Name | Name | Name |
| Address | Address | Address |
| City - State - Zip | City - State - Zip | City - State - Zip |
| Phone | Phone | Phone |

LOG OF FORMATIONS

Well API#: 37-127-20016--

(If you will need more space than this page, please photocopy the blank form before filling it in.)

| Formation Name or Type | Top (feet) | Bottom (feet) | Gas at (feet) | Oil at (feet) | Water at (fresh / brine: ft.) | Source of Data |
|------------------------|---------------|------------------|------------------|------------------|----------------------------------|----------------|
| | | | | | | |
| | | | | | | |

I do hereby certify to the best of my knowledge, information and belief that the well identified on this Well Record and Completion Report has been properly cased and cemented in accordance with the requirements of 25 Pa. Code Chapter 78 and any conditions contained in the permit for this well. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

| | | | | | | | |
|--|---|---------------------|--|--------------------|-------------|-----------------|--|
| <p>Well Operator's Signature</p> <p>Title: _____ Date: _____</p> | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">DEP USE ONLY</td> <td style="width: 50%;"></td> </tr> <tr> <td>Reviewed by: _____</td> <td>Date: _____</td> </tr> <tr> <td colspan="2">Comments: _____</td> </tr> </table> | DEP USE ONLY | | Reviewed by: _____ | Date: _____ | Comments: _____ | |
| DEP USE ONLY | | | | | | | |
| Reviewed by: _____ | Date: _____ | | | | | | |
| Comments: _____ | | | | | | | |



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

| | |
|---------------------|--------------------------|
| DEP USE ONLY | |
| Site ID | Primary Fac ID 728804 |
| Client Id 277879 | Subfacility Id |

Well Site Restoration Report

| | | | |
|--|--|--|---|
| A. Operator and Well Information | | <i>Please read instructions on back before completing this form.</i> | |
| Well Operator NEWFIELD APPALACHIA PA LLC | | DEP ID# 277879 | Well API # (Permit / Reg) 37-127-20016- |
| Address 363 N SAM HOUSTON PKWY E STE 2020, | | Well Farm Name & Well # VE CRUM 1 1 | |
| City HOUSTON | State TX | Zip Code 77060-2424 | County Wayne |
| Municipality Damascus | | Serial # | |
| Phone (281) 847-6031 | | Fax | |
| B. Land Application of Tophole Water | | E. Pit Disposal | |
| Date applied | pH | Describe pit closure procedures. | |
| Volume (bbls) | Spec. cond. (µmhos/cm) | | |
| C. Off-site Waste Disposal | | | |
| Type: <input type="checkbox"/> Drilling Fluid (803) | Amount: bbls | | |
| <input type="checkbox"/> Fracing Fluid (804) | bbls | | |
| <input type="checkbox"/> Other, specify: | Qty: bbls or tons | | |
| Method of disposal or reuse | <input type="checkbox"/> Sewage Treatment Plant (10) | Subbase, material: Thickness: inches | |
| <input type="checkbox"/> Disposal Well (04) | <input type="checkbox"/> Brine Treatment Plant (12) | Pit liner, material: Thickness: mils | |
| <input type="checkbox"/> Landfill (05) | <input type="checkbox"/> Other (08) | Pit dimensions (feet) Length: Width: Depth: | |
| Facility Information | | F. Land Application | |
| Name | Permit # | Area: Length: feet Width: feet | |
| Hauler Information | | Waste-to-soil ratio (by volume): | |
| Name | | Chemical analysis of waste | |
| Address | | Cadmium (Cd) ppm Nickel (Ni) ppm | |
| City | State Zip Code | Copper (Cu) ppm Zinc (Zn) ppm | |
| D. On-site Disposal – Drill Cuttings or Waste | | Chromium (Cr) ppm Oil and Grease % | |
| Location of center of disposal area in relation to the well: | | Lead (Pb) ppm Spec. Cond. µmhos/cm | |
| Course | Distance | Mercury (Hg) ppm | |
| Describe the material disposed, including additives. | | Well Operator's Signature | |
| | | Title: Date: | |
| | | DEP USE ONLY | |
| | | Reviewed by: Date: | |
| Specify disposal method | | Comments: | |
| <input type="checkbox"/> Unlined pit, complete Section E. | <input type="checkbox"/> Dusting | | |
| <input type="checkbox"/> Lined pit, complete Section E. | <input type="checkbox"/> Solidification | | |
| <input type="checkbox"/> Land application, complete Section F. | <input type="checkbox"/> Other | | |

Instructions for Well Site Restoration Report

Form 5500-FM-OG0075

Use this form to file the Well Site Restoration Report as required under 25 Pa. Code § 78.65(3). This report is to be filed with the department within 60 days after the restoration of the well site.

Section A. Operator and Well Information

Enter the name, address and telephone number of the well operator/permittee.

Provide the requested well information.

Section B. Land Application Of Tophole Water

Land application of tophole water must be performed in accordance with 25 Pa. Code § 78.60.

Provide the date(s) when tophole water was applied to the land, the estimated volume discharged, and the pH and specific conductance readings of the tophole water.

Section C. Off-site Waste Disposal

If disposing of residual waste off-site, complete this section.

Check the box next to each type of waste taken off-site for disposal. More than one box may be checked. Identify the number of barrels of drilling or fracing fluid removed. If checking "other", identify the waste and show the amount in either barrels or tons. Circle the appropriate unit of measurement.

Check the box next to the type of facility or site receiving the waste. Provide the name and permit number of the facility.

Provide the name and address of the person or company hauling the waste.

Section D. On-site Disposal – Drill Cuttings or Waste

If disposing of drill cuttings and/or residual waste on-site in accordance with 25 Pa. Code § 78.61 (Disposal of drill cuttings), § 78.62 (Disposal of residual waste—pits), or § 78.63 (Disposal of residual waste—land application), complete this section.

Locate the approximate center of the disposal area by giving the course in degrees and the distance in feet from the wellhead.

Describe the types of materials that were disposed on-site. Include drill cuttings above the surface casing seat, drill cuttings below the surface casing seat, cement returns, drilling muds, frac sands, and any other material that is being disposed on-site. Indicate any additives that were in the materials being disposed.

Additives are usually present to modify the performance of cement, drilling muds or frac sands. An example might be salt or oil in drilling muds.

Check the box next to the on-site disposal methods used. If "other" is checked, briefly describe the method of disposal.

Section E. Pit Disposal

If disposing of drill cuttings under 25 Pa. Code § 78.61 (Disposal of drill cuttings) complete the pit dimensions part of this section. If disposing of drill cuttings and/or residual waste under 25 Pa. Code § 78.62 (Disposal of residual waste—pits), complete all of this section.

Describe the procedures used to close the pit. The procedures should conform to requirements in 25 Pa. Code § 78.62.

Describe the type of material and thickness used for the subbase and pit liner. The manufacturer should be identified when describing the type of material used for the pit liner.

Provide the dimensions of the pit, giving the appropriate length, width, and depth in feet.

Section F. Land Application

If disposing of drill cuttings and/or residual waste including contaminated drill cuttings under 25 Pa. Code § 78.63, complete this section.

Provide the approximate length and width of the land application area in feet. Indicate the ratio of waste to soil by volume. As an example, if a 3-inch layer of waste was mixed into a 6-inch layer of soil the ratio would be 1/2. In no case may the ratio exceed 1/1.

Complete the chemical analysis information if it is requested by the department. The analysis is to be performed on the waste soil mixture after land application has occurred. See the guidelines for land application in the "Oil and Gas Operators Manual" for taking samples and for analysis methods.

If more room is needed to complete any section, provide the information on 8 1/2" by 11" sheets of paper and attach to this form. Indicate the sections the information applies to.

CRUM WELL PAD
 NEWFIELD APPALACHIA PA LLC.

DAMASCUS TOWNSHIP, WAYNE COUNTY, PENNSYLVANIA

EROSION & SEDIMENT CONTROL PLAN

JUNE 2010

| DRAWING INDEX | |
|---------------|------------------------------------|
| No. | DRAWING TITLE |
| C-1 | EROSION & SEDIMENT CONTROL PLAN |
| C-2 | STAKEOUT & SITE GEOMETRY DETAILS |
| C-3 | EROSION & SEDIMENT CONTROL DETAILS |
| C-4 | STAKEOUT & SITE GEOMETRY PLAN |
| C-5 | SITE SECTIONS |
| C-6 | STABLE T. AND QUANTITIES |
| C-7 | CONSTRUCTION REGULATIONS |



TETRA TECH

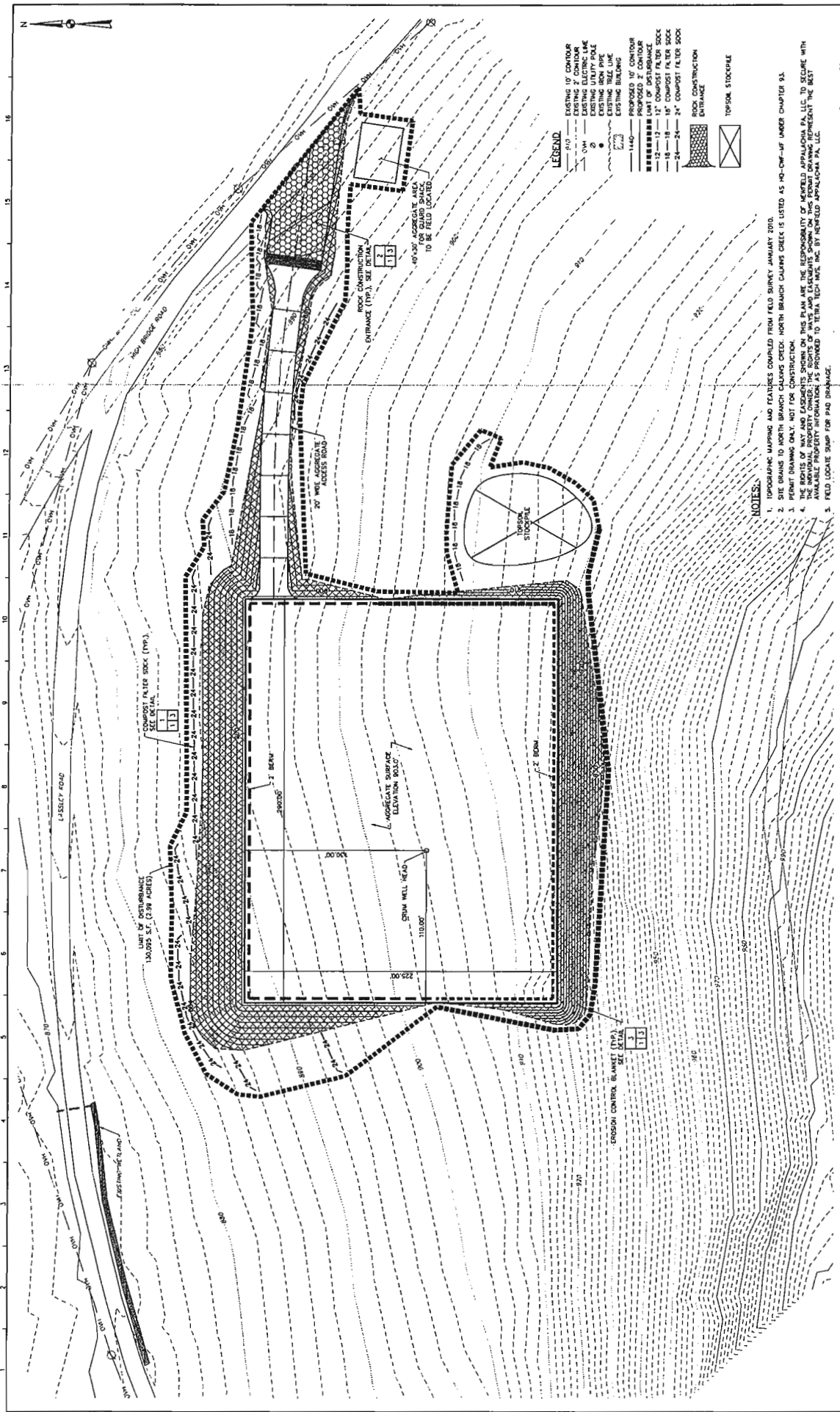
complex world | CLEAR SOLUTIONS™

661 ANDERSEN DRIVE - FOSTER PLAZA VII, PITTSBURGH, PA 15220
 TEL: (412) 921-7090 | FAX: (412) 921-4040



LOCATION MAP
 DAMASCUS, PA. - USGS 7.5' QUADRANGLE
 CRUM WELL PAD
 WAYNE COUNTY, PENNSYLVANIA
 SCALE: 1" = 2000'

0 2000 4000
 SCALE: 1" = 2000'



- LEGEND**
- EXISTING 10' CONTOUR
 - EXISTING 5' CONTOUR
 - EXISTING ELEVATION
 - EXISTING UTILITY POLE
 - EXISTING IRON PIPE
 - EXISTING CONCRETE
 - EXISTING BUILDING
 - PROPOSED 10' CONTOUR
 - PROPOSED 5' CONTOUR
 - LIMIT OF DISTURBANCE
 - COMPOST FILTER SOCK
 - COMPOST FILTER SOCK
 - COMPOST FILTER SOCK
 - ROCK CONSTRUCTION ENTRANCE
 - TOPSOIL STOCKPILE

- NOTES:**
1. TOPOGRAPHIC MAPPING AND FEATURES COMPILED FROM FIELD SURVEY JANUARY 2010.
 2. SITE DRAINS TO NORTH BRANCH CALAUS CREEK, NORTH BRANCH CALAUS CREEK IS LISTED AS NO-DW-AF UNDER CHAPTER 83.
 3. PERMIT DRAWING ONLY. NOT FOR CONSTRUCTION.
 4. THE RIGHTS OF WAY AND EASEMENTS SHOWN ON THIS PLAN ARE THE RESPONSIBILITY OF NEWFIELD APPALACHIA PA, LLC TO SECURE WITH APPROPRIATE PERMITS. THE INFORMATION IS FOR GENERAL INFORMATION ONLY AND DOES NOT REPRESENT THE BEST AVAILABLE PROPERTY INFORMATION AS PROVIDED TO TETRA TECH INC. BY NEWFIELD APPALACHIA PA, LLC.
 5. FIELD LOCATE STAMP FOR PAD DRAINAGE.

DATE: 8/15/10
 SHEET NO.: 113
 DESIGNED BY: B.S.
 DRAWN BY: B.S.
 CHECKED BY: A.S.
 SHEET: 1 OF 7
 CONTRACTOR: TETRA TECH INC.
C-1

NEWFIELD APPALACHIA PA LLC,
 WAYNE COUNTY, PENNSYLVANIA
 CRUM WELL PAD
 EROSION & SEDIMENT CONTROL PLAN
 SCALE: 1" = 30'

| DATE | DATE | DESCRIPTION | BY |
|------|------|-------------|----|
| | | | |
| | | | |

TETRA TECH
 www.tetra-tech.com
 661 ANKENY DRIVE
 PITTSBURGH, PA 15106
 T: (412) 931-7990 F: (412) 931-4040



STANDARD EROSION AND SEDIMENT CONTROL PLAN NOTES

1. STORMWATER MUST NOT EXCEED 3 FEET. SLOPES MUST BE 2:1 OR FLATTER.
2. THE OPERATOR SHALL ASSURE THAT THE APPROVED EROSION AND SEDIMENT CONTROL PLAN IS PROPERLY IMPLEMENTED.
3. UNTIL THE SITE ACHIEVES FINAL STABILIZATION, THE OPERATOR SHALL ASSURE THAT THE BEST MANAGEMENT PRACTICES ARE IMPLEMENTED, OPERATED, AND MAINTAINED. THE OPERATOR SHALL MAINTAIN AND MAKE AVAILABLE TO DEPARTMENT OF ENVIRONMENTAL RESTORATION ALL RECORDS INCLUDING BUT NOT LIMITED TO: PERMITS, REPAIR, REPLACEMENT, RECORDING, AND RESTABILIZATION SHALL BE PERFORMED IMMEDIATELY UPON OCCURRENCE OF INFILTRATION.
4. ALL PUMPING OF SEWAGE TREATED WATER SHALL BE THROUGH A SEDIMENT CONTROL BWP, SUCH AS A PUMPED WATER FILTER BAG DISCHARGING OVER NON-DISTURBED AREAS.
5. THE CONTRACTOR SHALL REVIEW THE PROVISIONS OF THE APPENDIX 6.4. EROSION CONTROL RULES AND REGULATIONS, TITLE 25, PART 1, 102. EROSION CONTROL. ENVIRONMENTAL PROTECTION, SUBPART C, PROTECTION OF NATURAL RESOURCES, ARTICLE 6. WATER RESOURCES, CHAPTER 102. EROSION CONTROL.
6. A COPY OF THE EROSION AND SEDIMENT CONTROL PLAN MUST BE ON THE PROJECT SITE AT ALL TIMES.
7. TEMPORARY AREAS OF THESE BWPS MUST BE CONSTRUCTED, STABILIZED, AND FUNCTIONAL BEFORE SITE DISTURBANCE BEGINS WITHIN THE DISTURBED DURING REMOVAL OF THE BWPS MUST BE STABILIZED IMMEDIATELY.
8. AN AREA SHALL BE CONSIDERED TO HAVE ACHIEVED FINAL STABILIZATION WHEN IT HAS A UNIFORM UNIFORM JOE PERENNIAL VEGETATIVE COVER OR OTHER PERMANENT NON-VEGETATIVE COVER WITH A DENSITY SUFFICIENT TO RESIST ACCELERATED SURFACE EROSION AND SOIL LOSS. VEGETATIVE COVER SHALL BE SUFFICIENT TO RESIST SLIDING AND OTHER NONPOINT.
9. ALL ACTIVITIES MUST BE LIMITED TO THE BOUNDARIES OF THE BWP. NO OTHER ACTIVITIES SHALL BE CONDUCTED WITHIN THE BWP.
10. IN A TRUCKY WATERS AFTER EACH DISTURBANCE ACTIVITY CEASES, THE OPERATOR SHALL STABILIZE ANY AREAS DISTURBED BY THE ACTIVITIES. DURING NON-COMBATING PERIODS, MULCH MUST BE APPLIED AT THE SPECIFIED RATES. DISTURBED AREAS WHICH ARE NOT AT STABILIZATION SPECIFICATIONS DISTURBED AREAS WHICH ARE AT FINISHED GRADE OR WHICH SHALL NOT BE RESTORED WITHIN 1 YEAR MUST BE STABILIZED IN ACCORDANCE WITH THE PERMANENT VEGETATIVE STABILIZATION SPECIFICATIONS.
11. AT STREAM CROSSINGS, ALL BUTTER AREAS SHOULD BE MAINTAINED, ON BUTTERS, CLEARING, SOIL DISTURBANCES, EXCAVATION, AND DISTURBANCES MUST BE MAINTAINED. ALL DISTURBANCES SHOULD BE MAINTAINED BY ACCORDANCE WITH THE BEST MANAGEMENT PRACTICES INCLUDING PEEK SECTIONS, REVEALING AND MAINTAINING EROSION CONTROL MEASURES TO BE MAINTAINED OUTSIDE OF BUTTER.
12. MULCH OR EROSION CONTROL BLANKETS MUST BE INSTALLED ON ALL SLOPES 3:1 AND STEEPER.
13. DISTURBED AREAS MUST BE MAINTAINED AND STABILIZED. OR PLACED IN TEMPORARY STABILIZATION.
14. THE OPERATOR SHALL REMOVE FROM THE SITE RECYCLES OR DEBRIS OF ALL BUILDING MATERIALS AND WASTES IN ACCORDANCE WITH THE DEPARTMENT'S SOLID WASTE MANAGEMENT REGULATIONS AT 25 PA. CODE 2801. ET. SED. 2701. ET. SED. AND 2801. ET. SED. THE CONTRACTOR SHALL NOT ILLEGALLY BURY, DUMP, OR DISCHARGE ANY BUILDING MATERIAL OR WASTES AT THE SITE.

| TEMPORARY EROSION AND SEDIMENT CONTROLS | |
|---|----------------------------------|
| BWP | INSPECTION FREQUENCY |
| COMPOST FILTER SOCK | WEEKLY AND AFTER RAINFALL EVENTS |
| ROCK CONSTRUCTION ENTRANCE | DAILY |
| MULCH STABILIZATION PEG AND TRIM | WEEKLY AND AFTER RAINFALL EVENTS |

REVEGETATION

- A. TEMPORARY GRASS COVER SHALL BE ESTABLISHED IN THE FOLLOWING AREAS:**
1. TEMPORARY GRASS COVER SHALL BE ESTABLISHED FOR A PERIOD GREATER THAN THIRTY (30) DAYS.
 2. WHERE VEGETATIVE FILTERS MUST BE ESTABLISHED BELOW FILTER BAGS, A MINIMUM RETENTION OF 18 IN. SHALL BE MAINTAINED. THE OPERATOR SHALL MAINTAIN AND MAKE AVAILABLE TO DEPARTMENT OF ENVIRONMENTAL RESTORATION ALL RECORDS INCLUDING BUT NOT LIMITED TO: PERMITS, REPAIR, REPLACEMENT, RECORDING, AND RESTABILIZATION SHALL BE PERFORMED IMMEDIATELY UPON OCCURRENCE OF INFILTRATION.
 3. ALL PUMPING OF SEWAGE TREATED WATER SHALL BE THROUGH A SEDIMENT CONTROL BWP, SUCH AS A PUMPED WATER FILTER BAG DISCHARGING OVER NON-DISTURBED AREAS.
- B. PERMANENT COVER:**

| MIXTURE NUMBER | SEASON | SEEDING RATE LB./AC. |
|----------------|--------|---|
| 1 | COOL | TALL FESCUE(75%) OR PER FESCUE(45) PLUS BIRDFOOT(15) OR PERENNIAL RYEGRASS(35) PLUS BIRDFOOT(15) TREC(10) |
| 2 | COOL | BIRDFOOT(75%) PLUS TALL FESCUE(25) |
| 3 | COOL | ORCHARDGRASS(75) OR SMOOTH BROMGRASS(53) PLUS BIRDFOOT(27) TREC(10) |
| 4 | WARM | FURFUR(75) PLUS TALL FESCUE(25) OR PERENNIAL RYEGRASS(53) PLUS BIRDFOOT(27) TREC(10) |
| 5 | WARM | PERENNIAL RYEGRASS(75) OR BIG BLUESTEM(53) PLUS BIRDFOOT(27) TREC(10) |

| SITE CONDITION | SEED MIXTURE |
|---------------------------------|--------------|
| SOFT SOILS (TIMES MOST SOFT) | 2, 4 OR 6 |
| VARIABLE DRAINAGE | 2 |
| SOFT SOILS & FILLS (SAND) | 1, 2 OR 3 |
| SOFT SOILS & FILLS (CLAY) | 2 OR 3 |
| GULLIES & EROSION AREAS | 2 OR 3 |
| EROSION CONTROL BUNPS | 1 OR 2 |
| FOR HAY OR GRAZE | 2 OR 3 |
| WET - DRY WET | 1 OR 2 |
| VARIABLE DRAINAGE | 4 OR 6 |
| WELL-DRAINED AREAS FOR DRAINAGE | 2 OR 3 |
| WELL-DRAINED AREAS FOR DRAINAGE | 2, 4 OR 3 |
| (SLOPE TO 50% 15:1) | 2, 3 OR 6 |
| FOR DRAINAGE/ANY | 2, 3 OR 6 |

CONSTRUCTION SEQUENCE

1. LOCATE STAGING AREAS AND ACCESS POINTS INCLUDING CONSTRUCTION ENTRANCES. INSTALL SEDIMENT BARRIERS DOWN SLOPE OF THESE AREAS.
2. DEMONSTRATE CONSTRUCTION ENTRANCE. REFER TO THE ROCK CONSTRUCTION ENTRANCE DETAIL ON DRAWINGS FOR DETAILS.
3. INSTALL SEDIMENT BARRIERS ALONG THE PERIMETER OF THE SITE AS SHOWN ON THE CONSTRUCTION DRAWINGS AND ROCK AREAS AS SHOWN ON THE EROSION CONTROL BLANKET, TEMPORARY SLOPE PILES, CHANNELS AND DRAINAGE.
4. STRIP AND STOCKPILE TOPSOIL. CONSTRUCT STOCKPILES AS SHOWN IN THE DETAILS ON THE CONSTRUCTION DRAWINGS.
5. IMPROVE TOTAL AREA OF DISTURBANCE. MAINTAIN ALL TEMPORARY SOIL STOCKPILES WITH EXISTING SOIL EROSION CONTROL MEASURES.
6. GRADE SURFACE TO FINISHED GRADE ELEVATIONS AS SHOWN AS PRACTICABLE.
7. INSTALL EROSION CONTROL BLANKET ON ALL SLOPES GREATER THAN 3:1 AS SHOWN ON THE CONSTRUCTION DRAWINGS.
8. MAINTAINLY SEED AND MULCH DISTURBED AREAS OR PREPARE FOR AGGREGATE STABILIZATION.
9. PERENNIAL VEGETATIVE COVER AND AGGREGATE STABILIZATION IS COMPLETE AND A UNIFORM JOE PERENNIAL VEGETATIVE COVER AND AGGREGATE STABILIZATION OVER THE DISTURBED AREA. THE SOIL AND VEGETATIVE AREAS DESTROYED BY CONSTRUCTION SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER. THE CONTRACTOR SHALL CONSIDER ALL NECESSARY CONTROLS AND MEASURES UPON ESTABLISHMENT OF A UNIFORM JOE VEGETATIVE COVER AND AGGREGATE STABILIZATION.
10. MAINTAIN ALL TEMPORARY AREAS OR PREPARE FOR AGGREGATE STABILIZATION.
11. PERENNIAL VEGETATIVE COVER AND AGGREGATE STABILIZATION IS COMPLETE AND A UNIFORM JOE PERENNIAL VEGETATIVE COVER AND AGGREGATE STABILIZATION OVER THE DISTURBED AREA. THE SOIL AND VEGETATIVE AREAS DESTROYED BY CONSTRUCTION SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER. THE CONTRACTOR SHALL CONSIDER ALL NECESSARY CONTROLS AND MEASURES UPON ESTABLISHMENT OF A UNIFORM JOE VEGETATIVE COVER AND AGGREGATE STABILIZATION.
12. REMOVE ALL SOIL AND EROSION SEDIMENT CONTROL MEASURES UPON ESTABLISHMENT OF A UNIFORM JOE VEGETATIVE COVER AND AGGREGATE STABILIZATION.

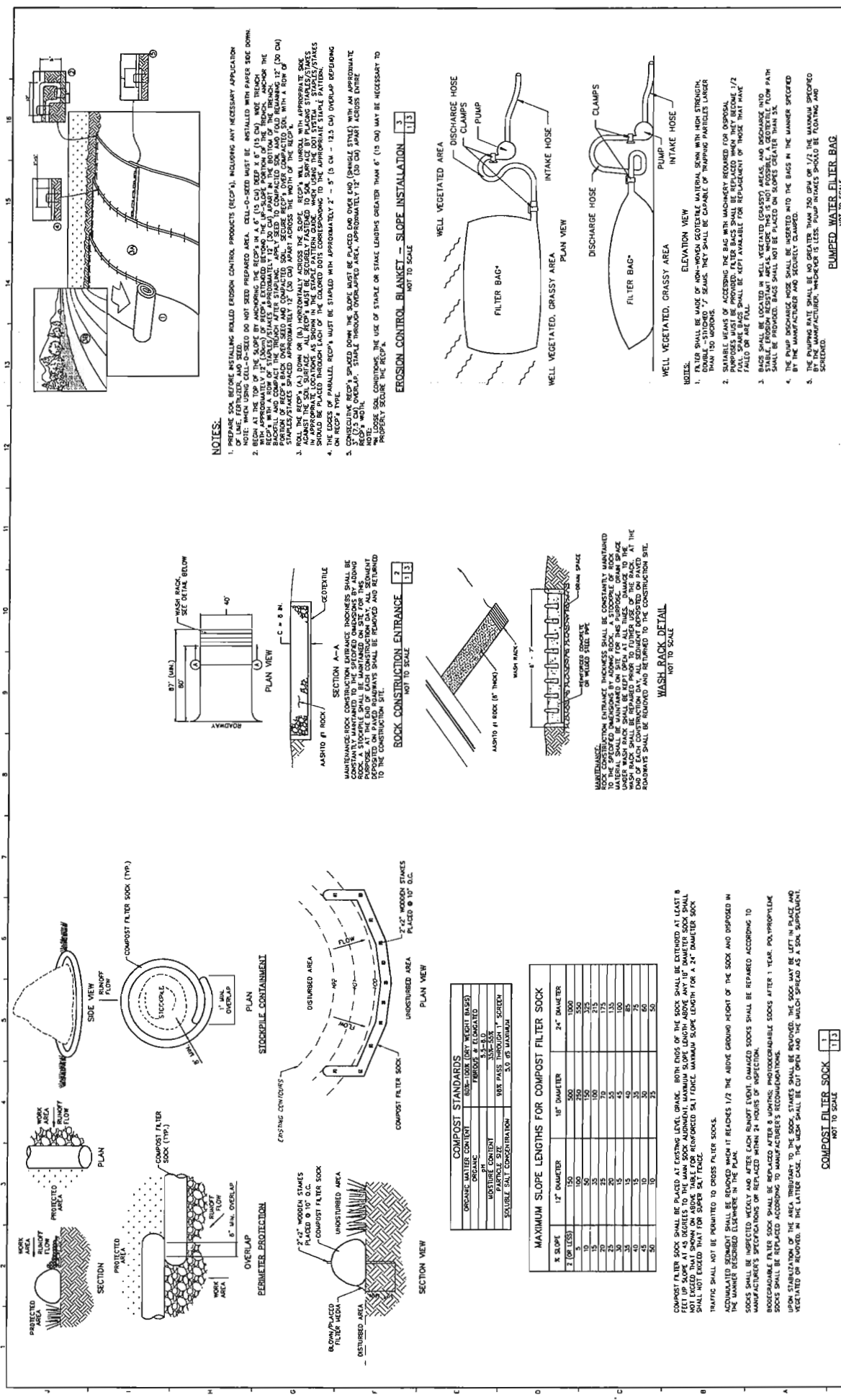
SITE RESTORATION

1. AREAS AT FINAL GRADE ARE TO BE SEED, MULCHED AND STABILIZED IMMEDIATELY AS SPECIFIED ABOVE. WITHIN NINE MONTHS AFTER COMPLETION OF DRILLING THE WELL, THE OIL GAS WELL OWNER OR OPERATOR MUST RECLOSE THE LAND SURFACE WITHIN THE AREA DISTURBED IN DRILLING, COMPLETING AND PRODUCING THE WELL. THIS INCLUDES:
 - REMOVING OR FILING THE PIT USED TO CONTAIN PRODUCED FLUIDS OR INDUSTRIAL WASTES AND DRILL CUTTINGS.
 - REMOVING ALL DRILLING BURNERS NOT NEEDED FOR PRODUCTION. OILING SUPPLIES AND EQUIPMENT MUST BE REMOVED FROM ALL AREAS. BURNERS MAY BE STORED AT THE WELL SITE IF THE EXPRESS WRITTEN CONSENT OF THE SURFACE LANDOWNER IS OBTAINED.
 - REMOVING TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES TO MAINTAIN THE FEDERAL FOR ACCELERATED EROSION AND SEDIMENTATION DUE TO EARTH DISTURBANCES NECESSARY FOR SITE RESTORATION. THESE AREAS ARE TO BE SEED AND MULCHED UPON COMPLETION.

| | |
|--------------|-------------|
| DATE | 6/21/25 |
| PROJECT NO. | 115220003 |
| DESIGNED BY: | BA |
| DRAWN BY: | BA |
| CHECKED BY: | AND |
| SHEET: | 2 OF 7 |
| CONTRACT NO. | 25-010-0000 |

NEWFIELD APPALACHIA PA LLC.
WAYNE COUNTY, PENNSYLVANIA
EROSION & SEDIMENT CONTROL NOTES
SCALE: NOT TO SCALE
C-2

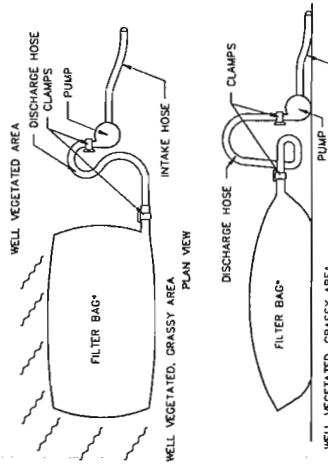
TETRA TECH
www.tetrattech.com
861 ANDREWS DRIVE • COSTIS PLAZA 7
PITTSBURGH, PA 15201
P: (412) 321-7000 F: (412) 321-4440



NOTES:

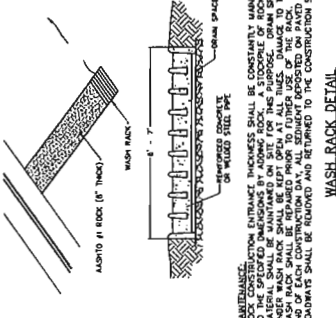
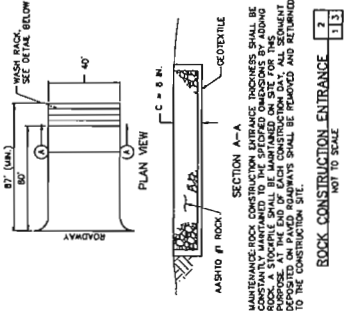
1. THESE SOCKS BEARING REINFORCED EROSION CONTROL PRODUCTS (RECP'S), INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED.
2. BEHIND AS THE TOE OF THE SLOPE BY ANCHORING THE RECP'S IN A 6" (15 CM) DEEP X 6" (15 CM) WIDE TRENCH. RECP'S WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30 CM) APART IN THE BOTTOM OF THE TRENCH. THE PORTION OF RECP'S BACK OVER SEED AND COMPACTED SOIL. SECURE RECP'S OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" (30 CM) APART ACROSS THE WIDTH OF THE RECP'S.
3. THE EDGES OF PARALLEL RECP'S MUST BE STAPLED WITH APPROXIMATELY 2" - 4" (5 CM - 12.5 CM) OVERLAP REFURRING ON RECP'S TYPE.
4. CONSECUTIVE RECP'S SPICED DOWN THE SLOPE MUST BE PLACED END OVER END (SINGLE STAKE) WITH AN APPROXIMATE OVERLAP. SINGLE THROUGH-UNOCCUPIED AREA, APPROXIMATELY 12" (30 CM) APART ACROSS ENTIRE RECP'S WIDTH.
5. IN CASE OF SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" (15 CM) MAY BE NECESSARY TO PROPERLY SECURE THE RECP'S.

EROSION CONTROL BLANKET - SLOPE INSTALLATION 1/13
NOT TO SCALE



- NOTES:**
1. FILTER BAGS SHALL BE MADE OF NON-WOVEN GEOTEXTILE MATERIAL SKIN WITH HIGH STRENGTH, DOUBLE-ENDED 1/2" SEAMS. THEY SHALL BE CAPABLE OF TRAPPING PARTICLES LARGER THAN 1/2" (12.5 MM).
 2. SEAMS MUST BE SECURED TO THE BAG WITH MANUFACTURER'S RECOMMENDED FOR ORIGINAL PURPOSES MUST BE PROVIDED. FILTER BAGS SHALL BE REPLACED WHEN THEY BECOME 1/2 FULL. SPARE BAGS SHALL BE KEPT AVAILABLE FOR REPLACEMENT OF THOSE THAT HAVE FAILED ON THE PUMP.
 3. STAPLE (EROSION RESISTANT METAL) OR STAKE (WOODEN) SHALL BE PROVIDED AT 12" (30 CM) INTERVALS ALONG THE PERIMETER OF THE BAGS. STAPLES/STAKES SHALL BE PLACED ON SLOPES GREATER THAN 3%.
 4. THE PUMP DISCHARGE HOSE SHALL BE INSERTED INTO THE BAGS IN THE MANNER SPECIFIED BY THE MANUFACTURER AND SECURELY CLAMPED.
 5. THE PUMPING RATE SHALL BE NO GREATER THAN 750 GPM (28 LPM) OR 1/2 THE MAXIMUM SPECIFIED BY THE MANUFACTURER, WHICHEVER IS LESS. PUMP INLET(S) SHOULD BE FERTILE AND SCREENED.

PUMPED WATER FILTER BAG 1/13
NOT TO SCALE



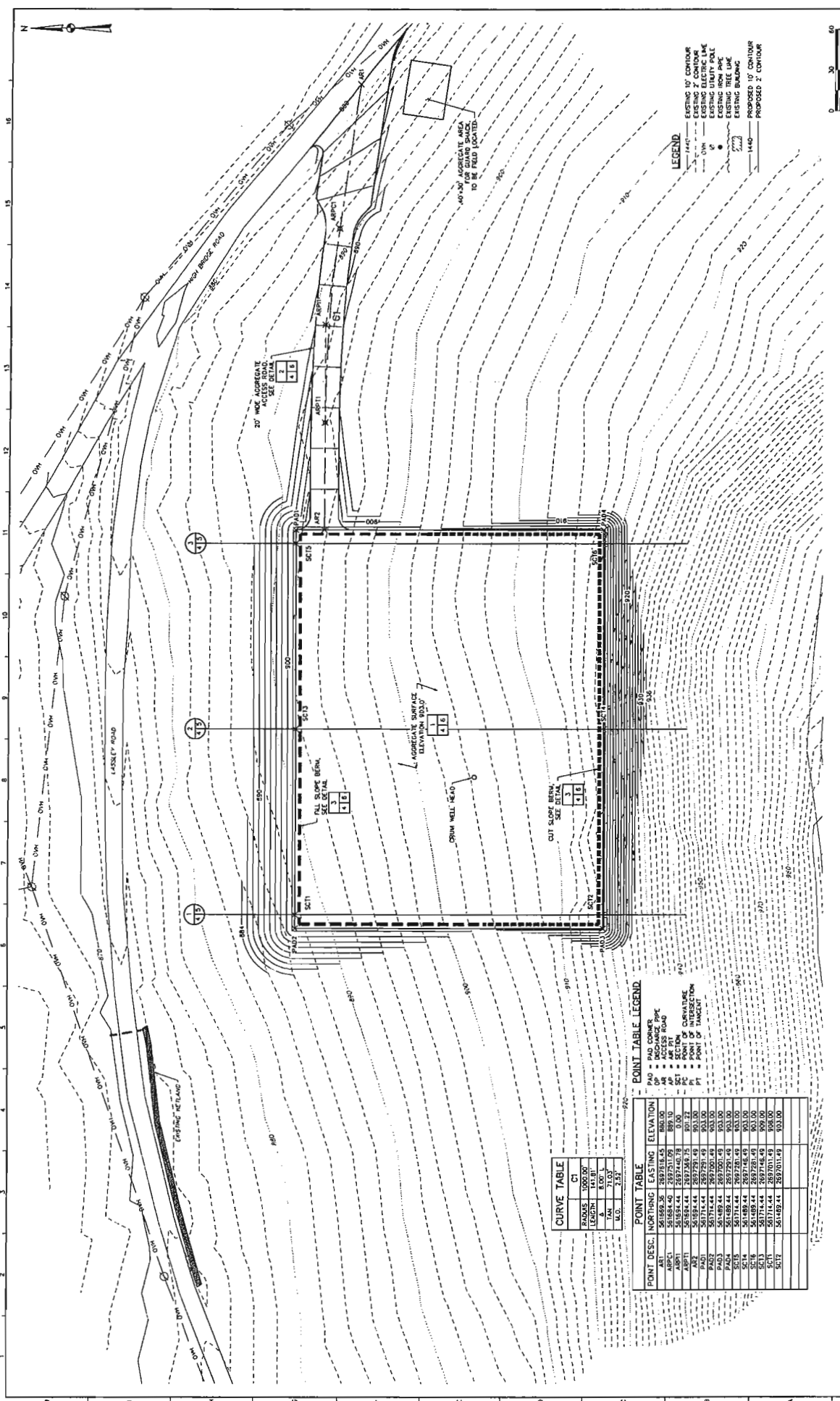
- MAINTENANCE:**
- ROCK CONSTRUCTION ENTRANCE THICKNESS SHALL BE CONSTANTLY MAINTAINED UNDER WASH RACK SHALL BE KEPT OPEN AT ALL TIMES. DAMAGE TO THE END OF EACH CONSTRUCTION DAY, ALL SEDIMENT DEPOSITED ON PAVED ADJACENTS SHALL BE REMOVED AND RETURNED TO THE CONSTRUCTION SITE.
- WASH RACK DETAIL**
NOT TO SCALE

TETRA TECH
www.tetrattech.com
681 ANDERSON DRIVE - FOSTER PLAZA 7
PITTSBURGH, PA 15220
T: (412) 971-7061 | F: (412) 971-4800

NEWFIELD APPALACHIA PA LLC.
WAYNE COUNTY, PENNSYLVANIA

CRUM WELL PAD
EROSION & SEDIMENT CONTROL DETAILS
SCALE: AS NOTED

DATE: 08/20/10
PROJECT NO.: 11020210
DRAWN BY: BH
CHECKED BY: ARB
SHEET: 3 OF 7
APPROVED BY: C-3



EXISTING 10' CONTOUR
 EXISTING 20' CONTOUR
 EXISTING 30' CONTOUR
 EXISTING UTILITY POLE
 EXISTING ROAD
 EXISTING BUILDING
 PROPOSED 10' CONTOUR
 PROPOSED 20' CONTOUR

LEGEND
 --- 10' CONTOUR
 --- 20' CONTOUR
 --- 30' CONTOUR
 --- EXISTING UTILITY POLE
 --- EXISTING ROAD
 --- EXISTING BUILDING
 --- PROPOSED 10' CONTOUR
 --- PROPOSED 20' CONTOUR

POINT TABLE LEGEND

| POINT DESC. | NORTHING | EASTING | ELEVATION |
|-------------|-----------|------------|-----------|
| AB1 | 561892.36 | 2897016.45 | 860.00 |
| AB2 | 561892.36 | 2897016.45 | 860.00 |
| AB3 | 561892.36 | 2897016.45 | 860.00 |
| AB4 | 561892.36 | 2897016.45 | 860.00 |
| AB5 | 561892.36 | 2897016.45 | 860.00 |
| AB6 | 561892.36 | 2897016.45 | 860.00 |
| AB7 | 561892.36 | 2897016.45 | 860.00 |
| AB8 | 561892.36 | 2897016.45 | 860.00 |
| AB9 | 561892.36 | 2897016.45 | 860.00 |
| AB10 | 561892.36 | 2897016.45 | 860.00 |
| AB11 | 561892.36 | 2897016.45 | 860.00 |
| AB12 | 561892.36 | 2897016.45 | 860.00 |
| AB13 | 561892.36 | 2897016.45 | 860.00 |
| AB14 | 561892.36 | 2897016.45 | 860.00 |
| AB15 | 561892.36 | 2897016.45 | 860.00 |
| AB16 | 561892.36 | 2897016.45 | 860.00 |
| AB17 | 561892.36 | 2897016.45 | 860.00 |
| AB18 | 561892.36 | 2897016.45 | 860.00 |
| AB19 | 561892.36 | 2897016.45 | 860.00 |
| AB20 | 561892.36 | 2897016.45 | 860.00 |
| AB21 | 561892.36 | 2897016.45 | 860.00 |
| AB22 | 561892.36 | 2897016.45 | 860.00 |
| AB23 | 561892.36 | 2897016.45 | 860.00 |
| AB24 | 561892.36 | 2897016.45 | 860.00 |
| AB25 | 561892.36 | 2897016.45 | 860.00 |
| AB26 | 561892.36 | 2897016.45 | 860.00 |
| AB27 | 561892.36 | 2897016.45 | 860.00 |
| AB28 | 561892.36 | 2897016.45 | 860.00 |
| AB29 | 561892.36 | 2897016.45 | 860.00 |
| AB30 | 561892.36 | 2897016.45 | 860.00 |
| AB31 | 561892.36 | 2897016.45 | 860.00 |
| AB32 | 561892.36 | 2897016.45 | 860.00 |
| AB33 | 561892.36 | 2897016.45 | 860.00 |
| AB34 | 561892.36 | 2897016.45 | 860.00 |
| AB35 | 561892.36 | 2897016.45 | 860.00 |
| AB36 | 561892.36 | 2897016.45 | 860.00 |
| AB37 | 561892.36 | 2897016.45 | 860.00 |
| AB38 | 561892.36 | 2897016.45 | 860.00 |
| AB39 | 561892.36 | 2897016.45 | 860.00 |
| AB40 | 561892.36 | 2897016.45 | 860.00 |
| AB41 | 561892.36 | 2897016.45 | 860.00 |
| AB42 | 561892.36 | 2897016.45 | 860.00 |
| AB43 | 561892.36 | 2897016.45 | 860.00 |
| AB44 | 561892.36 | 2897016.45 | 860.00 |
| AB45 | 561892.36 | 2897016.45 | 860.00 |
| AB46 | 561892.36 | 2897016.45 | 860.00 |
| AB47 | 561892.36 | 2897016.45 | 860.00 |
| AB48 | 561892.36 | 2897016.45 | 860.00 |
| AB49 | 561892.36 | 2897016.45 | 860.00 |
| AB50 | 561892.36 | 2897016.45 | 860.00 |

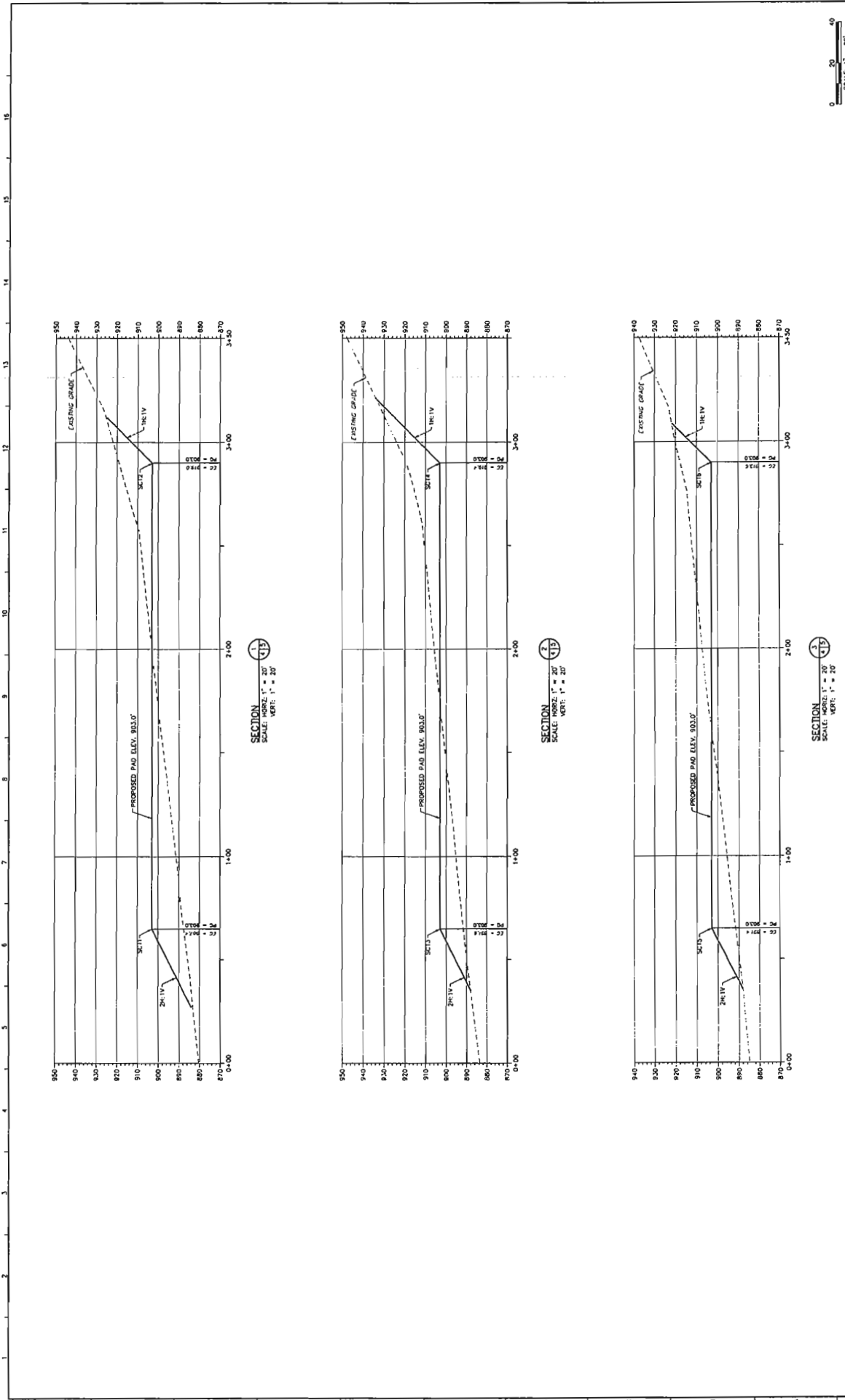
CURVE TABLE

| STATION | LENGTH | CHORD BEARING | CHORD LENGTH | ARC LENGTH | ARC BEARING | CHORD BEARING | CHORD LENGTH | ARC LENGTH | ARC BEARING |
|----------|--------|---------------|--------------|------------|-------------|---------------|--------------|------------|-------------|
| 1+00.00 | 141.87 | 112.10 | 141.87 | 141.87 | 112.10 | 141.87 | 141.87 | 141.87 | 112.10 |
| 1+141.87 | 31.03 | 112.10 | 31.03 | 31.03 | 112.10 | 31.03 | 31.03 | 31.03 | 112.10 |
| 1+172.90 | 2.57 | 112.10 | 2.57 | 2.57 | 112.10 | 2.57 | 2.57 | 2.57 | 112.10 |

NEWFIELD APPALACHIA PA LLC.
 WAYNE COUNTY, PENNSYLVANIA
**CRUM WELL PAD
 STAKEOUT & SITE GEOMETRY PLAN**
 SCALE: 1" = 30'
 DATE: 6/7/2010
 DESIGNED BY: TETRA TECH
 DRAWN BY: TETRA TECH
 CHECKED BY: TETRA TECH
 SHEET: 4 OF 7
 APPROVED BY: TETRA TECH
 C-4

TETRA TECH
 www.tetra-tech.com
 601 JACKSON DRIVE, SUITE 100A
 PITTSBURGH, PA 15220
 P: (412) 921-1095 | F: (412) 921-4940

MARK DATE DESCRIPTION BY



DATE: 8/05/10
 PROJECT NO.: 11202749
 DESIGNED BY: RAL
 DRAWN BY: BH
 CHECKED BY: JWB
 APPROVED BY: JWB
 PROJECT: CRUM WELLS, INC. WVA, INC.
C-5

NEWFIELD APPALACHIA PA LLC.
 WAYNE COUNTY, PENNSYLVANIA
**CRUM WELLS PAD
 SITE SECTIONS**
 SCALE: 1" = 20'

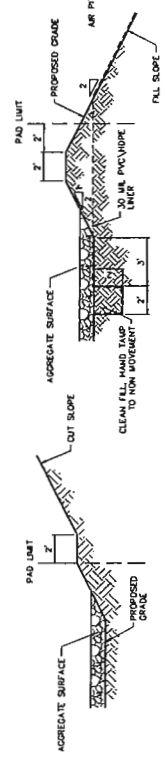
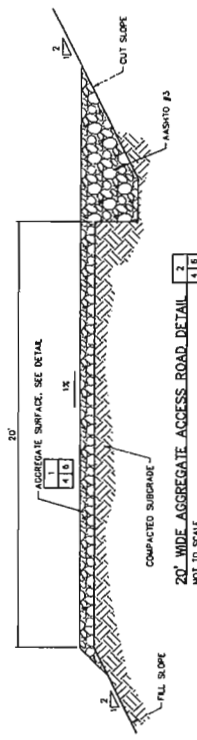
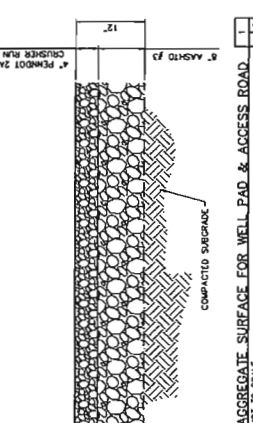
| MARK | DATE | DESCRIPTION | BY |
|------|------|-------------|----|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

TETRA TECH
 881 ANDERSON DRIVE - FORT LEE PLAZA 7
 PITTSBURGH, PA 15120
 P: (412) 821-1000 F: (412) 821-6840

THE UNIVERSITY OF WEST VIRGINIA
 COLLEGE OF ENGINEERING
 DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

15 14 13 12 11 10 9 8 7 6 5 4 3 2

| PROJECT BID QUANTITIES | | | |
|------------------------|---|-------------|----------|
| ITEM | DESCRIPTION | UNITS | QUANTITY |
| 1 | MOBILIZATION/DEMOBILIZATION | LUMP SUM | 1 |
| 2 | CLEARING & GRUBBING | CUBIC YARD | 2,500 |
| 3 | STRIP & STOCKPILE TOPSOIL | LINEAR FOOT | 0 |
| 4 | COMPOST FILTER SOCK - 12" DIAMETER | LINEAR FOOT | 500 |
| 5 | COMPOST FILTER SOCK - 24" DIAMETER | LINEAR FOOT | 500 |
| 6 | AGGREGATE FOR WELLS PAD, ACCESS ROAD & 30'x40' GUARD STACK AREA | CUBIC YARD | 2,800 |
| 7 | LEACHATE FOR WELLS PAD, ACCESS ROAD & 30'x40' GUARD STACK AREA | CUBIC YARD | 1,000 |
| 8 | LEACHATE FOR WELLS PAD, ACCESS ROAD & 30'x40' GUARD STACK AREA | CUBIC YARD | 1,000 |
| 9 | LEACHATE FOR WELLS PAD, ACCESS ROAD & 30'x40' GUARD STACK AREA | CUBIC YARD | 1,000 |
| 10 | ROCK CUT | CUBIC YARD | N/A |
| 11 | BRUSH | CUBIC YARD | 500 |
| 12 | BRUSH | CUBIC YARD | 500 |
| 13 | LEACHATE CONTROL SKANNET | SQUARE YARD | 3,000 |
| 14 | LEACHATE CONTROL SKANNET | SQUARE YARD | 3,000 |
| 15 | LEACHATE CONTROL SKANNET | SQUARE YARD | 3,000 |
| 16 | TEMPORARY CHAIN LINK FENCE DURING CONSTRUCTION | LINEAR FOOT | N/A |
| 17 | TEMPORARY CHAIN LINK FENCE DURING CONSTRUCTION | LINEAR FOOT | N/A |
| 18 | TEMPORARY CHAIN LINK FENCE DURING CONSTRUCTION | LINEAR FOOT | N/A |
| 19 | MAINTENANCE AND REPAIR OF EXISTING CONTROL DEVICES | LUMP SUM | 1 |



| | |
|-------------|-----------------|
| DATE | 6/25/20 |
| PROJECT NO. | 11202218 |
| DRAWN BY: | BR |
| CHECKED BY: | ASB |
| SHEET: | 6 OF 7 |
| COMPANY: | TETRA TECH INC. |

NEWFIELD APPALACHIA PA LLC.
WAYNE COUNTY, PENNSYLVANIA

CRUM WELL PAD
CONSTRUCTION DETAILS & BID QUANTITIES

SCALE: AS NOTED
C-6



681 ANDERSON DRIVE - FORT LITTLE, COCA 17
PITTSBURGH, PA 15120
T: (412) 271-2001 F: (412) 271-4040

GENERAL
 CONSTRUCTION ACTIVITIES WILL BE PERFORMED IN ACCORDANCE WITH PENNDOT PUBLICATION 408 SPECIFICATIONS - LATEST EDITION. THE FOLLOWING CONSTRUCTION OPERATIONS ARE INCLUDED IN THE BO PACKAGE FOR THE SITE AND ARE SUMMARIZED BELOW. SHOULD A CONFLICT BE DISCOVERED, CONTACT THE OWNER FOR A FINAL DECISION. THE OWNER IS DEFINED AS NEWFIELD APPALACHIA PA, LLC.
 THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS AND OR MANUFACTURERS MATERIAL CATALOG CUTS TO THE OWNER FOR REVIEW.
 THE CONTRACT TERMS AND CONDITIONS SHALL BE IN ACCORDANCE WITH THE GENERAL AND SPECIAL PROVISIONS AND THE AGREEMENT AS PROVIDED BY THE OWNER.

TECHNICAL SPECIFICATIONS
1.0 CLEARING AND GRUBBING -
 1.1 DESCRIPTION
 REMOVAL OF TOPSOIL TO THE LIMITS OF GRADING AND STOCKPILE ON SITE AT A LOCATION DESIGNATED BY THE OWNER.
 TO THE LIMITS OF GRADING AND DISPOSE OF OFF SITE.
 REMOVAL OF TRASH OR DEBRIS WITHIN THE GRADING LIMITS.
 1.2 CONSTRUCTION
 INSTALL EROSION AND SEDIMENT CONTROL FEATURES PRIOR TO THE START OF CLEARING AND GRUBBING OPERATIONS
 CUT TREES AND SHRUBS AND DISPOSE OF OFFSITE UNLESS DIRECTED BY THE OWNER
 BURNING IS NOT PERMITTED
 REMOVE STUMPS WITHIN THE GRADING AREA TO A DEPTH AT LEAST 2 FEET BELOW THE SUBGRADE ELEVATION AND OR SLOPE ELEVATIONS
 DO NOT DAMAGE TREES OF AREAS BEYOND THE LIMIT OF GRADING. DAMAGES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

2.0 EROSION AND SEDIMENT CONTROLS
 2.1 DESCRIPTION
 PREVENT EROSION, FURNISH, INSTALL AND MAINTAIN THE EROSION AND SEDIMENT CONTROL DEVICES IN ACCORDANCE WITH THE CONTRACT DRAWINGS AND OR THE APPROVED EROSION AND SEDIMENT CONTROL MATERIAL.
 2.2 MATERIAL
 COMPOST FILTER SOCKS SHALL BE CONSTRUCTIONALLY MADE USING 5 MIL CONTINUOUS HOPE FLAMMENT WOVEN WITH 3/8 INCH MESH NETTING WITH 2/8 INCH WOVEN ORGANIC COMPOST FILTER SOCK
 COMPOST - SEE SHEET C-3
 WOODEN STAKES - 2 INCH BY 2 INCH BY 42 INCH
 ROCK CONSTRUCTION ENTRANCE
 ASAPTED JET LAKSTONE IN ACCORDANCE WITH PENNDOT PUBLICATION 408 SECTION 703 - AGGREGATE
 COARSE/STABLE - CLASS 4 SEPARATION IN ACCORDANCE WITH PENNDOT PUBLICATION 408 SECTION 725

TRUCK WASH BRACK
 CONCRETE IN ACCORDANCE WITH PENNDOT PUBLICATION 408 SECTION 704 - CEMENT CONCRETE - CLASS C
 WELDED STEEL PIPE - MINIMUM 4 INCH DIAMETER
 EROSION BLANKET
 100% BIODEGRADABLE EROSION CONTROL BLANKET, UNACHIEVED-PRODUCED WAT OF 100% COCONUT FIBER WITH A FUNCTIONAL LONGEVITY OF UP TO 24 MONTHS.
 THE BLANKET SHALL BE OF CONSISTENT THICKNESS WITH THE COCONUT FIBER DISTRIBUTED OVER THE ENTIRE AREA OF THE MAT. THE BLANKET SHALL BE COVERED ON THE TOP AND BOTTOM SURFACES WITH A 2 INCH WOODEN STAKE AT 100 FEET ON CENTER THROUGH THE FILTER SOCK.
 CROSS DIRECTIONAL STRAINS WITHIN THROUGH THE WASTED MACHINE STRANDS TO FORM AN APPROXIMATE 0.50 X 1.00 (1/2" X 2 1/4") MESH. THE BLANKET SHALL BE SEWN TOGETHER ON 1.50 INCH (1.81 CM) CENTERS WITH DEGRADABLE THREAD.

MATERIAL SHALL MEET REQUIREMENTS ESTABLISHED BY THE EROSION CONTROL TECHNOLOGY COUNCIL (ECTC):
 MATRICE - 100 PERCENT COCONUT FIBER 0.5 LB/50'2'
 100 PERCENT BIODEGRADABLE ORGANIC JUTE FIBER 9.3 LB/1000 FT2
 THREAD - BIODEGRADABLE
 TEMPORARY SEED AND MULCH
 SEE SHEET C-2

RP RAP
 IN ACCORDANCE WITH PENNDOT PUBLICATION 408 SECTION 805 - MULCHING - HAY, STRAW OR WOOD FIBER
 2.3 CONSTRUCTION
 INSTALL THE ROCK CONSTRUCTION ENTRANCE AND THE WASH FACILITY PRIOR TO THE START OF EARTHWORK OPERATIONS. MAINTAIN THE ROCK THICKNESS BY ADDING ROCK FROM AN ADJACENT STOCKPILE.
 REMOVE SEDIMENT DEPOSITS ON A DAILY BASIS FROM THE ROCK ENTRANCE AND PUBLIC STREETS AND RETURN THE SEDIMENT TO THE CONSTRUCTION SITE.
 INSTALL FIELDS SOCKS AT THE LOCATIONS SHOWN ON THE CONTRACT DRAWINGS IN ACCORDANCE WITH THE DIMENSIONS SPECIFIED.
 INSTALL 2 INCH BY 2 INCH WOODEN STAKE AT 100 FEET ON CENTER THROUGH THE FILTER SOCK.
 MAINTAINANCE AND REPAIR
 UPON COMPLETION OF EARTH DISTURBANCE AND EMBANKMENT CONSTRUCTION, APPLY TEMPORARY SEED AND MULCH.
 INSPECT AND REPAIR DAMAGED OR DEGRADED EROSION AND SEDIMENT CONTROL DEVICES. INSPECT THE CONTROL DEVICES AFTER EACH RAIN EVENT AND OR AT A MINIMUM OF WEEKLY.
 IMMEDIATELY REPAIR, RE-STACK, EXTEND OR REPLACE DAMAGED CONTROL DEVICES.
 REMOVE SEDIMENT BUILD UP OR DEBRIS WHEN THE BUILD UP REACHES ONE HALF THE HEIGHT OF THE CONTROL DEVICE. DISPOSE OF THE SOIL MATERIAL ON SITE. DISPOSE OF TRASH AND
 INSTALL ROCK LOGS AT THE LINES AND GRADINGS INDICATED ON THE CONTRACT DRAWINGS.

3.0 DEMOLITION
 3.1 DESCRIPTION
 REMOVAL OF BUILDINGS, WALLS, STRUCTURES AS INDICATED ON THE CONTRACT DRAWINGS.
 3.2 CONSTRUCTION
 REMOVE AND DISPOSE OF OFF SITE BUILDINGS, WALLS, STRUCTURES AS INDICATED.
 ON-SITE DISPOSAL IS NOT PERMITTED.

4.0 EARTHWORK - EXCAVATION AND EMBANKMENT
 4.1 DESCRIPTION
 EXCAVATE SOIL AND ROCK TO THE LINES AND GRADINGS INDICATED ON THE CONTRACT DRAWINGS.
 CONSTRUCT EMBANKMENTS TO THE LINES AND GRADINGS INDICATED ON THE CONTRACT DRAWINGS.
 4.2 CONSTRUCTION
 EXCAVATE SOIL AND ROCK BY MECHANICAL MEANS.
 BURNING IS NOT PERMITTED.
 FOUNDATION AREAS IN ACCORDANCE WITH SECTION 1.0 CLEARING AND GRUBBING.
 PLACE SOIL MATERIAL IN NOT MORE THAN 30" MAXIMUM LIFT. DO NOT LIFT MORE THAN ONE (1) FEET LESS THAN ONE (1) FEET. EXCEPT FOR VERY HARD MATERIALS. THE CONTRACTOR SHALL SAMPLE, TEST AND SUBMIT THE RESULTS TO THE OWNER PRIOR TO THE START OF EMBANKMENT OPERATIONS. MAINTAIN SOIL TOP SOIL MOISTURE WITHIN PLUS OR MINUS TWO PERCENTAGE POINTS.
 PLACE SOIL MATERIAL THAT IS FROZEN, WET OR CONTAINING OBJECTS/UNDESIRABLE MATERIAL.
 PLACE ROCK MATERIAL IN UNIFORM LAYERS. MAXIMUM ROCK SIZE SHALL BE 1/3 THE WIDTH OF THE EMBANKMENT OR CUT SURFACE TO 100% OF ASTM D698 STANDARD PROCTOR.
 PREPARE THE PAD SUBGRADE AND ACCESS ROAD SUBGRADE BY COMPACTING THE TOP TWO FEET OF THE EMBANKMENT OR CUT SURFACE TO 100% OF ASTM D698 STANDARD PROCTOR.
 SHOULD NON REPAIABLE ROCK BE ENCOUNTERED, IMMEDIATELY CONTACT THE OWNER FOR DIRECTION ON EXCAVATION.

8.0 CULVERT PIPE
 8.1 DESCRIPTION
 FURNISH, PROVIDE AND INSTALL DUCTILE IRON OR WELDED STEEL CULVERT PIPE AT ROAD CROSSINGS AT THE DIAMETER, LINE AND GRADE INDICATED ON THE CONTRACT DRAWINGS.
 8.1.2 MATERIAL
 WELDED STEEL CULVERT PIPE IN ACCORDANCE WITH A53, TYPE S.
 DUCTILE IRON PIPE IN ACCORDANCE WITH ASTM A118
 8.1.3 CONSTRUCTION
 DUCTILE IRON PIPE AND MAXIMUM CULVERT PIPE DURING CONSTRUCTION. KEEP THE PIPE CLEAR OF DEBRIS AND SEDIMENT BUILDUP.
 7.0 WELL PAD AND ACCESS ROAD
 7.1 DESCRIPTION
 PROVIDE, FURNISH AND INSTALL AGGREGATE FOR THE WELL PAD SURFACE AND THE ACCESS ROAD SURFACE.
 7.2 MATERIAL
 AGGREGATE IN ACCORDANCE WITH PENNDOT PUBLICATION 408 SECTION 703 AGGREGATE
 SIX INCHES OF FINEST # 3
 PERFORATED CORRUGATED POLYETHYLENE CULVERT UNDERDRAIN PIPE
 FOUR INCH DIAMETER IN ACCORDANCE WITH PENNDOT PUBLICATION 408 SECTION 801 - PIPE CULVERTS
 COMPACT AND SHAKE SUBGRADE TO THE LINES AND GRADINGS ON THE CONTRACT DRAWINGS.
 COMPACT THE SUBGRADE TO 100% OF ASTM D698 STANDARD PROCTOR. REMOVE AND REPLACE ANY SUBGRADE THAT IS SOFT OR DISPLAYS VISUAL MOVEMENT WITH CLEAN FILL.
 INSTALL THE AGGREGATE IN TWO LIFTS. COMPACT LIFTS TO NON-MOVEMENT.
 INSTALL THE CORRUGATED CULVERT PIPE TO THE LINE AND GRADE SHOWN ON THE CONTRACT DRAWINGS.

8.0 SITE RESTORATION
 8.1 DESCRIPTION
 UPON COMPLETION OF THE WELL DRILLING AND AT THE NOTIFICATION BY THE OWNER, RETURN TO THE SITE AND REMOVE AND DISPOSE OF LOOSE AGGREGATE, COVER THE SITE WITH TOPSOIL FROM MATERIAL STOCKPILE AND APPLY PERMANENT SEED, SUPPLEMENTS AND MULCH.
 8.2 TOPSOIL FROM THE EXISTING STOCKPILE
 PERMANENT SEED AND SOIL SUPPLEMENTS SEE SHEET C-2
 MULCH IN ACCORDANCE WITH PENNDOT PUBLICATION 408 SECTION 805 - MULCHING - HAY, STRAW OR WOOD FIBER
 8.3 CONSTRUCTION
 REMOVE AND DISPOSE OF OFF SITE LOOSE AGGREGATE FROM THE WELL PAD.
 REMOVE AND DISPOSE OF OFF SITE LOOSE AGGREGATE FROM THE WELL PAD AND APPLY PERMANENT SEED, SOIL SUPPLEMENTS AND MULCH.
 SPREAD TOPSOIL EVENLY ACROSS THE WELL PAD AND APPLY PERMANENT SEED, SOIL SUPPLEMENTS AND MULCH.

| | |
|--------------|-----------|
| DATE: | 8/15/20 |
| PROJECT NO.: | 112022058 |
| DESIGNED BY: | BAI |
| DRAWN BY: | BAI |
| CHECKED BY: | BAI |
| SHEET # OF | 7 OF 7 |
| APPROVED BY: | BAI |

SCALE: AS NOTED

NEWFIELD APPALACHIA PA LLC.
 WAYNE COUNTY, PENNSYLVANIA

CRUM WELL PAD
 CONSTRUCTION SPECIFICATIONS

C-7

DAMASCUS TOWNSHIP

WAYNE COUNTY, PENNSYLVANIA
NOTICE OF ACTIVE PERMIT

DRIVEWAY

PERMIT

PERMIT NUMBER

3402

ISSUED TO **VERNON D. & ELEANOR B. CRUM**

ISSUED: **05/10/10**

FOR: **ACCESS DRIVEWAY**

PIPE: **YES** DIAM: **18 INCHES**

PIPE OFFSET FROM ROAD CENTERLINE (FT): **20+-**

LOCATION: **NO # HIGH BRIDGE ROAD**

**CONSTRUCTION MUST BEGIN WITHIN 12 MONTHS OF
DATE OF ISSUE.**

**THIS NOTICE MUST BE POSTED AT THE PROJECT LOCATION
WHERE IT IS VISIBLE TO THE PUBLIC.**



ZONING OFFICER

DAMASCUS TOWNSHIP ROAD OCCUPANCY PERMIT

DAMASCUS TOWNSHIP, WAYNE COUNTY, PENNSYLVANIA

ISSUED IN ACCORDANCE WITH ATTACHED DOCUMENTS

DATE ISSUED: **May 10, 2010**
ISSUED TO: **VERNON D. & ELEANOR B. CRUM**
ADDRESS: **94 LASSLEY ROAD, MILANVILLE, PA 18443**
LOCATION: **NO # HIGH BRIDGE ROAD T-636**
PERMIT NO.: **3402**
WORK START DATE **05/10/10**
WORK MUST BE COMPLETED BEFORE **05/10/11**
PERMIT ISSUED FOR USE TYPE: **ACCESS DRIVEWAY**
NEAREST INTERSECTING ROAD: **LASSLEY ROAD**
DIST. TO NEAREST ROAD: **250+- FEET**
DIST. TO NEAREST INTERSECTING DRIVEWAY SAME SIDE **N/A FEET**
DIST. TO NEAREST INTERSECTING DRIVEWAY OPP SIDE **50+- FEET**
TOWNSHIP ROAD R.O.W. WIDTH **33 FEET**
IMPROVED ROADWAY WIDTH **18 FEET**
APPROX. SIGHT DISTANCE LEFT **250 FEET**
APPROX. SIGHT DISTANCE RIGHT **300 FEET**
POSTED SPEED LIMIT: **N/A MPH**
PURPOSE OF WORK: **COMMERCIAL**
INSTALL CULV. PIPE **YES**
MIN. PIPE DIAM **18 INCH**
MIN. PIPE LENGTH **60+- FEET**
OFFSET FROM ROAD CENTER **20+- FEET MIN.**
UTILITY OVERHEAD OR UNDERGROUND **N/A**
UTILITY PARALLEL OR CROSSING **N/A**
UTILITY OFFSET FROM RD CENTER **N/A FEET**



STOP – CALL BEFORE YOU DIG!
PENNSYLVANIA LAW REQUIRES
THREE WORKING DAYS NOTICE
Pennsylvania One Call System, Inc.
1-800-242-1776

Out-of-state callers dial 8-1-1

Be prepared to provide exact dig location.

1. Under and subject to all conditions, restrictions and regulations prescribed by the Township and on the general provisions and specifications, a true copy whereof is attached and made a part hereof, with the same force and effect as if written or printed herein and subject to the special conditions, restrictions and regulations hereinafter set forth.
2. Property owner is responsible for clearing of brush, trees and other obstructions to enable and maintain adequate sight distance at all times.
3. Property owner is responsible for maintaining any drainage facilities installed to prevent water runoff from eroding or flooding the public roadway, or otherwise creating a nuisance or hazard.
4. No parking of any vehicles in a public roadway is allowed.
5. Notify Township 48 hours in advance of start of construction for inspection.
6. No grading or altering of stormwater drainage allowed without consulting Township.

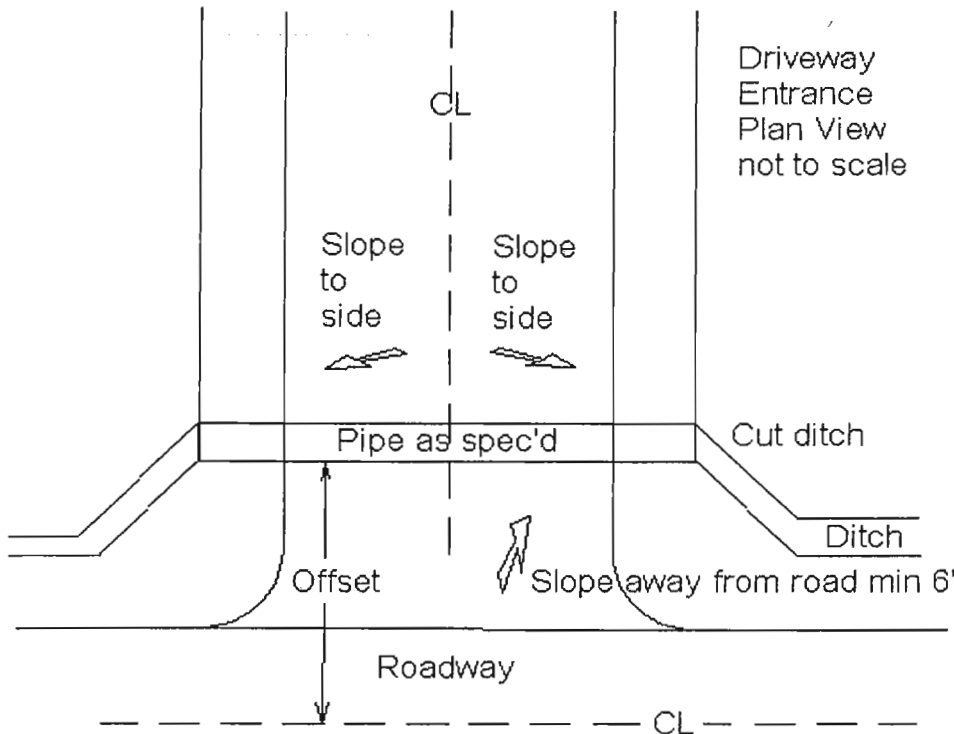
APPROVED BY:

DATE:

5/26/10

IMPORTANT: 1) The terms and conditions of this permit require the permittee to complete this work by the date specified in the permit. Where permittee fails to complete the work by the time specified the permit will become void. 2) If the permittee applies for a time extension before the expiration date of this permit a 30 day extension will be granted in the form of a supplemental permit. 3) If the work is started and not completed by specified date permittee must notify the Township prior to the expiration date of the permit. 4) The fees are applied to inspections of the site and associated filing of documents by the Township and are not refundable.

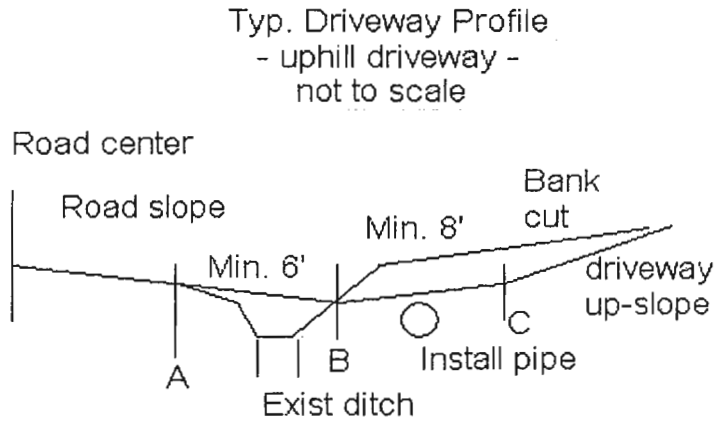
FIGURE 1 - DRIVEWAY ENTRANCE PLAN VIEW



Notes:

1. Driveway must be crowned min 4% from centerline to provide positive drainage.
2. Pipe must be set back (offset) minimum as specified in permit. Further setback to provide adequate cover over the pipe is allowable. 20+- feet from center
3. Minimum recommended pipe cover 12 inches of material.
4. Pipe size must be minimum diameter as specified in permit. 18 inches min.
5. Roadside ditch must be cut to provide flow of stormwater to and from installed pipe.
6. Grade must be downhill from roadway as specified in figure 3 or 4.
7. Runoff from driveway must not reach roadway.
8. No grading or altering of stormwater drainage allowed without consulting Township.

FIGURE 3 - DRIVEWAY PROFILE (TYP) - UPHILL ACCESS



Notes:

1. Driveway must be crowned min 4% from centerline to provide positive drainage.
2. Cut upslope to provide drainage ditch.
3. Driveway ditch must discharge to driveway pipe.
4. Fill downslope side as needed.
5. Runoff must run to sides of driveway surface
6. Runoff must not be allowed to run into township roadway.
7. No grading or altering of stormwater drainage allowed without consulting Township.
8. Minimum recommended pipe cover 12 inches of material.

Driveway Address for the Crum 1-1 Well Site

Address was assigned by GIS and is on file with county Emergency Management office and 911 dispatch.

Crum 1-1
151 High Bridge Rd
Milinville PA 18423

**PREPAREDNESS, PREVENTION,
AND CONTINGENCY PLAN
WAYNE COUNTY FIELD
WAYNE COUNTY, PENNSYLVANIA**

Prepared for:

NEWFIELD APPALACHIA PA LLC
363 N. Sam Houston Pkwy E., Suite 2020
Houston, TX 77060



Prepared by:

TETRA TECH NUS INC
116 N. Washington Avenue
Scranton, PA 18503



May 2010

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1.0 DESCRIPTION OF FACILITY

1.1 DESCRIPTION OF THE INDUSTRIAL OR COMMERCIAL ACTIVITY

Newfield Appalachia PA LLC (Newfield) is a natural gas exploration company with operations planned for Wayne County, Pennsylvania. Operations will involve natural gas exploration of the Marcellus Shale formation, which will include site preparation, drilling, and well development and production activities. Wastes generated during these activities will be typical for gas drilling operations and will include drill cuttings, produced water, drilling and frac fluids, waste oil, municipal waste and trash. No hazardous waste is expected to be generated at the Newfield sites.

Newfield is currently in the exploratory phase of operations, which will require construction activities for new natural gas well pads and access roads.

This Prevention, Preparedness and Control (PPC) Plan applies to all well sites in Wayne County, Pa.

The attached map (Figure 1) in Appendix B shows the area covered under this PPC Plan. Figure 2 is the required 7.5 topographic map of the specific well site. The proposed Site Plan (Figure 3) shows the site layout, the well site boundaries, material storage areas, waste storage areas, dike drains and drainage that leads away from the well site, and the entrances and exits to the well site.

During the different stages of site preparation, construction, drilling, well development and production, the site will store various fuels, oils and chemicals on-site. A chemical and container inventory for the specific well site is located in Table 1 of Appendix C.

1.2 DESCRIPTION OF EXISTING EMERGENCY RESPONSE PLANS

This is a new facility and this plan has been prepared prior to construction of the well pad. There are no previous emergency response plans.

A separate Spill Prevention Control and Countermeasure (SPCC) Plan will be prepared for each facility meeting the requirements defined in 40 CFR§112.

1.3 MATERIAL AND WASTE INVENTORY

Information in this section is used to evaluate the prevention, containment, mitigation, cleanup, and disposal measures which would be used in the event of a spill, discharge, explosion, or fire. Oils, chemicals and other hazardous materials anticipated to be used and stored at the facility during site preparation and construction, drilling, well development and production are listed in Table 1.

~~MSDS's will be maintained onsite for chemicals and compounds used at the facility in accordance with the Occupational Safety and Health Administration (OSHA) worker right-to-know requirements, as appropriate.~~

1.4 POLLUTION INCIDENT HISTORY

Newfield has not had any reportable incidents for this facility.

1.5 IMPLEMENTATION SCHEDULE FOR PLAN ELEMENTS NOT CURRENTLY IN PLACE

All plan elements are in place.

1.6 PURPOSE AND IMPLEMENTATION OF PPC PLAN

Newfield has developed and will implement this PPC Plan for effective action to minimize and abate hazards to human health and the environment from fire, explosion, and emission or discharge of pollutants to air, soil, surface water or groundwater. This plan was prepared to satisfy the requirements set forth in 25 PA Code Section 78.

The Drilling Manager serves as the Primary Emergency Coordinator and is responsible for the preparation and implementation of the PPC Plan. The PPC Plan has been prepared and implemented in general accordance with Pennsylvania Department of Environmental Protection (PADEP) guidelines, and will be submitted to PADEP for approval at such time as the PADEP may prescribe.

This PPC Plan identifies and describes any arrangements with police departments, fire departments, hospitals, contractors, and state, county, and local emergency response teams to coordinate emergency services.

The PPC Plan lists names, addresses and phone numbers of all persons identified to act as Emergency Coordinator. One person is named as the Primary Emergency Coordinator and others are listed in the order in which they will assume responsibility as alternates. The PPC Plan also includes a list of emergency equipment at the facility, the location and a physical description of emergency equipment, and a brief outline of emergency equipment capabilities.

1.7 PLAN REVISIONS

This PPC Plan will be reviewed and amended, annually, or whenever:

- Applicable PADEP regulations are revised;
- The plan fails in an emergency;
- The list of Emergency Coordinators changes;
- The list of emergency equipment changes; and
- Construction, operation, maintenance, or other circumstances change in a manner that materially increases the potential for fires, explosions, or releases of toxic or hazardous constituents; or which changes the response necessary in an emergency.

2.0 IMPLEMENTATION OF PPC PLAN

2.1 ORGANIZATIONAL STRUCTURE OF FACILITY FOR IMPLEMENTATION

The Drilling Manager has been designated as the Primary Emergency Coordinator. The Primary Emergency Coordinator is responsible for the following:

- Coordination of spill cleanup activities;
- Notification of appropriate authorities; and
- Tank and chemical storage area inspections.

The Drilling Manager has administrative responsibility for updating, maintaining, and implementing this PPC Plan. Specifically, these responsibilities include:

- Identification of materials and wastes handled during site operation (inventory);
- Identification of potential spill sources (risk assessment);
- Establishment of spill reporting procedures;
- Coordination of the visual inspection program;
- Review of past incidents, spills, and countermeasures employed;
- Coordination and implementation of the PPC Plan goals;
- Training/educational programs and updates;
- Ensuring periodic review of the PPC Plan for adequacy and appropriateness;
- Administration and institution of appropriate changes at regular intervals;
- Review of new construction and process changes relative to the PPC Plan;
- Evaluation of PPC Plan effectiveness prior to, during and subsequent to its implementation; and
- Instituting improvements to the PPC Plan.

The Production Manager is designated as Secondary Emergency Coordinator, and, in the absence of the Drilling Manager, will assume the role of emergency coordinator for emergencies. The Secondary Emergency Coordinator will report directly to the Primary Emergency Coordinator in matters regarding this plan, and can assist with implementing the above-listed items.

2.2 LIST OF EMERGENCY COORDINATORS

As required by 25 PA Code 265.55, there will be at least one employee, either on the construction site or on call, with the responsibility for coordinating emergency response measures. The Primary and Secondary Emergency Coordinators will be thoroughly familiar with this PPC Plan, site operations and activities, the location and characteristics of materials and wastes, the location of the facility's records, and the layout of the facility. The Emergency Coordinators have the authority to commit the resources necessary to carry out the PPC Plan and for coordinating emergency response measures. In the event of a spill or release, one of the Emergency Coordinators will be immediately notified. The following individuals have been designated to act as Emergency Coordinators:

Primary Emergency Coordinator

Name: Don Sleeth
Title: Drilling Manager
Office: 281-674-2501
Cell: 281-974-0051

Secondary Emergency Coordinator

Name: Jack Cochran
Title: Production Manager
Office: 814-437-2344
Cell: 814-671-1557

2.3 DUTIES AND RESPONSIBILITIES OF THE EMERGENCY COORDINATOR

As required by 25 PA Code 265.56 and the PPC Plan Guidance Documents, whenever there is an imminent or actual emergency situation, the Emergency Coordinator or his designee must immediately:

1. Notify all facility personnel.
2. Notify appropriate state or local agencies with designated response roles and contracted emergency response companies if additional assistance is required.
3. Identify the problem. Is it a physical emergency such as a fire, explosion, or spill? Is it a natural disaster such as a flood, tornado, or other severe weather? Is it a social emergency such as a bomb threat, riot, or vandalism?

4. Assess the health or environmental hazards and how this problem or condition will affect employees or its affect on the surrounding community.
5. Take all reasonable measures to stabilize the situation. The Emergency Coordinator will take all reasonable measures to ensure that the fire, explosion, emission, or discharge does not reoccur or spread to other materials at the site. These measures can include, when appropriate, stopping operations, collecting and containing released materials or wastes, and removing or isolating containers.

Whenever there is an emission, discharge, fire, or explosion, the Emergency Coordinator or his designee must immediately attempt to identify the character, exact source, amount, and aerial extent of emitted or discharged materials. He/she may do this by observation, by review of facility records or manifests, and, if necessary, by instrumental and chemical analysis. Concurrently, the Emergency Coordinator or his designee must assess possible hazards to human health or the environment that may result from emission, discharge, fire, or explosion. This assessment must consider both direct and indirect effects of the emission, discharge, fire, or explosion.

If the Emergency Coordinator determines that the facility has had an emission, discharge, fire, or explosion which would threaten human health or the environment (beyond the limits of the site) and if evacuation of local areas may be advisable, he/she must immediately notify the applicable local authorities (police, fire, etc.); he/she must also immediately notify the PADEP by telephone at (800) 541-2050 (24-hour number), PADEP Northeast Region at (570) 826-2511 (24-hrs), the National Response Center at (800) 424-8802, Wayne County Emergency Management Agency (EMA) at (570) 253-1622, and the Pennsylvania Emergency Management Agency at (717) 651-2001, and report the following information:

- Name of the person reporting the incident;
- Name and location of the facility;
- Telephone number where the person reporting the spill can be reached;
- Date, time, and location of the incident;
- A brief description of the incident, nature of the materials involved, extent of any injuries, and possible hazards to human health or the environment;
- The estimated quantity of the materials spilled; and
- The extent of contamination of land, water, or air, if known.

If spills or discharges of a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) hazardous substance in greater than reportable quantities has occurred, the Emergency Coordinator must notify DEP at (800) 541-2050 and the National Response Center at (800) 424-8802 and report the above information. For an offsite release (spill or discharge) of a reportable quantity of a CERCLA hazardous substance or a Superfund Amendments and Reauthorization Act Extremely Hazardous Substance, the Emergency Coordinator ~~must immediately notify the National Response Center at (800) 424-8802 and~~ report the above information.

If a release occurs from a storage tank which enters a water supply or which threatens the water supply of downstream users, the Emergency Coordinator must immediately notify the Wayne County EMA (570) 253-1622, the Pennsylvania Emergency Management Agency at (717) 651-2001, and DEP at (800) 541-2050. If appropriate, the Emergency Coordinator may assist the Emergency Management Agencies in notifying the downstream water users. The priorities for notification will be by closest proximity to the release site.

During an emergency, the Emergency Coordinator will take all reasonable measures necessary to ensure that fire, explosion, emission, or discharge do not occur, recur, or spread to other materials at the facility. These shall include, where applicable, stopping facility operations, collecting and containing released materials, and removing or isolating containers. If the facility stops operations in response to a fire, explosion, emission, or discharge, the Emergency Coordinator must ensure that adequate monitoring is conducted for leaks, pressure buildup, gas generation, or ruptures in valves, pipes, or other equipment whenever this is appropriate.

The Emergency Coordinator will oversee and direct facility personnel in the performance of their responsibilities for addressing the emergency situation. Immediately following an emergency, the Emergency Coordinator (with PADEP approval) must provide for treating, storing, or disposing residues, contaminated soil, etc., from an emission, discharge, fire, or explosion at the construction site. The Emergency Coordinator must ensure that in the affected areas of the facility, no material incompatible with the emitted or discharged residues is processed, stored, treated, or disposed until cleanup procedures are completed and that all emergency equipment utilized in implementation of the PPC Plan is cleaned and fit for its intended use before operations are resumed. Newfield will notify PADEP and the appropriate State or local

authorities that the facility is in compliance before operations are resumed in the affected areas of the facility. Newfield will note the time, date and details of an incident that requires implementing the PPC Plan.

Within 15 days after the incident, Newfield will submit a written report on the incident to PADEP and the U.S. Environmental Protection Agency regional administrator. The report must be submitted to:

Director - Bureau of Water Quality Management
Pennsylvania Department of Environmental Protection
909 Elmerton Avenue
Harrisburg, PA 17110

Regional Administrator
U.S. Environmental Protection Agency
Region III
1650 Arch Street
Philadelphia, PA 19103

Director - PADEP Northeast Office
Pennsylvania Department of Environmental Protection
2 Public Square
Wilkes-Barre, PA 18711

The report should include the following information:

- Name, address, and telephone number of the individual filing the report;
- Name, address, and telephone number of the facility;
- Date, time, type, and location of incident;
- A brief description of the circumstances causing the incident;
- Description and estimated quantity (by weight) of materials or wastes involved;
- The extent of injuries, if any;
- An assessment of actual or potential threat to human health or the environment and assessment of contamination of land, water, or air, where applicable;
- Estimated quantity and disposition of recovered materials or wastes that resulted from the incident; and
- A description of what actions Newfield intends to take to prevent a similar occurrence in the future.

2.4 CHAIN OF COMMAND

Facility personnel must report emergency situations to the Emergency Coordinators. A Chain of Command flow chart (Table 5, Appendix C) has been developed and should be implemented during an emergency. The Emergency Response Chain of Command flow chart will be posted

next to all telephones onsite, posted in areas where potential emergency situations could arise, and placed in onsite company vehicles, as appropriate.

2.5 DISTRIBUTION OF THIS PPC PLAN

A copy of this PPC Plan and subsequent revisions will be distributed to:

- Drilling Manager (Primary Emergency Coordinator)
 - Production Manager (Secondary Emergency Coordinator)
-

The PPC Plan will be reviewed and amended, if necessary, based on the criteria described earlier in Section 1.7.

3.0 SPILL AND LEAK PREVENTION AND RESPONSE

The site will be maintained and operated to minimize the possibility of a fire, explosion or discharge of oils, hazardous materials or their constituents to air, soil, surface water or groundwater which could threaten human health or the environment, in accordance with the requirements of 25 PA Code Section 265.31.

3.1 PRE-RELEASE PLANNING

The following sections discuss specific locations where the potential exists for accidental spills of oils and/or chemicals. The controls that are in place to minimize the potential for an uncontrolled release to the environment are also discussed. In the event that an uncontrolled spill of hazardous substances occurs, the procedures described in Section 4.0 will be followed.

To enhance spill prevention at the facility, great care will be exercised in handling oil and other materials covered in this PPC Plan. Any unusual conditions observed by any employees or contractors will be reported to one of the Emergency Response Coordinators. Management personnel whose responsibilities include involvement with the materials discussed in this document will also be familiar with this plan and the procedures recommended for spill prevention.

Spill Prevention Measures: Procedures that are to be followed to prevent and/or minimize oil spills at the Newfield facility include:

- ASTs and/or containers will be stored in secondary containment with sufficient volume;
- ASTs and regulated material containers will be visually inspected weekly for leaks;
- Special care will be taken when transferring regulated materials to prevent product loss;
- Regulated materials will be stored in a manner that minimizes the potential for contact with stormwater;
- Absorbent and spill control materials shall be maintained on-site for emergency use;

- Emergency response personnel will be familiar with procedures to follow in the case of a spill; and
- In cases where there may be leaking equipment or operations where oil or oil-related compounds are leaked, spilled, or otherwise released, containment booms or absorbent materials shall be used and equipment shall be repaired.

In the event that an uncontrolled spill of oil or a hazardous material occurs, the procedures described in Section 4.0 will be followed. Responses should be coordinated with federal, state and local agencies as appropriate.

3.2 MATERIAL COMPATIBILITY

The majority of materials received on-site in totes, drums, pails or other small containers are stored in the containers supplied by the manufacturer.

Construction materials used for the ASTs have been selected and designed to be compatible with the materials that are being stored and are typical for the natural gas industry.

3.3 INSPECTIONS AND MONITORING PROGRAM

Operating equipment will be inspected daily, and a copy of the inspection and maintenance form is included in Appendix A. Employees are responsible for detecting and reporting potential problems on the inspection and maintenance form.

Storage tank inspections will be conducted weekly and include evaluation of the following: pumps, valves, and fittings for leaks; the tank condition for evidence of corrosion; secondary containment; evidence of spilled materials; and effectiveness of housekeeping practices.

Completed inspection forms and inspection reports will be maintained in the Primary Emergency Coordinator's office. Noncompliance issues identified during the comprehensive site evaluation will be addressed in a timely manner. If additional control measures are required, implementation of the measures will generally occur within 90 days of the site evaluation. Compliance issues that require revisions to the PPC Plan (description of additional pollutant sources, measures, or controls) will be incorporated into the plan within approximately 15 days of the site evaluation.

Stormwater Management System: Stormwater inspections will include an evaluation of best management practices (BMPs), where appropriate. In accordance with the erosion and sedimentation control plan prepared for the site, erosion and sedimentation control (ESC) measures will be implemented where there is the potential for sediment or soil particles to impact stormwater quality. Repairs will be made, as necessary, following the site inspection.

Storage Tanks and Drum Storage Areas: Tanks and drum storage areas will be accessed daily. Spills or leaks that may occur will be contained by secondary containment and noted as part of routine facility operations. To enhance the daily observations, periodic inspections will be performed for the tank and drum storage areas as described in Table 2. The inspections will include observation of spill and/or leaks and observations of the condition of associated secondary containment structures. Records for the inspections will be maintained in the Primary Emergency Coordinator's office.

3.4 PREVENTIVE MAINTENANCE

Newfield will ensure that preventative maintenance of operating machinery on each construction site is performed regularly.

3.5 HOUSEKEEPING PROGRAM

The Newfield Construction Manager will be responsible for general construction site housekeeping. Specific steps taken under this program will include:

- Debris and/or sediment removal, as necessary.
- Regular refuse pickup and disposal.
- Proper filling and emptying of storage containers, tanks, and equipment to minimize spill potential.
- Periodic review of good housekeeping procedures in the employee-training program.

Once completed, the Production Manager will have overall responsibility for housekeeping at the facility. Newfield currently does not anticipate that bulk quantities of hazardous waste materials will be stored at the facility.

3.6 SECURITY

The facility is not fully fenced but is located in a remote location with limited access except via the site access road. The facility is normally manned during drilling and well development.

Flow and drain valves are locked and in the off position when in non-operational or non-standby status. The starter controls for each oil pump are locked in the off position when in non-operating or non-standby status. Master flow/drain valves are all located on the Facility and monitored by staff.

Any loading/unloading connections of facility piping is capped or blind flanged when not in service or is in standby service for an extended amount of time.

The facility has lighting sufficient for detection of spills during nighttime operations. Consideration has been given to: (a) discovery of spills occurring during hours of darkness, both by operating personnel, if present, and by non-operating personnel, and (b) prevention of spills occurring through acts of vandalism.

3.7 EXTERNAL FACTOR PLANNING

External factors are not anticipated to increase the risk of a spill or release that would impact human safety or the environment. Power outages, adverse weather conditions, or employee strikes could result in discontinuation of earth moving, drilling or well preparation activities. The Emergency Coordinator will monitor operations and initiate their orderly shutdown when necessary.

Access road conditions may be impacted by adverse weather conditions, possibly increasing the risk of a release of materials being delivered or removed. Truck drivers should report poor road conditions to the Construction or Drilling Manager. If conditions deteriorate to where they may impact safe movement of materials, the construction or Drilling Manager will review the conditions and initiate repairs or road closure as deemed necessary.

3.8 EMPLOYEE TRAINING PROGRAM

Newfield's employee training program enables employees to understand the processes and materials with which they are working, the safety and health hazards, the practices for preventing spills, and the procedures for responding properly and rapidly to spills. It also familiarizes personnel with emergency procedures.

All Newfield employees receive job specific training. Emergency Coordinators, Well Tenders, and other oil or hazardous material handling employees receive annual training on the facility's PPC and SPCC plans.

Job specific training includes preventive maintenance, inspection and monitoring activities, shut down procedures and housekeeping practices. PPC training will include spill/release recognition, initial response, initial notifications and follow-up. The training program is designed to ensure that personnel are able to respond effectively to emergencies by familiarizing them with emergency procedures, emergency equipment systems including, where applicable: procedures for using, inspecting, repairing, and replacing emergency and monitoring equipment; key parameters for automatic cut-off systems; communications and alarms systems; response to fires and explosions; site evacuation procedures; and shutdown of operations.

Annual right-to-know training for all facility employees is conducted relevant to the materials present at the facility. Employees will be given detailed instructions regarding the materials and wastes with which they are working; including safety and health hazards, handling methods, proper disposal procedures, and emergency procedures. The location of MSDS's for on-site materials will be identified to all employees.

Training records will be maintained at the facility and in the employee's personnel file.

4.0 COUNTERMEASURES

4.1 COUNTERMEASURES TO BE UNDERTAKEN BY FACILITY

The following sections present general spill response practices to be implemented at the Newfield facility, as appropriate.

4.1.1 Spill Clean-Up Procedures - General

Incidental spills should be contained and cleaned up when discovered per the employees job related training. Clean up material should be placed into a marked container and the Construction or Drilling Manager notified appropriately.

For large spills or spills of oils or hazardous materials which may reach surface water or impact the environment, the employee who first discovers the spill should contact the Emergency Coordinator. He should then work to contain and clean-up the spill.

Spill clean-up involves three steps: containment, removal, and disposal. In the event of a spill, it is very important that the material be contained to the maximum extent possible in order to minimize the effect of the spill and the cost of clean-up. **NOTE: ANY SHEEN ON A WATERBODY (STREAM, RIVER, OR WETLAND) IS A REPORTABLE RELEASE.** Once the spill is contained, the spilled material and contaminated material must be collected and physically removed from the area

4.1.2 Spill Clean-Up Procedures - Specific

The employee should do the following:

- Contain the spill to the smallest area possible using absorbent materials, earthen dikes or other diversion or containment structures. Stormwater collection structures will be either blocked or pumped.
- Block off the area to prevent traffic or employees from entering the area.
- For oils and other organic materials, apply a non-reactive sorbent material, such as Oil-Dri or Kitty Litter, to the spill.
- In the case of a spill of acids hazardous waste, check the MSDS and then neutralize with lime or soda ash if appropriate.
- If a leaking tank is involved, stop liquid flows as appropriate and dike the tank area with earth or absorbent material.

- If a leaking pail, drum or other small container is involved, place it in an over-pack container.
- Clean up spilled material and place it in a marked container.
- Work with the emergency coordinator to properly store the material and arrange for proper disposal

4.1.3 Fire or Explosion

In the case of a fire or explosion, the local fire department should be notified by calling 911. Employees may attempt to extinguish fires using handheld fire extinguishers based upon their job training.

The Emergency Coordinator will determine if evacuation per section 4.4 is required.

4.2 COUNTERMEASURES TO BE UNDERTAKEN BY CONTRACTORS

The following list shows area emergency response contractors to contact should the facility require outside help.

Company: Minuteman Spill Response, Inc.
Address: P.O. Box 10
Mifflinville, PA 18631
Telephone Number: 570-759-3658
Response Time: Approximately 2 to 3 hrs
Equipment and Services: Hazardous Materials Emergency Response

4.3 INTERNAL AND EXTERNAL COMMUNICATIONS AND ALARM SYSTEM

This section describes the internal communications or alarm used to provide immediate emergency instruction (voice or signal) to installation personnel, and the external communications or alarm system used to summon emergency assistance from local police or fire departments.

Newfield facilities in Wayne County are remote and generally do not have land-line telephone systems or alarm systems. The primary means of communication is via voice or mobile telephones. Mobile phones are provided to the Drilling and Production Managers (Primary and Secondary Emergency Coordinators).

Fire, police, and emergency service can be summoned by calling the 911 or per the numbers listed in Table 3.

4.4 EVACUATION PLAN

In the unlikely event that the site must be evacuated, the Emergency Coordinator will alert personnel to re-group at the pre-designated location for attendance taking. The Emergency Coordinator is responsible to verify that all site workers are accounted for during an evacuation. Periodic drills will be conducted, if deemed necessary, to evaluate the effectiveness of this evacuation plan.

If an emergency situation requires evacuation of personnel, the Emergency Coordinator will implement the following evacuation procedures:

1. The Emergency Coordinator will provide evacuation instructions to facility personnel via the construction site communications network, as appropriate.
2. Personnel evacuation will typically proceed as follows:
 - a. If downwind of incident: Evacuate via the most accessible route perpendicular to the prevailing wind direction.
 - b. If upwind of incident: Evacuate in an upwind direction.
3. Personnel will reassemble at the public road at the facility entrance as shown on Figure 3 or an alternate assembly point identified by the Emergency Coordinator, that is upwind of the incident location, and remain at this location until the Emergency Coordinator has accounted for all personnel.
4. The names of employees and the destination of employees transported to hospitals, etc. for treatment will be recorded by the Emergency Coordinator, first aid personnel or fire officials.

Once on public roadways, evacuation routes are left up to the individual.

4.5 EMERGENCY EQUIPMENT AVAILABLE FOR RESPONSE

This section provides a list of available emergency equipment, and procedures for maintenance and decontamination of emergency equipment. Newfield's emergency equipment at the facility will allow personnel to respond safely and quickly to emergency situations. Equipment will be inspected and maintained by Construction Manager to assure recommended quantities are available and its proper operation in time of emergency. After an emergency, equipment will be decontaminated, cleaned, and re-fit for its intended use before normal operations resume.

The Newfield facility will be equipped with the following emergency response equipment:

- (1) Mobile telephones are provided to the Drilling and Production Managers and are immediately available at the scene of operations for summoning emergency assistance from local police departments, fire departments or State or local emergency response teams.
 - (2) Portable fire extinguishers, fire control equipment, spill control equipment and decontamination equipment. This equipment is detailed in Table 4 of Appendix C.
-

5.0 EMERGENCY SPILL CONTROL NETWORK

5.1 ARRANGEMENTS WITH LOCAL EMERGENCY RESPONSE AGENCIES AND HOSPITALS

This section provides a list of local emergency response agencies and hospitals, and associated phone numbers. Arrangements can be made, as appropriate, to inform local emergency response agencies and hospitals concerning the type of materials handled at the Newfield facility and the potential need for services.

If appropriate, arrangements can be made to designate who will be the primary emergency response agency and who will provide support services during emergencies. Efforts can be made to familiarize police, fire departments, emergency response teams, and the Wayne County Emergency Management Agency (EMA) Coordinator with the layout of the site, the properties and dangers associated with any hazardous materials handled, places where personnel would normally be working, entrances to roads inside the site, and potential evacuation routes.

If considered appropriate by Newfield's Emergency Coordinator, agreements with hospitals and emergency response agencies can be made and included in the periodic updating or amending of the PPC Plan. The agreements and/or arrangements include efforts to familiarize area agencies and emergency responders with facility operations and potential emergency operations. The following agencies can be contacted and provided with a copy of this PPC Plan, at the discretion of the Newfield Emergency Coordinator.

- Local fire companies;
- Local county emergency response personnel;
- Local ambulance personnel; and
- Local hospital.

Table 3 lists local emergency response agencies to be contacted in the event of an emergency or reportable spill. In the unlikely event that a widespread emergency exists, the Wayne County EMA would be contacted first, and the Coordinator in turn could contact appropriate emergency response agencies through their communications network.

The Wayne County Emergency Management Agency can be contacted at (570) 253-1622. Routing of injured persons will be performed by emergency medical services personnel based on the number and type of injuries requiring treatment. The emergency medical services coordinator may be provided with a copy of this PPC Plan to assist in planning. The nearest hospitals are Catskill Regional Medical Hospital in Callicoon, New York, and Wayne County Memorial Hospital in Honesdale, Pennsylvania. The nearest fire departments are Callicoon Fire District in Callicoon, New York, Protection Engine Co No. 3 in Honesdale, Pennsylvania, and Narrowsburg Fire Department, in Narrowsburg, New York. The nearest police departments are the Honesdale Police Department, located in Honesdale, Pennsylvania, and Waymart Police Department in Honesdale Pennsylvania. All emergency response departments shall be reached through the 911 system.

5.2 NOTIFICATION LISTS

If the Emergency Coordinator determines that the facility has had an emission, discharge, fire, or explosion that could threaten human health or the environment, he will contact and report as necessary his findings to the appropriate agencies listed in Table 3. When calling any of the agencies listed in Table 3, the following information should be available for reporting to the identified agencies:

- Company name and location;
- Name of person reporting the spill, title, and telephone number;
- The type of material released;
- Estimated or exact (if known) quantity of material released (i.e., gallons, pounds, etc.);
- A brief description of the incident, including type of incident, nature of hazardous material involvement, and possible hazards to human health and the environment outside the facility;
- Probable source and location of the spill source;
- Date and time of the spill;
- Location of entry point into surface water and amount reaching the waterway (if applicable);
- The name of the receiving water and the downstream water bodies of which it is a tributary;
- Confirmation that release has been stopped or, if not, when will it be stopped;
- Mitigation/containment actions initiated;
- Direction of material movement;

- Potential population affected by the release;
- Name of person to contact on behalf of the company who will be at the scene and will be directing response measures;
- Telephone number where the on-scene coordinator can be reached; and
- The extent of injuries, if any.

A reporting form is attached in Appendix D for use by the Emergency Coordinator.

A written report including the above listed information, and other information that may be required by the applicable regulations (see 25 PA Code Section 265.56) regarding the spilled material, will need to be transmitted within 15 days to the following agencies:

U.S. Environmental Protection Agency
Region III
Spill Response Section
1650 Arch Street
Philadelphia, PA 19103

Pennsylvania Department of Environmental Protection
Bureau of Water Quality Management
2 Public Square
Wilkes-Barre, Pennsylvania 18711

6.0 WASTE DISPOSAL PRACTICES

Produced water will be removed periodically from the tanks at each well site and transported by a licensed residual waste hauler to a permitted disposal facility. Other wastes generated onsite will include used hydraulic oil that will be reclaimed from operating equipment and transported offsite for recycling. All wastes will be disposed in accordance with applicable local, state, and federal regulations.

7.0 STORMWATER MANAGEMENT PRACTICES

Newfield implements several Best Management Practices (BMPs) at each well site to reduce the potential for stormwater runoff of suspended solids and other contaminants. These BMPs include routine visual inspections, preventive maintenance, good housekeeping, and management of stormwater run-on and runoff. Routine inspection and monitoring, preventive maintenance, and good housekeeping programs are discussed in Sections 3.3, 3.4, and 3.5 of this PPC Plan. These programs prevent accidental releases of contaminants and reduce contaminant migrations via stormwater discharges. Stormwater management activities are discussed in Section 3.1 of this PPC Plan. The certification statement regarding the evaluation of discharges and confirmation that they will be comprised solely of stormwater is presented at the beginning of this Plan. Potential "significant sources of non-stormwater at the site" may include condensate, brine, hydraulic oil drums and tanks, gasoline and diesel fuel. Storage areas for these significant sources will be inspected on a daily basis.

8.0 SEDIMENT AND EROSION PREVENTION

Erosion and sedimentation controls are managed in accordance with PADEP requirements. Copies of the site E&S Plan are available at the Newfield office in Honesdale, PA and at each well site.

APPENDIX A
INSPECTION FORMS

**NEWFIELD APPALACHIA PA LLC
Weekly Facility Inspection Form**

| | |
|----------------------------|------------------------|
| Facility: | Inspector Name: |
| | |
| Date of Inspection: | |
| | |

Instructions: Indicate yes or no. If no, record observations describing the specific equipment and discrepancy.

| Aboveground Storage Tanks | | |
|---|------------------------------|-----------------------------|
| • Equipment appears adequately supported | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • No evidence of active or past leaks from equipment, piping, connections, vales, vents, etc. | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Coating condition appears satisfactory | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Corrosion appears acceptable | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Level gauages/alarms are operative | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Containers are labeled | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Observations: | | |

| Processing Equipment | | |
|---|------------------------------|-----------------------------|
| • Equipment appears adequately supported | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • No evidence of active or past leaks from equipment, piping, connections, vales, vents, etc. | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Coating condition appears satisfactory | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Corrosion appears acceptable | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Observations: | | |

| Other Facility Equipment is Checked for: | | |
|---|------------------------------|-----------------------------|
| ❖ No evidence of active or past leaks | | |
| ❖ Condition of equipment appears to be satisfactory (i.e., not damaged, deteriorated, or worn), and | | |
| ❖ Corrosion appears to be acceptable. | | |
| • Wellheads | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Gathering systems | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Well test stations | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Traps/Sumps | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Drainage systems and nearby ditches | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Applicable flowlines including right-of-way areas | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Containment systems | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Facility piping | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Observations: | | |

NEWFIELD APPALACHIA PA LLC
Weekly Facility Inspection Form

Secondary Containment

- | | | |
|--|------------------------------|-----------------------------|
| • Passive containment (berm) has adequate capacity and integrity as intended | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Active containment measures are adequate | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • No evidence of active or past leaks (i.e., staining, sheen) | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Any valves are closed and plugged | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Active containment is free from a significant quantity of rain/snow | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

Observations:

Security

- | | | |
|--|------------------------------|-----------------------------|
| • Lighting is adequate to observe leaks, spills, and vandalism | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| • Pumps, valves, nozzles are locked | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

Observations:

Spill Response

- | | | |
|---|------------------------------|-----------------------------|
| • Spill response kits are stocked and located in readily accessible areas | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
|---|------------------------------|-----------------------------|

Observations:

Signature:

Date:

E&S INSPECTION FORM

The E&S plan contains a maintenance program which provides for inspection of BMPs (Best Management Practices such as filter sock, vegetation, construction entrances, etc.) on a weekly basis and after each measurable rainfall event, including the repair of BMPs to ensure effective and efficient operation. The maintenance program for both the temporary and permanent erosion and sediment control BMPs, including disposal of materials removed from the BMPs or project area, has been included in the narrative. The type of maintenance, such as cleanout, repair, replacement, regrading, re-stabilizing, etc. for each of the BMPs is included in the plan. **NOTE: This inspection report must be kept up to date and onsite.**

| INSPECTION DATE | INITIALS | RAINFALL OR WEEKLY? | LOCATION OF E&S CONTROL(S) | CONDITION NOTED | CORRECTIVE MEASURES TAKEN |
|-----------------|----------|---------------------|----------------------------|-----------------|---------------------------|
| | | | | | |
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| | | | | | |
| | | | | | |

Facility: _____ **Inspector:** _____ **Signed:** _____ **Date:** _____
Print *Signature*

Tank Truck Loading and Unloading Checklist

Date: _____ Material being loaded/unloaded: _____

Driver/Loader present during loading or unloading of material _____
(signature)

- _____ Current volume in storage tank was checked prior to loading.
- _____ Fill hose inspected for condition prior to loading.
- _____ Wheel chocks in place prior to loading.
- _____ Tanker valve(s) were inspected for leakage prior to filling and departure.
- _____ The loading of the tanker was monitored.
- _____ Hoses were replaced and capped after loading.
- _____ No material was spilled onto the containment pad or ground.

- These forms must be completed for every tank truck shipment and must be filed in the facility PPC Plan.
- All spills should be immediately reported to at least one of the following Newfield personnel:

Don Sleeth
Drilling Manager
Office: 281-674-2501
Cell: 281-974-0051

Jack Cochran
Production Manager
Office: 814-437-2344
Cell: 814-671-1557

Burl Eakle
Cell: 918-448-1296

Delivery Information

Invoice No. _____

Load No. _____

Company _____

APPENDIX B
FIGURES



TETRA TECH

Figure 1
Well Field Map
Newfield Exploration Company

Legend

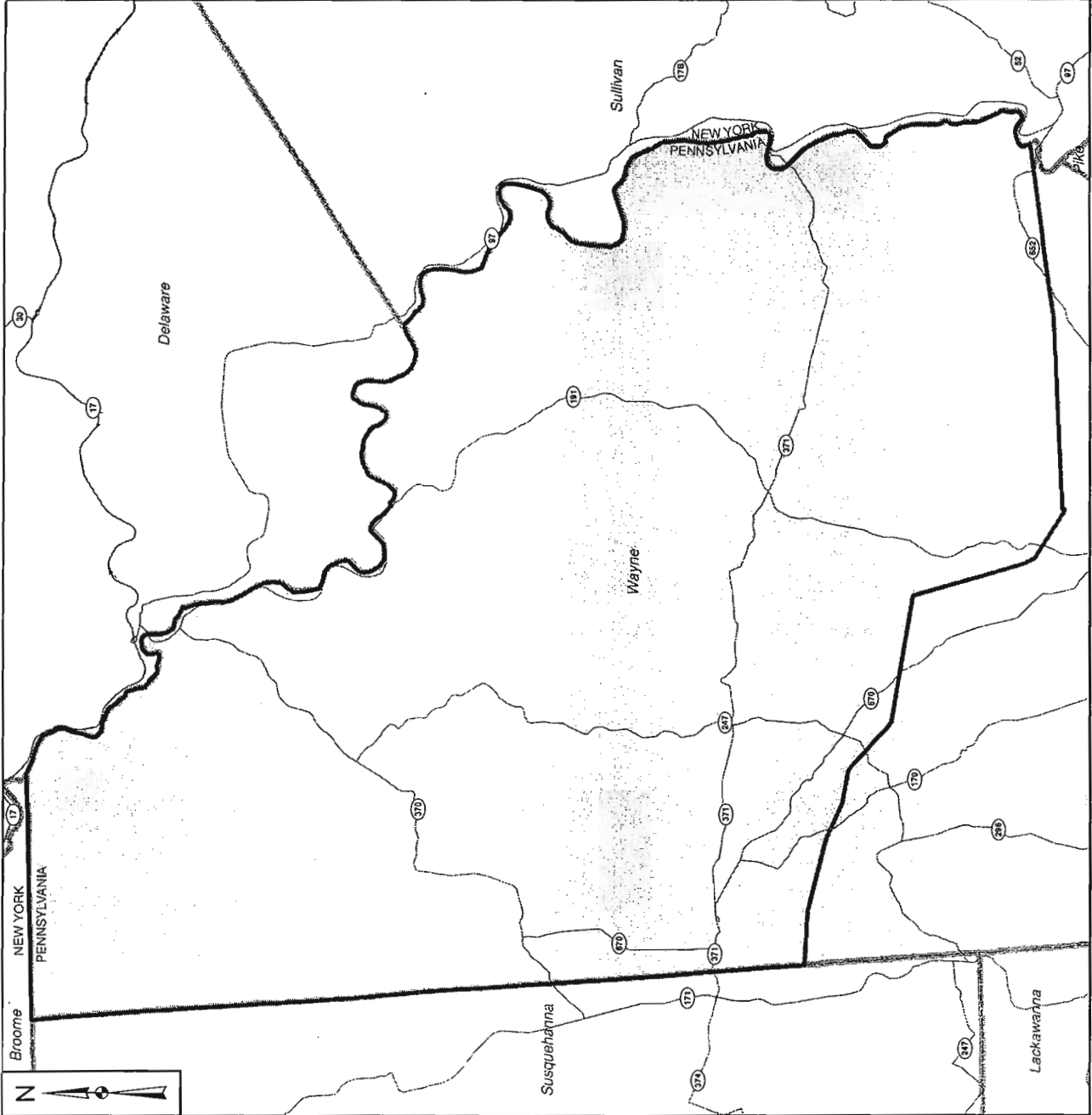
- Road (E)
- County (E)
- Wayne County (E)
- Lease Area (N)

Sources:
 (E) - Indicates the data was provided by ESRI.
 (N) - Indicates the data was provided by Newfield Exploration Company

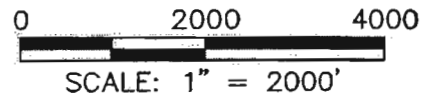
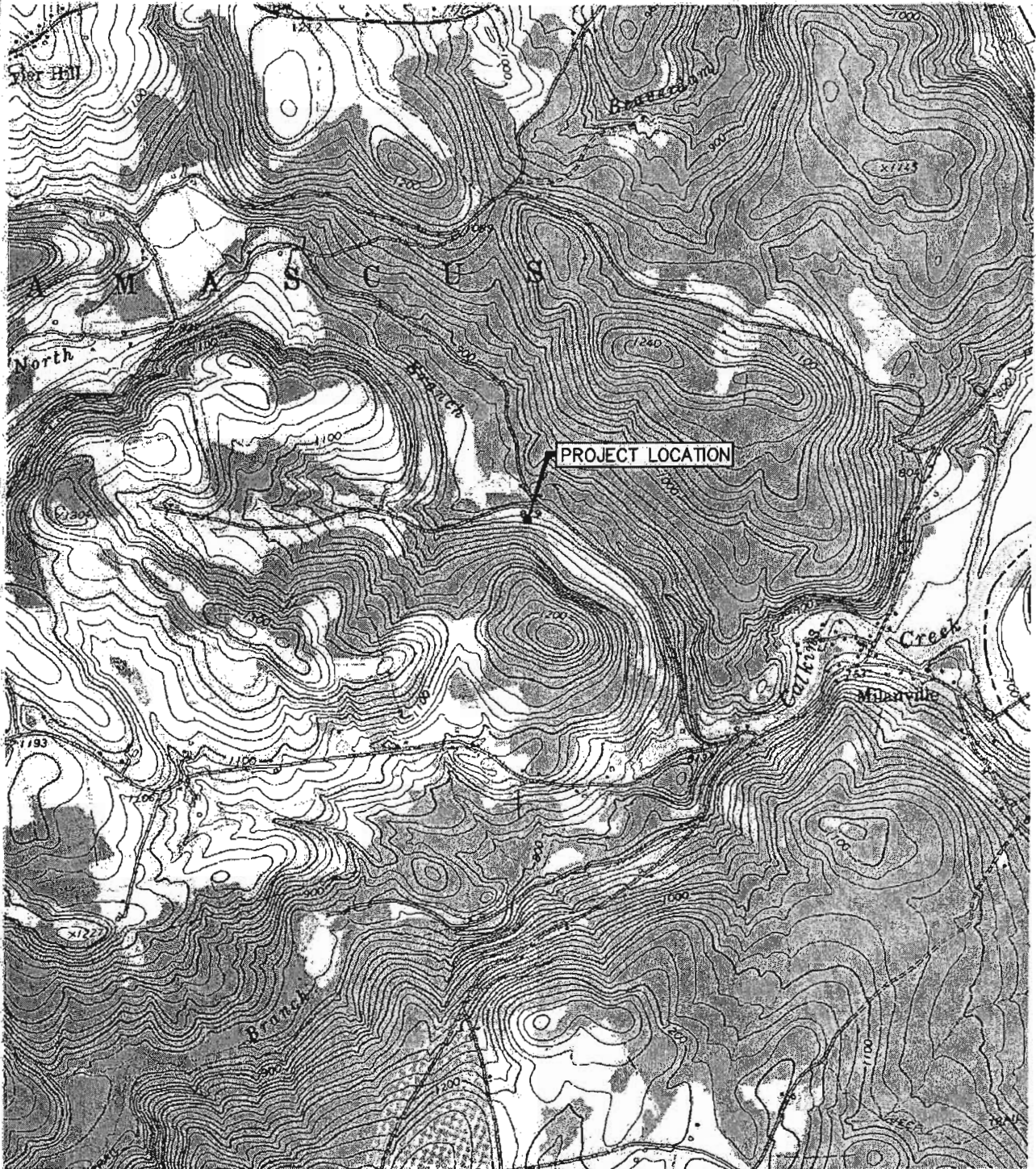


Drawn By: S. PAXTON 04/20/10
 Checked By: A. STRASSNER 04/20/10
 Approved By:

Contract Number: 112C02679



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TETRA TECH

WWW.TETRATECH.COM

661 ANDERSEN DRIVE - FOSTER PLAZA 7
PITTSBURGH, PA 15220
T: (412) 921-7090 | F: (412) 921-4040

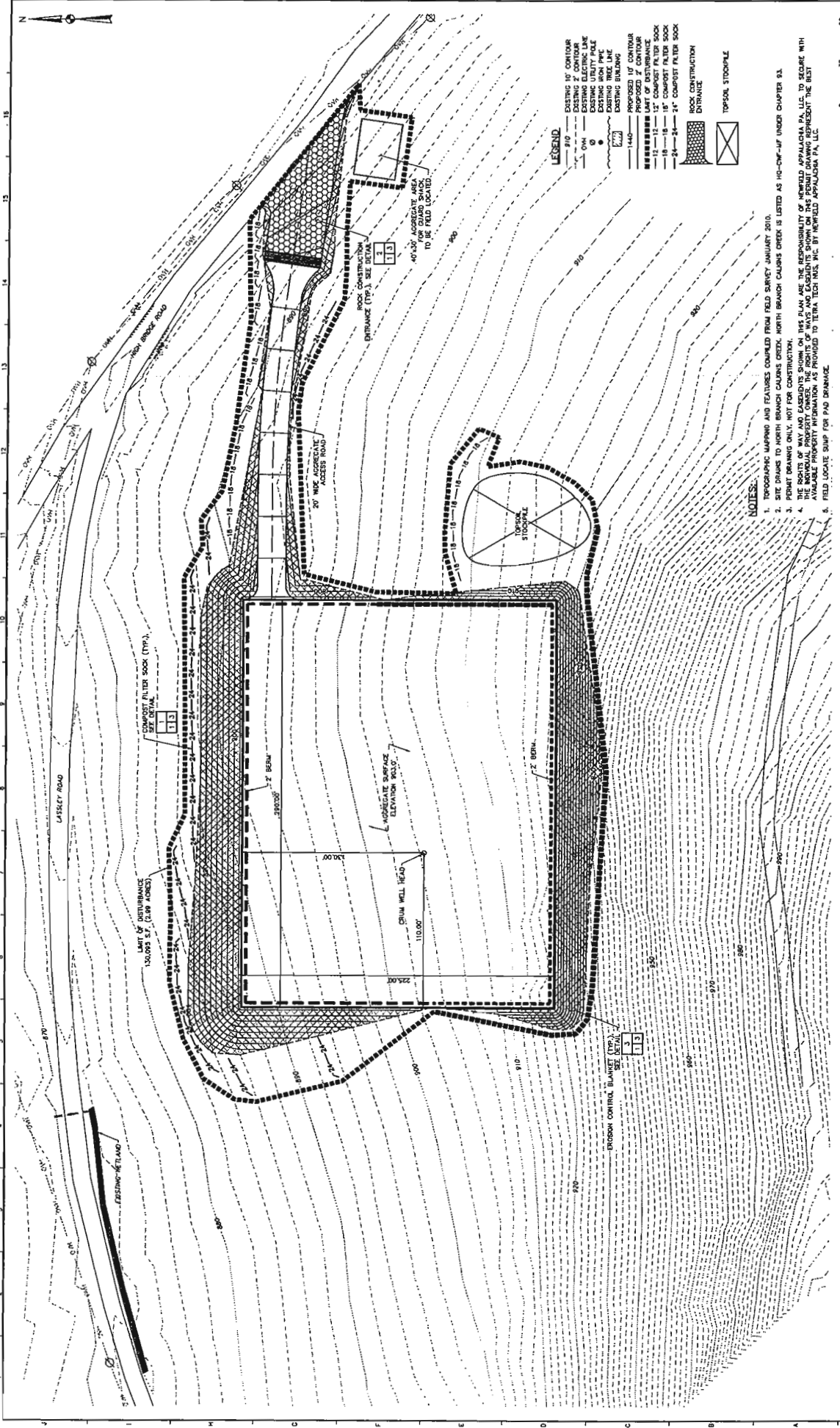
**NEWFIELD EXPLORATION COMPANY
WAYNE COUNTY, PENNSYLVANIA**

**CRUM WELL PAD
LOCATION MAP**
SCALE: 1" = 2000'

| | |
|--------------|-----------|
| DATE: | 3/3/10 |
| PROJECT NO.: | 112C02568 |
| DESIGNED BY: | RAL |
| DRAWN BY: | BH |
| CHECKED BY: | RAL |
| SHEET: | 1 OF 2 |

COPYRIGHT TETRA TECH INC.

FIGURE 2



- LEGEND**
- EXISTING 1/2" CONTOUR
 - EXISTING 2" CONTOUR
 - EXISTING ELECTRIC LINE
 - EXISTING TELEPHONE LINE
 - EXISTING IRON PIPE
 - EXISTING TREE LINE
 - EXISTING BUILDING
 - PROPOSED 1/2" CONTOUR
 - PROPOSED 2" CONTOUR
 - LIMIT OF DISTURBANCE
 - 12" COMPOST FILTER SOCK
 - 18" COMPOST FILTER SOCK
 - 24" COMPOST FILTER SOCK
 - ROCK CONSTRUCTION ENTRANCE
 - TOPSOIL STOCKPILE

- NOTES:**
1. TOPOGRAPHIC MAPING AND FEATURES COURTEAS FROM FIELD SURVEY JANUARY 2010.
 2. SITE DRAWS TO NORTH BRANCH CALUMS CREEK, NORTH BRANCH CALUMS CREEK IS LISTED AS HQ-CM-41F UNDER CHAPTER 83.
 3. PERMIT DRAWING ONLY, NOT FOR CONSTRUCTION.
 4. THE RIGHTS OF WAY AND EASEMENTS SHOWN ON THIS PLAN ARE THE RESPONSIBILITY OF NEWFIELD APPALACHIA PA, LLC TO SECURE WITH THE INDIVIDUAL PROPERTY OWNER. THE RIGHTS OF WAY AND EASEMENTS SHOWN ON THIS PERMIT DRAWING REPRESENT THE BEST PROVIDED TO TETRA TECH INC. BY NEWFIELD APPALACHIA PA, LLC.
 5. FIELD LOCATE SHIP FOR PAD DRAINAGE.

SCALE: 1" = 30'

| | |
|---------------|-----------|
| DATE: | 6/17/10 |
| PROJECT NO.: | 110207583 |
| DESIGNED BY: | RAJ |
| DRAWN BY: | BS |
| CHECKED BY: | BS |
| SHEET: | 1 OF 7 |
| CONTRACT NO.: | 7 |

NEWFIELD APPALACHIA PA LLC,
WAYNE COUNTY, PENNSYLVANIA

CRUM WELL PAD
EROSION & SEDIMENT CONTROL PLAN

SCALE: 1" = 30'

| MARK | DATE | DESCRIPTION |
|------|------|-------------|
| | | |
| | | |
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| | | |

TETRA TECH

www.tetra-tech.com

681 ANDOVER ROAD, FORT MYERS PALM 7
PITTSBURGH, PA 15229
T: (412) 821-7000 | F: (412) 821-6040



APPENDIX C
TABLES

TABLE 1

LIST OF MATERIALS & WASTES

CONSTRUCTION

| POLLUTIONAL MATERIAL | VOLUME OR QUANTITY | LOCATION ONSITE | SPILL CONTAINMENT MATERIALS ONSITE/LOCATION |
|-----------------------------|---------------------------|------------------------|--|
| Diesel Fuel | 250 gallons | Well Pad | Sorbent pads; shovels/Gang box |
| Lubricants | 180 gallons | Well Pad | Sorbent pads; shovels/Gang box |
| OIL ABSORBANT | 2,500 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Trash & Debris | 2,000 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| | | | |

DRILLING

| POLLUTIONAL MATERIAL | VOLUME OR QUANTITY | LOCATION ONSITE | SPILL CONTAINMENT MATERIALS ONSITE/LOCATION |
|--|---------------------------|------------------------|--|
| Diesel Fuel | 2000 gallons | Well Pad | Sorbent pads; shovels/Gang box |
| Lubricants | 320 gallons | Well Pad | Sorbent pads; shovels/Gang box |
| DURATONE HT | 2,500 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| GELTONE V | 2,500 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Lime | 7,500 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| OIL ABSORBANT | 2,500 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Base Fluid | 300 bbl | Well Pad | Sorbent pads; shovels/Gang box |
| Rig Wash | 2,000 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Calcium Chloride (CaCl-) | 4,000 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| RHEMOD L | 1,770 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| LE SUPERMUL | 8,500 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| BARACARB 25, 50 (2 pallets each) | 12,600 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| WALNUT | 2,400 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| DRILTREAT | 1,900 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Liquid Mud | 1,500 bbl | Well Pad | Sorbent pads; shovels/Gang box |
| BAROID REGULAR / **BAROID BULK (barite) | 125,000 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Trash & Debris | 2,000 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| Drill Cuttings | 100,000 lbs | Air Pit | Sorbent pads; shovels/Gang box |
| Cement | 130,000 lbs | Well Pad | Sorbent pads; shovels/Gang box |
| | | | |

TABLE 2

INSPECTION AND MONITORING ACTIVITIES

| Activity | Frequency |
|---|--|
| Erosion and Sedimentation Control Measures | Weekly or after a significant rain event |
| Aboveground Storage Tanks | Daily |
| Drum Storage Areas | Daily |
| Best Management Practices (BMPs) | Per BMP requirements |
| Dust Control Measures | Daily |
| Preparedness, Prevention, and Contingency (PPC) Plan Compliance Evaluation Inspections and Update of PPC Plan, as Appropriate | Annually |

**TABLE 3
AGENCY NOTIFICATION LIST**

The following agencies are to be contacted, as appropriate, in the event of an emergency, accident, or chemical release.

| <u>Agency</u> | <u>Telephone No.</u> |
|--|----------------------|
| PADEP Northeast Regional Office | 570-826-2511 |
| PADEP Southcentral Office (Harrisburg) | 877-333-1904 |
| Pennsylvania Emergency Management Agency | 717-651-2001 |
| Police Department | 9-1-1 |
| Volunteer Fire Department | 9-1-1 |
| U.S. Environmental Protection Agency | 215-814-5700 |
| U.S. Coast Guard National Response Center | 800-424-8802 |
| U.S. Coast Guard (local) | 570-421-1191 |
| Pennsylvania Fish and Boat Commission | 814-445-8974 |
| Chemical Transportation Emergency Center: * Chemical Exposure Information | 800-424-9300 |

LOCAL EMERGENCY RESPONSE:

| | |
|---|--------------|
| Fire Department – Callicoon Fire District in Callicoon, New York, Protection Engine Co No. 3 in Honesdale, Pennsylvania Narrowsburg Fire Department, in Narrowsburg, New York. | 9-1-1 |
| Police Department – Honesdale Police Department, Honesdale, Pennsylvania Waymart Police Department, Honesdale Pennsylvania | 9-1-1 |
| Hospitals-Wayne County Memorial Hospital, Honesdale, Pennsylvania | 570-251-6672 |
| Catskill Regional Medical Hospital in Callicoon, New York | 845-887-5530 |
| Local Emergency Management Wayne County EMA | 570-253-1622 |

TABLE 4

On-Site Emergency Response Equipment

| On-Site Emergency Response Equipment |
|---|
| Fire Extinguishers |
| Tyvek Suits |
| Nitrile Gloves |
| Hearing Protection |
| Particulate Adsorbent |
| Absorbent Pads |
| Shovels |
| Earth Moving Equipment |
| Decontamination Equipment |

**TABLE 5
CHAIN OF COMMAND**

Primary Emergency Coordinator

Don Sleeth
Drilling Manager
Office: 281-674-2501
Cell: 281-974-0051

Secondary Emergency Coordinator

Jack Cochran
Production Manager
Office: 814-437-2344
Cell: 814-671-1557

Construction Manager

Burl Eakle
Cell: 918-448-1296

Offsite Emergency Response Contractors

Company: Minuteman Spill Response, Inc.
Telephone Number: 800-905-7788

**APPENDIX D
REPORTING FORM**

Spill Response Notification Form

| | | | |
|---|----------------|---|---------------|
| GENERAL REPORTING INFORMATION | | | |
| Prepared _____ | | | |
| (First) | (M.I.) | (Last) | (Position) |
| Daytime phone: (xxx) xxx-xxxx | | Evening phone: (xxx) xxx-xxxx | |
| Newfield Appalachia PA LLC | | | |
| (Company) | (Address) | (City) | (State) (Zip) |
| Calling for responsible party? Yes | | Were materials discharged? Yes Confidential? No | |
| Meeting Federal obligations to report: Yes | | | |
| INCIDENT DESCRIPTION | | | |
| Source and/or cause: | | | |
| | | | |
| Date of Incident: Time of Incident: | | | |
| Incident Location/Address | | | |
| Nearest City: XXXX, PA XXXXX (XXXXXXXX County) | | | |
| Distance from City: In city limits | | Direction from City: In city limits | |
| Facility Oil Storage Capacity: XXXXXX gallons | | | |
| Container Type: Container Capacity: _____ (gals) | | | |
| Facility Latitude: xx° xx' xx" Longitude xx° xx' xx" | | | |
| MATERIAL | | | |
| Name (or CHRIS Code): | | | |
| Discharged Quantity (Units): | | Discharged to Water (Units): | |
| RESPONSE ACTION | | | |
| Actions taken to correct, control or mitigate incident: | | | |
| | | | |
| IMPACT | | | |
| No. of Injuries: | No. of Deaths: | Other: | |
| Evacuation (Y/N): | Damage (Y/N): | Amount (\$): | |
| Medium Affected: | Description: | Additional Information: | |
| AGENCY NOTIFIED | | | |
| NRC 800-424-8802 | Date: | Time: | Contact: |
| PADEP (570) 826-2511 | Date: | Time: | Contact: |
| USCG | Date: | Time: | Contact: |
| Other | Date: | Time: | Contact: |
| ADDITIONAL INFORMATION: | | | |
| | | | |

APPENDIX E
MSDS SHEETS



MATERIAL SAFETY DATA SHEET

Diesel Fuel (All Types)

MSDS No. 9909

EMERGENCY OVERVIEW

CAUTION!

OSHA/NFPA COMBUSTIBLE LIQUID - SLIGHT TO MODERATE IRRITANT
EFFECTS CENTRAL NERVOUS SYSTEM
HARMFUL OR FATAL IF SWALLOWED

Moderate fire hazard. Avoid breathing vapors or mists. May cause dizziness and drowsiness. May cause moderate eye irritation and skin irritation (rash). Long-term, repeated exposure may cause skin cancer. If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs).



NFPA 704 (Section 16)

1. CHEMICAL PRODUCT AND COMPANY INFORMATION

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

EMERGENCY TELEPHONE NUMBER (24 hrs): CHEMTREC (800) 424-9300
COMPANY CONTACT (business hours): Corporate Safety (732) 750-6000
MSDS INTERNET WEBSITE: www.hess.com (See Environment, Health, Safety & Social Responsibility)

SYNONYMS: Ultra Low Sulfur Diesel (ULSD); Low Sulfur Diesel; Motor Vehicle Diesel Fuel; Diesel Fuel #2; Dyed Diesel Fuel; Non-Road, Locomotive and Marine Diesel Fuel; Tax-exempt Diesel Fuel

See Section 16 for abbreviations and acronyms.

2. COMPOSITION and CHEMICAL INFORMATION ON INGREDIENTS

| INGREDIENT NAME (CAS No.) | CONCENTRATION PERCENT BY WEIGHT |
|---------------------------|---------------------------------|
| Diesel Fuel (68476-34-6) | 100 |
| Naphthalene (91-20-3) | Typically < 0.01 |

A complex mixture of hydrocarbons with carbon numbers in the range C9 and higher. Diesel fuel may be dyed (red) for tax purposes. May contain a multifunctional additive.

3. HAZARDS IDENTIFICATION

EYES

Contact with liquid or vapor may cause mild irritation.

SKIN

May cause skin irritation with prolonged or repeated contact. Practically non-toxic if absorbed following acute (single) exposure. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.

INGESTION

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.



MATERIAL SAFETY DATA SHEET

Diesel Fuel (All Types)

MSDS No. 9909

INHALATION

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

CHRONIC EFFECTS and CARCINOGENICITY

Similar products produced skin cancer and systemic toxicity in laboratory animals following repeated applications. The significance of these results to human exposures has not been determined - see Section 11 Toxicological Information.

IARC classifies whole diesel fuel exhaust particulates as probably carcinogenic to humans (Group 2A). NIOSH regards whole diesel fuel exhaust particulates as a potential cause of occupational lung cancer based on animal studies and limited evidence in humans.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash).

4. FIRST AID MEASURES

EYES

In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

SKIN

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

INGESTION

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

INHALATION

Remove person to fresh air. If person is not breathing provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES:

| | |
|-------------------------------|---------------------------------|
| FLASH POINT: | > 125 °F (> 52 °C) minimum PMCC |
| AUTOIGNITION POINT: | 494 °F (257 °C) |
| OSHA/NFPA FLAMMABILITY CLASS: | 2 (COMBUSTIBLE) |
| LOWER EXPLOSIVE LIMIT (%): | 0.6 |
| UPPER EXPLOSIVE LIMIT (%): | 7.5 |

FIRE AND EXPLOSION HAZARDS

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

EXTINGUISHING MEDIA

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or Halon.



MATERIAL SAFETY DATA SHEET

Diesel Fuel (All Types)

MSDS No. 9909

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

FIRE FIGHTING INSTRUCTIONS

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

6. ACCIDENTAL RELEASE MEASURES

ACTIVATE FACILITY'S SPILL CONTINGENCY OR EMERGENCY RESPONSE PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

7. HANDLING and STORAGE

HANDLING PRECAUTIONS

Handle as a combustible liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Diesel fuel, and in particular low and ultra low sulfur diesel fuel, has the capability of accumulating a static electrical charge of sufficient energy to cause a fire/explosion in the presence of lower flashpoint products such as gasoline. The accumulation of such a static charge occurs as the diesel flows through pipelines, filters, nozzles and various work tasks such as tank/container filling, splash loading, tank cleaning; product sampling; tank gauging; cleaning, mixing, vacuum truck operations, switch loading, and product agitation. There is a greater potential for static charge accumulation in cold temperature, low humidity conditions.

Documents such as 29 CFR OSHA 1910.106 "Flammable and Combustible Liquids, NFPA 77 Recommended Practice on Static Electricity, API 2003 "Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents and ASTM D4865 "Standard Guide for Generation and Dissipation of Static



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Electricity in Petroleum Fuel Systems" address special precautions and design requirements involving loading rates, grounding, bonding, filter installation, conductivity additives and especially the hazards associated with "switch loading." ["Switch Loading" is when a higher flash point product (such as diesel) is loaded into tanks previously containing a low flash point product (such as gasoline) and the electrical charge generated during loading of the diesel results in a static ignition of the vapor from the previous cargo (gasoline).]

Note: When conductivity additives are used or are necessary the product should achieve 25 picosiemens/meter or greater at the handling temperature.

STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

8. EXPOSURE CONTROLS and PERSONAL PROTECTION

EXPOSURE LIMITS

| Components (CAS No.) | Source | Exposure Limits | | Note |
|---------------------------|--------|--|--|----------|
| | | TWA/STEL | | |
| Diesel Fuel: (68476-34-6) | OSHA | 5 mg/m, as mineral oil mist | | |
| | ACGIH | 100 mg/m ³ (as totally hydrocarbon vapor) TWA | | A3, skin |
| Naphthalene (91-20-3) | OSHA | 10 ppm TWA | | |
| | ACGIH | 10 ppm TWA / 15 ppm STEL | | A4, Skin |

ENGINEERING CONTROLS

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

EYE/FACE PROTECTION

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

SKIN PROTECTION

Gloves constructed of nitrile, neoprene, or PVC are recommended. Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.



MATERIAL SAFETY DATA SHEET

Diesel Fuel (All Types)

MSDS No. 9909

RESPIRATORY PROTECTION

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

9. PHYSICAL and CHEMICAL PROPERTIES

APPEARANCE

Clear, straw-yellow liquid. Dyed fuel oil will be red or reddish-colored.

ODOR

Mild, petroleum distillate odor

BASIC PHYSICAL PROPERTIES

BOILING RANGE: 320 to 690 oF (160 to 366 °C)
VAPOR PRESSURE: 0.009 psia @ 70 °F (21 °C)
VAPOR DENSITY (air = 1): > 1.0
SPECIFIC GRAVITY (H₂O = 1): 0.83 to 0.88 @ 60 °F (16 °C)
PERCENT VOLATILES: 100 %
EVAPORATION RATE: Slow; varies with conditions
SOLUBILITY (H₂O): Negligible

10. STABILITY and REACTIVITY

STABILITY: Stable. Hazardous polymerization will not occur.

CONDITIONS TO AVOID and INCOMPATIBLE MATERIALS

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Keep away from strong oxidizers; Viton®; Fluorel®

HAZARDOUS DECOMPOSITION PRODUCTS

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

11. TOXICOLOGICAL PROPERTIES

ACUTE TOXICITY

Acute dermal LD50 (rabbits): > 5 ml/kg
Acute oral LD50 (rats): 9 ml/kg
Primary dermal irritation: extremely irritating (rabbits) Draize eye irritation: non-irritating (rabbits)
Guinea pig sensitization: negative

CHRONIC EFFECTS AND CARCINOGENICITY

Carcinogenic: OSHA: NO IARC: NO NTP: NO ACGIH: A3

Studies have shown that similar products produce skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation.

MUTAGENICITY (genetic effects)

This material has been positive in a mutagenicity study.




MATERIAL SAFETY DATA SHEET

Diesel Fuel (All Types) **MSDS No. 9909**

12. ECOLOGICAL INFORMATION
 Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

13. DISPOSAL CONSIDERATIONS
 Consult federal, state and local waste regulations to determine appropriate disposal options.

14. TRANSPORTATION INFORMATION

| | | |
|---------------------------------|-------------------------|---|
| PROPER SHIPPING NAME: | Diesel Fuel | Placard (International Only): |
| HAZARD CLASS and PACKING GROUP: | 3, PG III | |
| DOT IDENTIFICATION NUMBER: | NA 1993 (Domestic) |  |
| | UN 1202 (International) | |
| DOT SHIPPING LABEL: | None | |

Use Combustible Placard if shipping in bulk domestically

15. REGULATORY INFORMATION
U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION
 This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other regulations at the state and/or local level. Consult those regulations applicable to your facility/operation.

CLEAN WATER ACT (OIL SPILLS)
 Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)
 The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

SARA SECTION 311/312 - HAZARD CLASSES

| | | | | |
|---------------------|-----------------------|-------------|-----------------------------------|-----------------|
| <u>ACUTE HEALTH</u> | <u>CHRONIC HEALTH</u> | <u>FIRE</u> | <u>SUDDEN RELEASE OF PRESSURE</u> | <u>REACTIVE</u> |
| X | X | X | -- | -- |

SARA SECTION 313 - SUPPLIER NOTIFICATION
 This product may contain listed chemicals below the *de minimis* levels which therefore are not subject to the supplier notification requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372. If you may be required to report releases of chemicals listed in 40 CFR 372.28, you may contact Hess Corporate Safety if you require additional information regarding this product.

CALIFORNIA PROPOSITON 65 LIST OF CHEMICALS
 This product contains the following chemicals that are included on the Proposition 65 "List of Chemicals" required by the California Safe Drinking Water and Toxic Enforcement Act of 1986:

| | |
|--|--------------------|
| <u>INGREDIENT NAME (CAS NUMBER)</u> | <u>Date Listed</u> |
| Diesel Engine Exhaust (no CAS Number listed) | 10/01/1990 |

CANADIAN REGULATORY INFORMATION (WHMIS)
 Class B, Division 3 (Combustible Liquid) and Class D, Division 2, Subdivision B (Toxic by other means)



MATERIAL SAFETY DATA SHEET

Diesel Fuel (All Types) **MSDS No. 9909**

16. OTHER INFORMATION

NFPA® HAZARD RATING HEALTH: 0
 FIRE: 2
 REACTIVITY: 0

Refer to NFPA 704 "Identification of the Fire Hazards of Materials" for further information

HMIS® HAZARD RATING HEALTH: 1 * * Chronic
 FIRE: 2
 PHYSICAL: 0

SUPERSEDES MSDS DATED: 02/28/2001

ABBREVIATIONS:

AP = Approximately < = Less than > = Greater than
N/A = Not Applicable N/D = Not Determined ppm = parts per million

ACRONYMS:

| | | | |
|--------|---|-------|--|
| ACGIH | American Conference of Governmental Industrial Hygienists | NTP | National Toxicology Program |
| AIHA | American Industrial Hygiene Association | OPA | Oil Pollution Act of 1990 |
| ANSI | American National Standards Institute (212) 642-4900 | OSHA | U.S. Occupational Safety & Health Administration |
| API | American Petroleum Institute (202) 682-8000 | PEL | Permissible Exposure Limit (OSHA) |
| CERCLA | Comprehensive Emergency Response, Compensation, and Liability Act | RCRA | Resource Conservation and Recovery Act |
| DOT | U.S. Department of Transportation [General info: (800) 467-4922] | REL | Recommended Exposure Limit (NIOSH) |
| EPA | U.S. Environmental Protection Agency | SARA | Superfund Amendments and Reauthorization Act of 1986 Title III |
| HMIS | Hazardous Materials Information System | SCBA | Self-Contained Breathing Apparatus |
| IARC | International Agency For Research On Cancer | SPCC | Spill Prevention, Control, and Countermeasures |
| MSHA | Mine Safety and Health Administration | STEL | Short-Term Exposure Limit (generally 15 minutes) |
| NFPA | National Fire Protection Association (617)770-3000 | TLV | Threshold Limit Value (ACGIH) |
| NIOSH | National Institute of Occupational Safety and Health | TSCA | Toxic Substances Control Act |
| NOIC | Notice of Intended Change (proposed change to ACGIH TLV) | TWA | Time Weighted Average (8 hr.) |
| | | WEEL | Workplace Environmental Exposure Level (AIHA) |
| | | WHMIS | Canadian Workplace Hazardous Materials Information System |

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

MATERIAL SAFETY DATA SHEET

Review Date: 04/23/2007

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT: PENNZOIL™ LONG-LIFE™ Motor Oil (All Grades)

MSDS NUMBER: 614348LU - 1

PRODUCT CODE(S): 5071324, 5071325, 5071326, 5071369, 5071371

MANUFACTURER

SOPUS Products

P.O. Box 4427

Houston, TX. 77210-4427

TELEPHONE NUMBERS

Spill Information: (877) 242-7400

Health Information: (877) 504-9351

MSDS Assistance Number: (877) 276-7285

SECTION 2 PRODUCT/INGREDIENTS

| INGREDIENTS | CAS# | CONCENTRATION |
|-------------------------------|------------|-----------------|
| Heavy Duty Motor Oil | | |
| Highly refined petroleum oils | Mixture | 90 - 99 %volume |
| Zinc Dialkyldithiophosphate | 68649-42-3 | 1 - 5 %volume |
| Proprietary additives | Mixture | 1 - 5 %volume |

SECTION 3 HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Appearance & Odor: Bright and clear liquid. Mild odor.

Health Hazards: No known immediate health hazards.

Physical Hazards: No known physical hazards.

NFPA Rating (Health, Fire, Reactivity): 0, 1, 0

Hazard Rating: Least - 0 Slight - 1 Moderate - 2 High - 3 Extreme - 4

Inhalation:

Inhalation of vapors (generated at high temperatures only) or oil mist may cause mild irritation of the nose, throat, and respiratory tract.

Eye Irritation:

Lubricating oils are generally considered no more than minimally irritating to the eyes.

Skin Contact:

May cause slight irritation of the skin. If irritation occurs, a temporary burning sensation and minor redness and/or swelling may result.

Ingestion:

Lubricating oils are generally no more than slightly toxic if swallowed.

Other Health Effects:

The International Agency for Research on Cancer (IARC) has determined there is sufficient evidence for the carcinogenicity in experimental animals of used gasoline motor oils. Handling procedures and safety precautions in the MSDS should be followed to minimize exposure to the used product.

Signs and Symptoms:

Irritation as noted above.

Aggravated Medical Conditions:

Pre-existing eye, skin and respiratory disorders may be aggravated by exposure to this product.

For additional health information, refer to section 11.

SECTION 4 FIRST AID MEASURES

Inhalation:

Remove victim to fresh air and provide oxygen if breathing is difficult. Get medical attention. If the victim has difficulty breathing or tightness of the chest, is dizzy, vomiting or unresponsive, give 100% oxygen with rescue breathing or CPR as required and transport to the nearest medical facility.

Skin:

Remove contaminated clothing and shoes and wipe excess from skin. Flush skin with water, then wash with soap and water. If irritation occurs, get medical attention. Do not reuse clothing until cleaned. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.

Eye:

Flush with water. If irritation occurs, get medical attention.

Ingestion:

Do not induce vomiting. In general, no treatment is necessary unless large quantities of product are ingested. However, get medical attention.

Note to Physician:

In general, emesis induction is unnecessary in high viscosity, low volatility products such as oils and greases.

SECTION 5 FIRE FIGHTING MEASURES

Flash Point [Method]: >400 °F / >204.44 °C [Pensky-Martens Closed Cup]

Extinguishing Media:

Material will float and can be re-ignited on surface of water. Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames. Do not use a direct stream of water.

Fire Fighting Instructions:

Do not enter confined fire space without full bunker gear (helmet with face shield, bunker coats, gloves and rubber boots), including a positive pressure, NIOSH approved, self-contained breathing apparatus. This material is non-flammable.

Unusual Fire Hazards:

Material may ignite when preheated.

SECTION 6**ACCIDENTAL RELEASE MEASURES****Protective Measures:**

May burn although not readily ignitable.

Wear appropriate personal protective equipment when cleaning up spills. Refer to Section 8.

Spill Management:

FOR LARGE SPILLS: Remove with vacuum truck or pump to storage/salvage vessels.

FOR SMALL SPILLS: Soak up residue with an absorbent such as clay, sand or other suitable material. Place in non-leaking container and seal tightly for proper disposal.

Place in container for proper disposal. Remove contaminated soil to remove contaminated trace residues. Dispose of in same manner as material.

Reporting:

CERCLA: Product is covered by EPA's Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) petroleum exclusion. Releases to air, land, or water are not reportable under CERCLA (Superfund).

CWA: This product is an oil as defined under Section 311 of EPA's Clean Water Act (CWA). Spills into or leading to surface waters that cause a sheen must be reported to the National Response Center, 1-800-424-8802.

SECTION 7**HANDLING AND STORAGE****Precautionary Measures:**

Wash with soap and water before eating, drinking, smoking, applying cosmetics, or using toilet. Launder contaminated clothing before reuse. Properly dispose of contaminated leather articles such as shoes or belts that cannot be decontaminated. Avoid heat, open flames, including pilot lights, and strong oxidizing agents. Use explosion-proof ventilation to prevent vapor accumulation. Ground all handling equipment to prevent sparking.

Storage:

Do not store in open or unlabeled containers. Store in a cool, dry place with adequate ventilation. Keep away from open flames and high temperatures.

Container Warnings:

Keep containers closed when not in use. Containers, even those that have been emptied, can contain explosive vapors. Do not cut, drill, grind, weld or perform similar operations on or near containers.

SECTION 8**EXPOSURE CONTROLS/PERSONAL PROTECTION**

| Chemical | Limit | TWA | STEL | Ceiling | Notation |
|-------------------|-----------|---------------------|----------------------|---------|----------|
| Oil mist, mineral | ACGIH TLV | 5 mg/m ³ | 10 mg/m ³ | | |
| Oil mist, mineral | OSHA PEL | 5 mg/m ³ | | | |

Exposure Controls

Provide adequate ventilation to control airborne concentrations below the exposure guidelines/limits.

Personal Protection

Personal protective equipment (PPE) selections vary based on potential exposure conditions such as handling practices, concentration and ventilation. Information on the selection of eye, skin and respiratory protection for use with this material is provided below.

Eye Protection:

Chemical Goggles, or Safety glasses with side shields

Skin Protection:

Use protective clothing which is chemically resistant to this material. Selection of protective clothing depends on potential exposure conditions and may include gloves, boots, suits and other items. The selection(s) should take into account such factors as job task, type of exposure and durability requirements.

Published literature, test data and/or glove and clothing manufacturers indicate the best protection is provided by:
Neoprene, or Nitrile Rubber

Respiratory Protection:

If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, an approved respirator must be worn. Respirator selection, use and maintenance should be in accordance with the requirements of the OSHA Respiratory Protection Standard, 29 CFR 1910.134.

Types of respirator(s) to be considered in the selection process include:

For Mist: Air Purifying, R or P style NIOSH approved respirator.

For Vapors: Air Purifying, R or P style prefilter & organic cartridge, NIOSH approved respirator. Self-contained breathing apparatus for use in environments with unknown concentrations or emergency situations.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance & Odor: Bright and clear liquid. Mild odor.

Substance Chemical Family: Petroleum Hydrocarbon

| | | | |
|------------------------------|--|-------------------------|-----------------|
| Flash Point | > 400 °F [Pensky-Martens Closed Cup] | Pour Point | -20 °F |
| Solubility (in Water) | Insoluble | Specific Gravity | 0.88 - 0.89 |
| Stability | Stable | Viscosity | 103 cSt @ 40 °C |

SECTION 10 REACTIVITY AND STABILITY

Stability:

Material is stable under normal conditions.

Conditions to Avoid:

Avoid heat and open flames.

Materials to Avoid:

Avoid contact with strong oxidizing agents.

Hazardous Decomposition Products:

Thermal decomposition products are highly dependent on combustion conditions. A complex mixture of airborne solids, liquids and gases will evolve when this material undergoes pyrolysis or combustion. Aldehydes, Carbon Monoxide, Carbon Dioxide, Hydrogen Sulfide, Ketones, Nitrogen Oxides and other unidentified organic compounds may be formed upon combustion.

SECTION 11 TOXICOLOGICAL INFORMATION**Acute Toxicity**

| TEST | Result | OSHA Classification | Material Tested |
|-------------|-------------------|---------------------|------------------------|
| Dermal LD50 | >5.0 g/kg(Rabbit) | Non-Toxic | Based on components(s) |
| Oral LD50 | >5.0 g/kg(Rat) | Non-Toxic | Based on components(s) |

Carcinogenicity Classification

| Chemical Name | NTP | IARC | ACGIH | OSHA |
|----------------------|-----|----------------------|--------------|------|
| Heavy Duty Motor Oil | No | Not Reviewed by IARC | Not Reviewed | No |

SECTION 12 ECOLOGICAL INFORMATION**Environmental Impact Summary:**

There is no ecological data available for this product. However, this product is an oil. It is persistent and does not readily biodegrade. However, it does not bioaccumulate.

SECTION 13 DISPOSAL CONSIDERATIONS**RCRA Information:**

Under RCRA, it is the responsibility of the user of the material to determine, at the time of the disposal, whether the material meets RCRA criteria for hazardous waste. This is because material uses, transformations, mixtures, processes, etc. may affect the classification. Refer to the latest EPA, state and local regulations regarding proper disposal.

SECTION 14 TRANSPORT INFORMATION**US Department of Transportation Classification**

This material is not subject to DOT regulations under 49 CFR Parts 171-180.

Oil: This product is an oil under 49CFR (DOT) Part 130. If shipped by rail or highway in a tank with a capacity of 3500 gallons or more, it is subject to these requirements. Mixtures or solutions containing 10% or more of this product may also be subject to this rule.

International Air Transport Association

Not regulated under IATA rules.

International Maritime Organization Classification
Not regulated under International Maritime Organization rules.

SECTION 15 REGULATORY INFORMATION

Federal Regulatory Status

OSHA Classification:

Under normal conditions of use or in a foreseeable emergency, this product does not meet the definition of a hazardous chemical when evaluated according to the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Ozone Depleting Substances (40 CFR 82 Clean Air Act):

This material does not contain nor was it directly manufactured with any Class I or Class II ozone depleting substances.

Superfund Amendment & Reauthorization Act (SARA) Title III:

There are no components in this product on the SARA 302 list.

SARA Hazard Categories (311/312):

| Immediate Health | Delayed Health | Fire | Pressure | Reactivity |
|------------------|----------------|------|----------|------------|
| NO | NO | NO | NO | NO |

SARA Toxic Release Inventory (TRI) (313):

Zinc compounds

Toxic Substances Control Act (TSCA) Status:

All component(s) of this material is(are) listed on the EPA/TSCA Inventory of Chemical Substances.

Other Chemical Inventories:

Component(s) of this material is (are) listed on the Australian AICS, Canadian DSL, Chinese Inventory, European EINECS, Korean Inventory, Philippines PICCS,

State Regulation

The following chemicals are specifically listed by individual states; other product specific health and safety data in other sections of the MSDS may also be applicable for state requirements. For details on your regulatory requirements you should contact the appropriate agency in your state.

SECTION 16 OTHER INFORMATION

Revision#: 1

Review Date: 04/23/2007

Revision Date: 12/19/2006

Revisions since last change (discussion): This Material Safety Data Sheet (MSDS) has been reviewed to fully comply with the guidance contained in the ANSI MSDS standard (ANSI Z400.1-2003). We encourage you to take the opportunity to read the MSDS and review the information contained therein.

SECTION 17 LABEL INFORMATION

READ AND UNDERSTAND MATERIAL SAFETY DATA SHEET BEFORE HANDLING OR DISPOSING OF PRODUCT. THIS LABEL COMPLIES WITH THE REQUIREMENTS OF THE OSHA HAZARD COMMUNICATION STANDARD (29 CFR 1910.1200) FOR USE IN THE WORKPLACE. THIS LABEL IS NOT INTENDED TO BE USED WITH PACKAGING INTENDED FOR SALE TO CONSUMERS AND MAY NOT CONFORM WITH THE REQUIREMENTS OF THE CONSUMER PRODUCT SAFETY ACT OR OTHER RELATED REGULATORY REQUIREMENTS.

PRODUCT CODE(S): 5071324, 5071325, 5071326, 5071369, 5071371

PENNZOIL™ LONG-LIFE™ Motor Oil (All Grades)

ATTENTION!

PROLONGED OR REPEATED SKIN CONTACT MAY CAUSE OIL ACNE OR DERMATITIS. USED GASOLINE ENGINE OIL HAS BEEN SHOWN TO CAUSE CANCER IN LABORATORY ANIMALS.

Precautionary Measures:

Avoid prolonged or repeated contact with eyes, skin and clothing. Avoid breathing of vapors, fumes, or mist. Use only with adequate ventilation. Wash thoroughly after handling.

FIRST AID

Inhalation: If the victim has difficulty breathing or tightness of the chest, is dizzy, vomiting or unresponsive, give 100% oxygen with rescue breathing or CPR as required and transport to the nearest medical facility.

Skin Contact: Remove contaminated clothing and shoes and wipe excess from skin. Flush skin with water, then wash with soap and water. If irritation occurs, get medical attention. Do not reuse clothing until cleaned. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.

Eye Contact: Flush with water. If irritation occurs, get medical attention.

Ingestion: Do not induce vomiting. In general, no treatment is necessary unless large quantities of product are ingested. However, get medical attention.

FIRE

in case of fire, Use water fog, 'alcohol foam', dry chemical or carbon dioxide (CO2) to extinguish flames. Do not use a direct stream of water. Material will float and can be re-ignited on surface of water.

SPILL OR LEAK

Dike and contain spill.

FOR LARGE SPILLS: Remove with vacuum truck or pump to storage/salvage vessels.

FOR SMALL SPILLS: Soak up residue with an absorbent such as clay, sand or other suitable material. Place in non-leaking container and seal tightly for proper disposal.

CONTAINS: Highly refined petroleum oils, Mixture; Zinc Dialkyldithiophosphate, 68649-42-3; Proprietary additives; Mixture

NFPA Rating (Health, Fire, Reactivity): 0, 1, 0

TRANSPORTATION

US Department of Transportation Classification

This material is not subject to DOT regulations under 49 CFR Parts 171-180.

Oil: This product is an oil under 49CFR (DOT) Part 130. If shipped by rail or highway in a tank with a capacity of 3500 gallons or more, it is subject to these requirements: Mixtures or solutions containing 10% or more of this product may also be subject to this rule.

CAUTION: Misuse of empty containers can be hazardous. Empty containers can be hazardous if used to store toxic, flammable, or reactive materials. Cutting or welding of empty containers might cause fire, explosion or toxic fumes from residues. Do not pressurize or expose to open flames or heat. Keep container closed and drum bungs in place.

Name and Address

SOPUS Products
P.O. Box 4427
Houston, TX 77210-4427

ADMINISTRATIVE INFORMATION

MANUFACTURER ADDRESS: SOPUS Products, P.O. Box 4427, Houston, TX. 77210-4427.

THE INFORMATION CONTAINED IN THIS DATA SHEET IS BASED ON THE DATA AVAILABLE TO US AT THIS TIME, AND IS BELIEVED TO BE ACCURATE BASED UPON THAT : IT IS PROVIDED INDEPENDENTLY OF ANY SALE OF THE PRODUCT, FOR PURPOSE OF HAZARD COMMUNICATION. IT IS NOT INTENDED TO CONSTITUTE PRODUCT PERFORMANCE INFORMATION, AND NO EXPRESS OR IMPLIED WARRANTY OF ANY KIND IS MADE WITH RESPECT TO THE PRODUCT, UNDERLYING DATA OR THE INFORMATION CONTAINED HEREIN. YOU ARE URGED TO OBTAIN DATA SHEETS FOR ALL PRODUCTS YOU BUY, PROCESS, USE OR DISTRIBUTE, AND ARE ENCOURAGED TO ADVISE THOSE WHO MAY COME IN CONTACT WITH SUCH PRODUCTS OF THE INFORMATION CONTAINED HEREIN.

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44815-10737-100R-04/16/2007

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **CALCIUM CHLORIDE - POWDER**

Revision Date: 02-Jan-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: CALCIUM CHLORIDE - POWDER
Synonyms: None
Chemical Family: Inorganic Salt
Application: Accelerator

Manufacturer/Supplier Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By Chemical Compliance
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|------------------|------------|-----------|----------------|----------------|
| Calcium chloride | | 60 - 100% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory irritation. May be harmful if swallowed.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention. Remove contaminated clothing and launder before reuse.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

NFPA Ratings: Health 1, Flammability 0, Reactivity 0
HMIS Ratings: Flammability 0, Reactivity 0, Health 1

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.

Storage Information Store in a cool, dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Dust proof goggles.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|------------------------------------|----------------|
| Physical State: | Solid |
| Color: | White |
| Odor: | Odorless |
| pH: | 10 |
| Specific Gravity @ 20 C (Water=1): | 0.83 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 51 |
| Boiling Point/Range (F): | Not Determined |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | 42 |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | 147.02 |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|------------------|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | None known. |
| Hazardous Decomposition Products | None known. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause respiratory irritation. |
| Skin Contact | May cause skin irritation. May cause skin burns on prolonged contact. |
| Eye Contact | May cause severe eye irritation. May cause corneal injury. |
| Ingestion | Causes burns of the mouth, throat and stomach. |
| Aggravated Medical Conditions | Skin disorders. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | LD50: 1000 mg/kg (Rat) |
| Dermal Toxicity: | LD50: > 5000 mg/kg (Rabbit) |
| Inhalation Toxicity: | Not determined |
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Not determined |

Genotoxicity: Not determined

**Reproductive /
Developmental Toxicity:** Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined

Persistence/Degradability Not applicable

Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined

Acute Crustaceans Toxicity: Not determined

Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

15. REGULATORY INFORMATION

US Regulations

| | |
|--|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity For This Product | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | Does not apply. |
| PA Right-to-Know Law | Does not apply. |

Canadian Regulations

| | |
|-------------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2B Toxic Materials |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: DRILTREAT®

Revision Date: 09-Mar-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: DRILTREAT®
Synonyms: None
Chemical Family: Lipid
Application: Oil-wetting Agent

Manufacturer/Supplier: Baroid Drilling Fluids
a Product Service Line of Halliburton Energy Services, Inc.
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------------|------------|-----------|----------------|----------------|
| Contains no hazardous substances | Mixture | 60 - 100% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye irritation.

4. FIRST AID MEASURES

Inhalation: Under normal conditions, first aid procedures are not required.
Skin: Wash with soap and water.
Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Ingestion: Under normal conditions, first aid procedures are not required.
Notes to Physician: Not Applicable

5. FIRE FIGHTING MEASURES

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | 400 |
| Flash Point/Range (C): | 204 |
| Flash Point Method: | PMCC |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire-fighting personnel.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0
HMIS Ratings: Flammability 0, Reactivity 0, Health 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing.

Storage Information Store away from oxidizers.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally necessary.

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Physical State: | Liquid |
| Color: | Amber |
| Odor: | Bean |
| pH: | 6.4-7 |
| Specific Gravity @ 20 C (Water=1): | 1.03 |
| Density @ 20 C (lbs./gallon): | 8.58 |
| Bulk Density @ 20 C (lbs/ft ³): | Not Determined |
| Boiling Point/Range (F): | Not Determined |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | 32 |
| Freezing Point/Range (C): | 0 |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | 0 |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Disperses |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|-------------------------------------|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None known. |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | None known. |
| Skin Contact | None known. |
| Eye Contact | May cause mild eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Not determined |

Genotoxicity: Not determined
Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Biodegradable
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: TLM96: 497,500 ppm (Mysidopsis bahia) SPP @ 12 ppb
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|--|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity For This Product | Not applicable. |

| | |
|--|--|
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | Does not apply. |
| PA Right-to-Know Law | Does not apply. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **DURATONE® HT**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: DURATONE® HT
Synonyms: None
Chemical Family: Blend
Application: Fluid Loss Additive

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-------------------------------|------------|----------|-------------------------|---|
| Kaolin | 1332-58-7 | 10 - 30% | 2 mg/m ³ | Not applicable |
| Nonylphenol | 25154-52-3 | 5 - 10% | Not applicable | Not applicable |
| Sodium hydroxide | 1310-73-2 | 1 - 5% | 2 mg/m ³ | 2 mg/m ³ |
| Quaternary ammonium compounds | | 10 - 30% | Not applicable | Not applicable |
| Crystalline silica, quartz | 14808-60-7 | 1 - 5% | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD
May cause eye, skin, and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|--|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists. |
| Ingestion | Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|---|--|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | 608 |
| Autoignition Temperature (C): | 320 |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |
| Fire Extinguishing Media | Water fog, carbon dioxide, foam, dry chemical. |
| Special Exposure Hazards | Decomposition in fire may produce toxic gases. |
| Special Protective Equipment for Fire-Fighters | Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel. |
| NFPA Ratings: | Health 2, Flammability 0, Reactivity 0 |
| HMIS Ratings: | Flammability 0, Reactivity 0, Health 2* |

6. ACCIDENTAL RELEASE MEASURES

| | |
|---|--|
| Personal Precautionary Measures | Use appropriate protective equipment. Avoid creating and breathing dust. |
| Environmental Precautionary Measures | Prevent from entering sewers, waterways, or low areas. |

Procedure for Cleaning / Absorption

Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information Store in a dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 12 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2.

Respiratory Protection Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product.

Hand Protection Normal work gloves.

Skin Protection Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|-----------------------------|
| Physical State: | Solid |
| Color: | Gray to black |
| Odor: | Odorless |
| pH: | Not Determined |
| Specific Gravity @ 20 C (Water=1): | 1.8 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 31 uncompactd; 44 compacted |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | < -1 (OECD117) |

9. PHYSICAL AND CHEMICAL PROPERTIES

Molecular Weight (g/mole): Not Determined

10. STABILITY AND REACTIVITY

Stability Data: Stable

Hazardous Polymerization: Will Not Occur

Conditions to Avoid None anticipated

Incompatibility (Materials to Avoid) Strong alkalis. Strong acids. Aldehydes. Ketones. Acrylates.

Hazardous Decomposition Products Oxides of nitrogen. Carbon monoxide and carbon dioxide. Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).

Additional Guidelines Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure Eye or skin contact, inhalation.

Inhalation Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).

Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).

Skin Contact May cause moderate skin irritation. May cause an allergic skin reaction.

Eye Contact May cause severe eye irritation.

Ingestion Irritation of the mouth, throat, and stomach.

Aggravated Medical Conditions Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust.

Chronic Effects/Carcinogenicity Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

Other Information For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997).

Toxicity Tests

| | |
|---|---|
| Oral Toxicity: | LD50: > 5000 mg/kg (Rat) |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |
| Primary irritation Effect: | Not determined |
| Carcinogenicity | Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997). |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Ames Test: Negative |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|------------------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | BOD(28 Day): 9% of COD |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|-------------------------------------|
| Acute Fish Toxicity: | TLM96: 30 ppm (Oncorhynchus mykiss) |
| Acute Crustaceans Toxicity: | EC50: 370 mg/l (Daphnia magna) |

Acute Algae Toxicity: Not determined
Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory All components listed on inventory.

EPA SARA Title III Extremely Hazardous Substances Not applicable

EPA SARA (311,312) Hazard Class Acute Health Hazard
Chronic Health Hazard

EPA SARA (313) Chemicals This product contains toxic chemical(s) listed below which is(are) subject to the reporting requirements of Section 313 of Title III of SARA and 40 CFR Part 372: Aluminum Oxide//1344-28-1

EPA CERCLA/Superfund Reportable Spill Quantity Not applicable.

| | |
|--|--|
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Crystalline silica |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **GELTONE® V**

Revision Date: 02-Jun-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: GELTONE® V
Synonyms: None
Chemical Family: Blend
Application: Viscosifier

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------------|------------|-----------|-------------------------|---|
| Crystalline silica, cristobalite | 14464-46-1 | 0 - 1% | 0.025 mg/m ³ | 1/2 x 10 mg/m ³ %SiO ₂ + 2 |
| Crystalline silica, tridymite | 15468-32-3 | 0 - 1% | 0.05 mg/m ³ | 1/2 x 10 mg/m ³ %SiO ₂ + 2 |
| Crystalline silica, quartz | 14808-60-7 | 2-6 | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |
| Isopropanol | 67-63-0 | 1 - 5% | 200 ppm | 400 ppm |
| Modified bentonite | | 60 - 100% | Not applicable | Not applicable |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD
May cause eye, skin, and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|---|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists. |
| Ingestion | Under normal conditions, first aid procedures are not required. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|--|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

NFPA Ratings: Health 1, Flammability 0, Reactivity 0
HMIS Ratings: Flammability 0, Reactivity 0, Health 1*

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

| | |
|-----------------------------|--|
| Handling Precautions | This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet. |
| Storage Information | Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 24 months. |

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2. |
| Respiratory Protection | Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. |
| Hand Protection | Normal work gloves. |
| Skin Protection | Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing. |
| Eye Protection | Wear safety glasses or goggles to protect against exposure. |
| Other Precautions | None known. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|--------------------------|
| Physical State: | Powder |
| Color: | Tan |
| Odor: | Mild |
| pH: | Not Determined |
| Specific Gravity @ 20 C (Water=1): | 1.6 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 35- 57 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Miscible in hydrocarbons |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Hydrofluoric acid. |
| Hazardous Decomposition Products | Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--------------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | May cause skin irritation. |
| Eye Contact | May cause eye irritation. |
| Ingestion | Irritation of the mouth, throat, and stomach. |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |

Chronic Effects/Carcinogenicity Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

Other Information

For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997).

Toxicity Tests

| | |
|---|---|
| Oral Toxicity: | LD50: > 5000 mg/kg (Rat) |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997). |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|----------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Not determined |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|----------------|
| Acute Fish Toxicity: | Not determined |
| Acute Crustaceans Toxicity: | Not determined |
| Acute Algae Toxicity: | Not determined |

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory All components listed on inventory.

EPA SARA Title III Extremely Hazardous Substances Not applicable

EPA SARA (311,312) Hazard Class Acute Health Hazard
Chronic Health Hazard

EPA SARA (313) Chemicals This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).

EPA CERCLA/Superfund Reportable Spill Quantity For This Product Not applicable.

EPA RCRA Hazardous Waste Classification If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.

California Proposition 65 The California Proposition 65 regulations apply to this product.

| | |
|-------------------------------|--|
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2A Very Toxic Materials Crystalline silica |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: LE SUPERMUL

Revision Date: 02-Jan-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: LE SUPERMUL

Synonyms: None

Chemical Family: Blend

Application: Emulsifier

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-----------------------------------|------------|---------|----------------|----------------|
| Diethylene glycol monobutyl ether | 112-34-5 | 1 - 5% | Not applicable | Not applicable |
| Ethylene glycol monobutyl ether | 111-76-2 | 1 - 5% | 20 ppm | 50 ppm |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye and skin irritation. May cause headache, dizziness, and other central nervous system effects. May be harmful if swallowed.

4. FIRST AID MEASURES

Inhalation: If inhaled, remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult give oxygen. Get medical attention.

Skin: In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention. Remove contaminated clothing and launder before reuse.

Eyes: In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion: Get medical attention! If vomiting occurs, keep head lower than hips to prevent aspiration.

Notes to Physician: Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|-----------------|
| Flash Point/Range (F): | > 200Min: > 200 |
| Flash Point/Range (C): | > 100Min: > 93 |
| Flash Point Method: | PMCC |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Use water spray to cool fire exposed surfaces. Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 2, Flammability 1, Reactivity 0
HMS Ratings: Flammability 1, Reactivity 0, Health 2

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Wash hands after use. Launder contaminated clothing before reuse.

Storage Information Store away from oxidizers. Keep container closed when not in use. Product has a shelf life of 36 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Respiratory Protection Organic vapor respirator.
In high concentrations, supplied air respirator or a self-contained breathing apparatus.

Hand Protection Impervious rubber gloves.

Skin Protection Rubber apron.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:

Liquid

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Color: | Amber |
| Odor: | Mild |
| pH: | 2.6 |
| Specific Gravity @ 20 C (Water=1): | 0.924 |
| Density @ 20 C (lbs./gallon): | 7.7 |
| Bulk Density @ 20 C (lbs/ft3): | Not Determined |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | 20 |
| Freezing Point/Range (C): | -6.6 |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | 280-300 |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|---|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None known. |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Oxides of nitrogen. Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness. |
| Skin Contact | May cause skin irritation. |
| Eye Contact | May cause eye irritation. |
| Ingestion | May cause abdominal pain, vomiting, nausea, and diarrhea. May cause headache, dizziness, nausea, vomiting, gastrointestinal irritation and central nervous system depression. |
| Aggravated Medical Conditions | Lung disorders. Skin disorders. |
| Chronic Effects/Carcinogenicity | Prolonged or repeated exposure may cause reproductive system damage. Repeated overexposure may cause liver and kidney effects. |

Other Information None known.

Toxicity Tests

Oral Toxicity: Not determined
Dermal Toxicity: Not determined
Inhalation Toxicity: Not determined
Primary Irritation Effect: Not determined
Carcinogenicity Not determined
Genotoxicity: Not determined
**Reproductive /
Developmental Toxicity:** Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Not determined

Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: Not determined
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity For This Product | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2B Toxic Materials |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BAROID® OIL ABSORBENT**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BAROID® OIL ABSORBENT
Synonyms: None
Chemical Family: Mineral
Application: Suspending Agent
Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------|------------|-----------|-------------------------|---|
| Magnesium silicate | 1343-90-4 | 60 - 100% | Not applicable | Not applicable |
| Crystalline silica, quartz | 14808-60-7 | 2-6 | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD
May cause eye and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|---|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists. |
| Ingestion | Under normal conditions, first aid procedures are not required. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|---|---|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |
| Fire Extinguishing Media | All standard firefighting media. |
| Special Exposure Hazards | Not applicable. |
| Special Protective Equipment for Fire-Fighters | Not applicable. |
| NFPA Ratings: | Health 1, Flammability 0, Reactivity 0 |
| HMIS Ratings: | Flammability 0, Reactivity 0, Health 1* |

6. ACCIDENTAL RELEASE MEASURES

| | |
|---|---|
| Personal Precautionary Measures | Use appropriate protective equipment. Avoid creating and breathing dust. |
| Environmental Precautionary Measures | None known. |
| Procedure for Cleaning / Absorption | Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal. |

7. HANDLING AND STORAGE

| | |
|-----------------------------|--|
| Handling Precautions | This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet. |
| Storage Information | Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 60 months. |

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2. |
| Respiratory Protection | Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. |
| Hand Protection | Normal work gloves. |
| Skin Protection | Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing. |
| Eye Protection | Wear safety glasses or goggles to protect against exposure. |
| Other Precautions | None known. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Physical State: | Granules |
| Color: | Gray to tan |
| Odor: | Odorless |
| pH: | Not Determined |
| Specific Gravity @ 20 C (Water=1): | 2.6 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 32-38 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Hydrofluoric acid. |
| Hazardous Decomposition Products | Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | None known. |
| Eye Contact | May cause eye irritation. |
| Ingestion | May be harmful if swallowed. |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |
| Chronic Effects/Carcinogenicity | <p>Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.</p> <p>Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).</p> <p>There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.</p> |
| Other Information | For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997). |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

| | |
|---|---|
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997). |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|----------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Not applicable |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|----------------|
| Acute Fish Toxicity: | Not determined |
| Acute Crustaceans Toxicity: | Not determined |
| Acute Algae Toxicity: | Not determined |

| | |
|----------------------------------|----------------|
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Bury in a licensed landfill according to federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard Chronic Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |
| Canadian Regulations | |
| Canadian DSL Inventory | Product contains one or more components not listed on inventory. |
| WHMIS Hazard Class | D2A Very Toxic Materials Crystalline silica |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **RHEMOD L**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: RHEMOD L
Synonyms: None
Chemical Family: Tall oil fatty acid
Application: Viscosifier

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-----------------------------------|------------|----------|----------------|----------------|
| Fatty acids, C18-unsatd., trimers | 68937-90-6 | 10 - 30% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye and skin irritation. May be harmful if swallowed.

4. FIRST AID MEASURES

Inhalation: If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin: Wash with soap and water. Get medical attention if irritation persists.

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion: Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician: Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | 518 |
| Flash Point/Range (C): | 270 |
| Flash Point Method: | COC |
| Autoignition Temperature (F): | > 425 |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 1, Reactivity 0
HMIS Ratings: Flammability 0, Reactivity 0, Health 1

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Wash hands after use.

Storage Information Store in a cool, dry location. Product has a shelf life of 36 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Organic vapor respirator.

Hand Protection Impervious rubber gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|-----------------|----------------|
| Physical State: | Liquid |
| Color: | Dark |
| Odor: | Fatty acid |
| pH: | Not Determined |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Specific Gravity @ 20 C (Water=1): | 0.96 |
| Density @ 20 C (lbs./gallon): | 8 |
| Bulk Density @ 20 C (lbs/ft3): | 57.30 |
| Boiling Point/Range (F): | > 572 |
| Boiling Point/Range (C): | > 300 |
| Freezing Point/Range (F): | < -4 |
| Freezing Point/Range (C): | < 25 |
| Vapor Pressure @ 20 C (mmHg): | < 0.001 |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | 0 |
| Evaporation Rate (Butyl Acetate=1): | 0 |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | 1849 @ 25C |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|-------------------------------------|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None known. |
| Incompatibility (Materials to Avoid) | None known. |
| Hazardous Decomposition Products | Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|---|
| Principle Route of Exposure | Eye and skin contact. |
| Inhalation | May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness. |
| Skin Contact | May cause skin irritation. |
| Eye Contact | May cause mild eye irritation. |
| Ingestion | Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal. |
| Aggravated Medical Conditions | Skin disorders. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |

Dermal Toxicity: Not determined
Inhalation Toxicity: Not determined
Primary Irritation Effect: Not determined
Carcinogenicity Not determined
Genotoxicity: Not determined
Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Not determined
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: Not determined
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | Does not apply. |

Canadian Regulations

| | |
|------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BAROID® RIG WASH**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BAROID® RIG WASH
Synonyms: None
Chemical Family: Blend
Application: Surfactant

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-------------|------------|---------|---------------|--------------|
| Isopropanol | 67-63-0 | 1 - 5% | 200 ppm | 400 ppm |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye, skin, and respiratory irritation.

4. FIRST AID MEASURES

Inhalation: If inhaled, remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult give oxygen. Get medical attention.

Skin: Wash with soap and water. Get medical attention if irritation persists. Remove contaminated clothing and launder before reuse.

Eyes: In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion: If swallowed dilute with 1-2 glasses of milk or water and then induce vomiting.

Notes to Physician: Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|------------------------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Min: > 220 Not Determined |
| Flash Point Method: | Min: > 104 COC |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 0, Reactivity 0

HMS Ratings: Flammability 0, Reactivity 0, Health 1

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid breathing vapors.

Storage Information Store away from oxidizers. Keep container closed when not in use. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Respiratory Protection Organic vapor respirator.

Hand Protection Impervious rubber gloves.

Skin Protection Rubber apron.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|-----------------|----------------|
| Physical State: | Liquid |
| Color: | Clear blue |
| Odor: | Slight Alcohol |
| pH: | 9.5 |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Specific Gravity @ 20 C (Water=1): | 1.025 |
| Density @ 20 C (lbs./gallon): | 8.5 |
| Bulk Density @ 20 C (lbs/ft3): | 63.6 |
| Boiling Point/Range (F): | > 212 |
| Boiling Point/Range (C): | > 100 |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Soluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|---|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None known. |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Oxides of sulfur. Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause respiratory irritation. May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness. |
| Skin Contact | May cause skin irritation. |
| Eye Contact | May cause eye irritation. |
| Ingestion | May cause headache, dizziness, nausea, vomiting, gastrointestinal irritation and central nervous system depression. |
| Aggravated Medical Conditions | Skin disorders. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |

Dermal Toxicity: Not determined
Inhalation Toxicity: Not determined
Primary Irritation Effect: Not determined
Carcinogenicity Not determined
Genotoxicity: Not determined
**Reproductive /
Developmental Toxicity:** Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Not determined
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: Not determined
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Disposal should be made in accordance with federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard |
| EPA SARA (313) Chemicals | This product contains toxic chemical(s) listed below which is(are) subject to the reporting requirements of Section 313 of Title III of SARA and 40 CFR Part 372: Glycol Ethers//34398-01-1 Isopropanol//67-63-0 |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2B Toxic Materials |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **FWCA CEMENT ADDITIVE**

Revision Date: 04-Jan-2010

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: FWCA CEMENT ADDITIVE
Synonyms: None
Chemical Family: Polysaccharide
Application: Free Water Control Additive
Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000
Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------|------------|-----------|----------------------|----------------------|
| Cellulose derivative | | 60 - 100% | 10 mg/m ³ | 15 mg/m ³ |

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye and respiratory irritation. Airborne dust may be explosive.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | 770 |
| Autoignition Temperature (C): | 410 |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0

HMS Ratings: Health 0, Flammability 0, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid creating or inhaling dust.

Storage Information Store away from oxidizers. Store in a cool, dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|-----------------|----------------|
| Physical State: | Solid |
| Color: | White |
| Odor: | Characteristic |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| pH: | 6.5 |
| Specific Gravity @ 20 C (Water=1): | 1.39 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft ³): | 32 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | <5 |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Forms gel |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | >600 |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Aldehydes. Carboxylic acids. Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause mild respiratory irritation. |
| Skin Contact | None known. |
| Eye Contact | May cause mild eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |

Inhalation Toxicity: Not determined
Primary Irritation Effect: Not determined
Carcinogenicity Not determined
Genotoxicity: Not determined
Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Readily biodegradable
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: Not determined
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory or are exempt. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | Does not apply. |
| PA Right-to-Know Law | Does not apply. |

Canadian Regulations

| | |
|------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **HALAD® 322 CEMENT ADDITIVE**

Revision Date: 04-Jan-2010

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: HALAD® 322 CEMENT ADDITIVE
Synonyms: None
Chemical Family: Blend
Application: Cement Additive
Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000
Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------|------------|----------|----------------------|----------------------|
| Sodium formate | 141-53-7 | 1 - 5% | Not applicable | Not applicable |
| Cellulose derivative | | 10 - 30% | 10 mg/m ³ | 15 mg/m ³ |

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory irritation. Airborne dust may be explosive.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0

HMS Ratings: Health 0, Flammability 0, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid creating or inhaling dust.

Storage Information Store in a cool, dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|-----------------|----------|
| Physical State: | Solid |
| Color: | Red |
| Odor: | Odorless |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|-------------------|
| pH: | Not Determined |
| Specific Gravity @ 20 C (Water=1): | 1.28 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft ³): | 35.2 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Partially soluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | >600 |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|---|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Oxides of sulfur. Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause mild respiratory irritation. |
| Skin Contact | None known. |
| Eye Contact | May cause eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |

Inhalation Toxicity: Not determined
Primary Irritation Effect: Not determined
Carcinogenicity Not determined
Genotoxicity: Not determined
**Reproductive /
Developmental Toxicity:** Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Readily biodegradable
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: Not determined
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory or are exempt. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |

Canadian Regulations

| | |
|------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **HALAD® 344 CEMENT ADDITIVE**

Revision Date: 04-Jan-2010

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: HALAD® 344 CEMENT ADDITIVE
Synonyms: None
Chemical Family: Polymer
Application: Fluid Loss Additive

Manufacturer/Supplier Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-------------------------------|------------|-----------|----------------|----------------|
| Modified acrylamide copolymer | | 60 - 100% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye and respiratory irritation.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes Immediately flush eyes with large amounts of water for at least 15 minutes. Get immediate medical attention.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water spray, dry chemical, or foam.

Special Exposure Hazards Decomposition in fire may produce toxic gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 0, Flammability 1, Reactivity 0
HMS Ratings: Health 1, Flammability 1, Physical Hazard 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid creating or inhaling dust. Do not swallow. Avoid contact with eyes, skin, or clothing.

Storage Information Store in a cool, dry location. Store away from oxidizers. Keep container closed when not in use.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Dust/mist respirator. (95%)

Hand Protection Nitrile gloves. Polyvinylchloride gloves. Neoprene gloves. Rubber gloves. Butyl rubber gloves. Cloth gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Powder

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|--------------------|
| Color: | White to off white |
| Odor: | Odorless |
| pH: | Not Determined |
| Specific Gravity @ 20 C (Water=1): | 1.37 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 25-35 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | 18 |
| Freezing Point/Range (C): | -8 |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | <5 |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Soluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | >600 |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|---|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | None known. |
| Hazardous Decomposition Products | Oxides of nitrogen. Carbon monoxide and carbon dioxide. Oxides of sulfur. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause respiratory irritation. |
| Skin Contact | Prolonged or repeated contact may cause skin irritation. |
| Eye Contact | May cause eye irritation. |
| Ingestion | No adverse health effects are expected from swallowing. |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |

| | |
|---|----------------|
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Not determined |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|------------------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | BOD(28 Day): 3% of COD |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|--|
| Acute Fish Toxicity: | TLM48: 2000 mg/l (Arcatia tonsa) |
| Acute Crustaceans Toxicity: | TLM48: > 1000 mg/l (Daphnia magna) |
| Acute Algae Toxicity: | EC50: 3300 mg/l (Skeletonema costatum) |

| | |
|----------------------------------|----------------|
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Bury in a licensed landfill according to federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG

Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION**US Regulations**

| | |
|--|--|
| US TSCA Inventory | All components listed on inventory or are exempt. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |

Canadian Regulations

| | |
|-------------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION**The following sections have been revised since the last issue of this MSDS**

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: HR-5

Revision Date: 04-Jan-2010

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: HR-5
Synonyms: None
Chemical Family: Lignosulfonate
Application: Cement Retarder

Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-------------------------|------------|-----------|----------------|----------------|
| Modified lignosulfonate | | 60 - 100% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye and respiratory irritation.

4. FIRST AID MEASURES

Inhalation: If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin: Wash with soap and water. Get medical attention if irritation persists.

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion: Under normal conditions, first aid procedures are not required.

Notes to Physician: Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 0, Reactivity 0
HMS Ratings: Health 1, Flammability 0, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.

Storage Information Store in a cool, dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|------------------------------------|----------|
| Physical State: | Solid |
| Color: | Black |
| Odor: | Molasses |
| pH: | 9.5-10.3 |
| Specific Gravity @ 20 C (Water=1): | 1.32 |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 29.8 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | 25 |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|-------------------|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Oxides of sulfur. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause mild respiratory irritation. |
| Skin Contact | None known. |
| Eye Contact | May cause mechanical irritation to eye. |
| Ingestion | None known |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

Primary Irritation Effect: Not determined
Carcinogenicity Not determined
Genotoxicity: Not determined
**Reproductive /
Developmental Toxicity:** Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Readily biodegradable
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: TLM96: > 1000 ppm (Crangon crangon)
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory or are exempt. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | Does not apply. |
| PA Right-to-Know Law | Does not apply. |

Canadian Regulations

| | |
|------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **HR-601**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: HR-601
Synonyms: None
Chemical Family: Lignosulfonate
Application: Cement Retarder

Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-------------------------|------------|-----------|----------------|----------------|
| Modified lignosulfonate | | 60 - 100% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye and respiratory irritation.

4. FIRST AID MEASURES

Inhalation: If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin: Wash with soap and water. Get medical attention if irritation persists.

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion: Under normal conditions, first aid procedures are not required.

Notes to Physician: Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Lower (oz./ft3): | 0.2 |
| Flammability Limits in Air - Upper (%): | Not Determined |
| Flammability Limits in Air - Upper (oz./ft3): | 3.5 |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Decomposition in fire may produce toxic gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 1, Reactivity 0
HMIS Ratings: Health 1, Flammability 1, Physical Hazard 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.

Storage Information Store away from oxidizers. Store in a cool, dry location. Product has a shelf life of 24 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Physical State: | Solid |
| Color: | Brown |
| Odor: | Woody |
| pH: | 7.8 |
| Specific Gravity @ 20 C (Water=1): | 1.08 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 30.5 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Soluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|---|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | Oxides of sulfur. Carbon monoxide and carbon dioxide. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause mild respiratory irritation. |
| Skin Contact | None known. |
| Eye Contact | May cause mechanical irritation to eye. |
| Ingestion | None known |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |

Oral Toxicity: LD50: > 5000 mg/kg (Rat)
Dermal Toxicity: Not determined
Inhalation Toxicity: Not determined
Primary Irritation Effect: Not determined
Carcinogenicity Not determined
Genotoxicity: Not determined
**Reproductive /
Developmental Toxicity:** Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Readily biodegradable
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: TLM48: > 1000 mg/l (Daphnia magna)

Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|--|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | Does not apply. |
| PA Right-to-Know Law | Does not apply. |

Canadian Regulations

| | |
|-------------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **KCL POTASSIUM CHLORIDE**

Revision Date: 04-Jan-2010

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: KCL POTASSIUM CHLORIDE
Synonyms: None
Chemical Family: Inorganic Salt
Application: Additive
Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000
Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|--------------------|------------|-----------|----------------|----------------|
| Potassium chloride | 7447-40-7 | 60 - 100% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview May cause eye, skin, and respiratory irritation.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 1, Flammability 0, Reactivity 0

HMS Ratings: Health 1, Flammability 0, Reactivity 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Avoid breathing vapors.

Storage Information Store in a cool, dry location. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Dust proof goggles.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Physical State: | Solid |
| Color: | White to gray |
| Odor: | Odorless |
| pH: | 9.2 |
| Specific Gravity @ 20 C (Water=1): | 1.99 |
| Density @ 20 C (lbs./gallon): | Not Determined |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Bulk Density @ 20 C (lbs/ft ³): | 72.8 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | 25.5 |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | 74.55 |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|------------------|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | None known. |
| Hazardous Decomposition Products | None known. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause respiratory irritation. |
| Skin Contact | May cause moderate skin irritation. |
| Eye Contact | May cause severe eye irritation. |
| Ingestion | Irritation of the mouth, throat, and stomach. May cause abdominal pain, vomiting, nausea, and diarrhea. |
| Aggravated Medical Conditions | Skin disorders. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | LD50: > 5000 mg/kg (Rat) |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

Primary Irritation Effect: Not determined
Carcinogenicity Not determined
Genotoxicity: Not determined
Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined

Persistence/Degradability Not determined

Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: TLM96: 100-330 ppm (Crangon crangon)

Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined

Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory or are exempt. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | Does not apply. |
| PA Right-to-Know Law | Does not apply. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2B Toxic Materials |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **POZ STANDARD CEMENT 50/50**

Revision Date: 05-Jan-2009

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: POZ STANDARD CEMENT 50/50
Synonyms: None
Chemical Family: Cement
Application: Cement

Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------|------------|----------|-------------------------|---|
| Fly ash | 68131-74-8 | 30 - 60% | Not applicable | Not applicable |
| Bentonite | 1302-78-9 | 1 - 5% | Not applicable | Not applicable |
| Portland cement | 65997-15-1 | 30 - 60% | 10 mg/m ³ | 15 mg/m ³ |
| Crystalline silica, quartz | 14808-60-7 | 1 - 5% | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD
May cause eye, skin, and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|---|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing. |
| Ingestion | Under normal conditions, first aid procedures are not required. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|---|---|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |
| Fire Extinguishing Media | None - does not burn. |
| Special Exposure Hazards | Not applicable. |
| Special Protective Equipment for Fire-Fighters | Not applicable. |
| NFPA Ratings: | Health 1, Flammability 0, Reactivity 0 |
| HMS Ratings: | Health 1*, Flammability 0, Reactivity 0 |

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Product has a shelf life of 24 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2. |
| Respiratory Protection | Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. |
| Hand Protection | Normal work gloves. |
| Skin Protection | Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing. |
| Eye Protection | Wear safety glasses or goggles to protect against exposure. |
| Other Precautions | Eyewash fountains and safety showers must be easily accessible. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Physical State: | Solid |
| Color: | Gray |
| Odor: | Odorless |
| pH: | 12.4 |
| Specific Gravity @ 20 C (Water=1): | Not Determined |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | Not Determined |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Not Determined |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Hydrofluoric acid. |
| Hazardous Decomposition Products | Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | Can dry skin. May cause an allergic skin reaction. May cause alkali burns with confined contact. |
| Eye Contact | May cause severe eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |
| Chronic Effects/Carcinogenicity | <p>Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.</p> <p>Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, <i>Silica, Some Silicates and Organic Fibres</i> (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).</p> <p>There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.</p> |
| Other Information | For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997). |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

| | |
|---|---|
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997). |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|----------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Not applicable |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|----------------|
| Acute Fish Toxicity: | Not determined |
| Acute Crustaceans Toxicity: | Not determined |
| Acute Algae Toxicity: | Not determined |

| | |
|----------------------------------|----------------|
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Bury in a licensed landfill according to federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory or are exempt. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard Chronic Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |

Canadian Regulations

| | |
|------------------------|--|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | E Corrosive Material D2A Very Toxic Materials Crystalline silica |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **CEMENT - CLASS H - PREMIUM**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: CEMENT - CLASS H - PREMIUM
Synonyms: None
Chemical Family: Cement
Application: Cement

Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------|------------|-----------|-------------------------|---|
| Portland cement | 65997-15-1 | 60 - 100% | 10 mg/m ³ | 15 mg/m ³ |
| Crystalline silica, quartz | 14808-60-7 | <3 | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD
May cause eye, skin, and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|--------------------|---|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing. |
| Ingestion | Under normal conditions, first aid procedures are not required. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|--|---|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |
| Fire Extinguishing Media | None - does not burn. |
| Special Exposure Hazards | Not applicable. |
| Special Protective Equipment for Fire-Fighters | Not applicable. |
| NFPA Ratings: | Health 1, Flammability 0, Reactivity 0 |
| HMIS Ratings: | Flammability 0, Reactivity 0, Health 1* |

6. ACCIDENTAL RELEASE MEASURES

| | |
|--------------------------------------|---|
| Personal Precautionary Measures | Use appropriate protective equipment. Avoid creating and breathing dust. |
| Environmental Precautionary Measures | None known. |
| Procedure for Cleaning / Absorption | Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal. |

7. HANDLING AND STORAGE

| | |
|----------------------|--|
| Handling Precautions | Avoid contact with eyes, skin, or clothing. This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet. |
| Storage Information | Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Product has a shelf life of 24 months. |

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2. |
| Respiratory Protection | Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. |
| Hand Protection | Normal work gloves. |
| Skin Protection | Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing. |
| Eye Protection | Wear safety glasses or goggles to protect against exposure. |
| Other Precautions | Eyewash fountains and safety showers must be easily accessible. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Physical State: | Solid |
| Color: | Gray |
| Odor: | Odorless |
| pH: | 12.4 |
| Specific Gravity @ 20 C (Water=1): | 3.15 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 94 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | 0 |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | 0.5 |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | Keep away from any contact with water. |
| Incompatibility (Materials to Avoid) | Hydrofluoric acid. |
| Hazardous Decomposition Products | Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | Can dry skin. May cause an allergic skin reaction. May cause alkali burns with confined contact. |
| Eye Contact | May cause severe eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |
| Chronic Effects/Carcinogenicity | <p>Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.</p> <p>Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).</p> <p>There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.</p> |
| Other Information | For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997). |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

Primary Irritation Effect: Not determined
Carcinogenicity Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997).
Genotoxicity: Not determined
Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Not applicable
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: Not determined
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard Chronic Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |

Canadian Regulations

| | |
|------------------------|--|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | E Corrosive Material D2A Very Toxic Materials Crystalline silica |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BARACARB® 25**

Revision Date: 02-Jan-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BARACARB® 25
Synonyms: None
Chemical Family: Mineral
Application: Bridging Agent

Manufacturer/Supplier: Baroid Drilling Fluids
a Product Service Line of Halliburton Energy Services, Inc.
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------|------------|-----------|-------------------------|---|
| Crystalline silica, quartz | 14808-60-7 | 0 - 1% | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |
| Limestone | 1317-65-3 | 60 - 100% | 10 mg/m ³ | 15 mg/m ³ |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD
May cause eye, skin, and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|---|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists. |
| Ingestion | Under normal conditions, first aid procedures are not required. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|---|---|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |
| Fire Extinguishing Media | All standard firefighting media. |
| Special Exposure Hazards | Not applicable. |
| Special Protective Equipment for Fire-Fighters | Not applicable. |
| NFPA Ratings: | Health 0, Flammability 0, Reactivity 0 |
| HMIS Ratings: | Flammability 0, Reactivity 0, Health 1* |

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information Store away from acids. Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use in a well ventilated area. Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2. |
| Respiratory Protection | Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. |
| Hand Protection | Normal work gloves. |
| Skin Protection | Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing. |
| Eye Protection | Wear safety glasses or goggles to protect against exposure. |
| Other Precautions | None known. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Physical State: | Solid Powder |
| Color: | White |
| Odor: | Odorless |
| pH: | 8-9 |
| Specific Gravity @ 20 C (Water=1): | 2.7 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 168 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong acids. |
| Hazardous Decomposition Products | Carbon monoxide and carbon dioxide. Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | May cause skin irritation. |
| Eye Contact | May cause eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |
| Chronic Effects/Carcinogenicity | <p>Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.</p> <p>Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).</p> <p>There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.</p> |
| Other Information | For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997). |
| Toxicity Tests | |
| Oral Toxicity: | LD50: > 5000 mg/kg (Rat) |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

Primary Irritation Effect: Not determined
Carcinogenicity Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997).
Genotoxicity: Not determined
Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Not determined
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: TLM96: >1,000,000 ppm (Mysidopsis bahia) SPP @ 178.5 ppb
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard Chronic Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity For This Product | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |

Canadian Regulations

| | |
|------------------------|--|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2A Very Toxic Materials Crystalline silica |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BARACARB® 50**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BARACARB® 50
Synonyms: None
Chemical Family: Mineral
Application: Bridging Agent

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------|------------|-----------|-------------------------|---|
| Limestone | 1317-65-3 | 60 - 100% | 10 mg/m ³ | 15 mg/m ³ |
| Crystalline silica, quartz | 14808-60-7 | 0 - 1% | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD
May cause eye, skin, and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|---|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists. |
| Ingestion | Under normal conditions, first aid procedures are not required. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|--|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0
HMS Ratings: Flammability 0, Reactivity 0, Health 1*

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information Store away from acids. Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use in a well ventilated area. Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2. |
| Respiratory Protection | Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. |
| Hand Protection | Normal work gloves. |
| Skin Protection | Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing. |
| Eye Protection | Wear safety glasses or goggles to protect against exposure. |
| Other Precautions | None known. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Physical State: | Solid Powder |
| Color: | White |
| Odor: | Odorless |
| pH: | 8-9 |
| Specific Gravity @ 20 C (Water=1): | 2.7 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 72-112 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong acids. |
| Hazardous Decomposition Products | Carbon monoxide and carbon dioxide. Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | May cause skin irritation. |
| Eye Contact | May cause eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |
| Chronic Effects/Carcinogenicity | <p>Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.</p> <p>Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).</p> <p>There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.</p> |
| Other Information | For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997). |
| Toxicity Tests | |
| Oral Toxicity: | LD50: > 5000 mg/kg (Rat) |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

| | |
|---|---|
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997). |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|----------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Not determined |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|--|
| Acute Fish Toxicity: | Not determined |
| Acute Crustaceans Toxicity: | TLM96: >1,000,000 ppm (Mysidopsis bahia) SPP @ 178.5 ppb |
| Acute Algae Toxicity: | Not determined |

| | |
|----------------------------------|----------------|
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Bury in a licensed landfill according to federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard Chronic Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2A Very Toxic Materials Crystalline silica |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BAROID®**

Revision Date: 03-Jan-2008

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BAROID®
Synonyms: None
Chemical Family: Mineral
Application: Weight Additive

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|----------------------------|------------|-----------|-------------------------|---|
| Barium sulfate | 7727-43-7 | 60 - 100% | 10 mg/m ³ | 15 mg/m ³ |
| Crystalline silica, quartz | 14808-60-7 | 1 - 5% | 0.025 mg/m ³ | 10 mg/m ³ %SiO ₂ + 2 |

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD

May cause eye, skin, and respiratory irritation. May be harmful if swallowed.

DANGER! - CHRONIC HEALTH HAZARD

Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

| | |
|---------------------------|--|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Eyes | In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists. |
| Ingestion | Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person. |
| Notes to Physician | Not Applicable |

5. FIRE FIGHTING MEASURES

| | |
|--|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

NFPA Ratings: Health 1, Flammability 0, Reactivity 0
HMIS Ratings: Flammability 0, Reactivity 0, Health 1*

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 60 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| | |
|-------------------------------|--|
| Engineering Controls | Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2. |
| Respiratory Protection | Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. |
| Hand Protection | Normal work gloves. |
| Skin Protection | Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing. |
| Eye Protection | Wear safety glasses or goggles to protect against exposure. |
| Other Precautions | None known. |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|---------------------|
| Physical State: | Solid |
| Color: | Pink to tan to gray |
| Odor: | Odorless |
| pH: | 8-9- |
| Specific Gravity @ 20 C (Water=1): | 4.2 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 100- 155 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistrokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | 233.4 |

10. STABILITY AND REACTIVITY

| | |
|---|--|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | None known. |
| Hazardous Decomposition Products | Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C). |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|--|---|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | <p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p> |
| Skin Contact | None known. |
| Eye Contact | May cause mild eye irritation. |
| Ingestion | May produce nervous system effects such as feeling of weakness, unsteady walk, and dilation of blood vessels. May affect the heart and cardiovascular system. |
| Aggravated Medical Conditions | Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust. |
| Chronic Effects/Carcinogenicity | <p>Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.</p> <p>Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).</p> <p>There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.</p> |
| Other Information | For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997). |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |

| | |
|---|--|
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997)</u> . |
| Genotoxicity: | Not determined |
| Reproductive / Developmental Toxicity: | Not determined |

12. ECOLOGICAL INFORMATION

| | |
|----------------------------------|----------------|
| Mobility (Water/Soil/Air) | Not determined |
| Persistence/Degradability | Not applicable |
| Bio-accumulation | Not Determined |

Ecotoxicological Information

| | |
|------------------------------------|---|
| Acute Fish Toxicity: | TLM96: 7500 ppm (Oncorhynchus mykiss) |
| Acute Crustaceans Toxicity: | TLM96: > 1,000,000 ppm (Mysidopsis bahia) SPP @ 132.6 ppb |
| Acute Algae Toxicity: | Not determined |

| | |
|----------------------------------|----------------|
| Chemical Fate Information | Not determined |
| Other Information | Not applicable |

13. DISPOSAL CONSIDERATIONS

| | |
|-------------------------------|---|
| Disposal Method | Bury in a licensed landfill according to federal, state, and local regulations. |
| Contaminated Packaging | Follow all applicable national or local regulations. |

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard Chronic Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | The California Proposition 65 regulations apply to this product. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2A Very Toxic Materials Crystalline silica |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **LIME**

Revision Date: 02-Jan-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: LIME
Synonyms: None
Chemical Family: Inorganic
Application: pH Control

Manufacturer/Supplier: Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|-------------------|------------|-----------|---------------------|----------------------|
| Calcium hydroxide | 1305-62-0 | 60 - 100% | 5 mg/m ³ | 15 mg/m ³ |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye and skin burns. May cause respiratory irritation. May be harmful if swallowed.

4. FIRST AID MEASURES

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin Wash with soap and water. Get medical attention if irritation persists. Remove contaminated clothing and launder before reuse.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Ingestion Do not induce vomiting. Slowly dilute with 1-2 glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician Not Applicable

5. FIRE FIGHTING MEASURES

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not Determined

NFPA Ratings: Health 1, Flammability 0, Reactivity 0

HMS Ratings: Flammability 0, Reactivity 0, Health 1

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust.

Storage Information Store away from acids. Store in a cool, dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Dust/mist respirator. (95%)

Hand Protection Impervious rubber gloves.

Skin Protection Rubber apron.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| Physical State: | Solid |
| Color: | White |
| Odor: | Odorless |
| pH: | 12.2 |
| Specific Gravity @ 20 C (Water=1): | 2.24 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft3): | 75 |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|--|----------------|
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | 0.2 |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | 74.1 |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|------------------|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None anticipated |
| Incompatibility (Materials to Avoid) | Strong acids. |
| Hazardous Decomposition Products | None known. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause respiratory irritation. |
| Skin Contact | Causes severe skin irritation. May cause skin burns on prolonged contact. |
| Eye Contact | Causes severe eye irritation May cause eye burns. |
| Ingestion | Irritation of the mouth, throat, and stomach. |
| Aggravated Medical Conditions | Skin disorders. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | LD50: 7340 mg/kg (Rat) |
| Dermal Toxicity: | Not determined |
| Inhalation Toxicity: | Not determined |
| Primary Irritation Effect: | Not determined |
| Carcinogenicity | Not determined |

Genotoxicity: Not determined
**Reproductive /
Developmental Toxicity:** Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Not determined
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: TLM96: 100-500 ppm (Oncorhynchus mykiss)
Acute Crustaceans Toxicity: TLM96: 478,520 ppm (Mysidopsis bahia) SPP @ 8 ppb
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Empty container completely. Transport with all closures in place. Return for reuse or dispose in a sanitary landfill according to national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

15. REGULATORY INFORMATION

US Regulations

| | |
|--|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | Acute Health Hazard |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity For This Product | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | One or more components listed. |
| NJ Right-to-Know Law | One or more components listed. |
| PA Right-to-Know Law | One or more components listed. |
| Canadian Regulations | |
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | D2B Toxic Materials |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **WALNUT HULLS**

Revision Date: 02-Jan-2007

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: WALNUT HULLS
Synonyms: None
Chemical Family: Nut Hulls
Application: Loss Circulation Material

Manufacturer/Supplier: Halliburton Energy Services
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By: Chemical Compliance
Telephone: 1-580-251-4335

2. COMPOSITION/INFORMATION ON INGREDIENTS

| SUBSTANCE | CAS Number | PERCENT | ACGIH TLV-TWA | OSHA PEL-TWA |
|--------------|------------|-----------|----------------|----------------|
| Walnut hulls | Mixture | 60 - 100% | Not applicable | Not applicable |

3. HAZARDS IDENTIFICATION

Hazard Overview: May cause eye irritation.

4. FIRST AID MEASURES

Inhalation: Under normal conditions, first aid procedures are not required.

Skin: Under normal conditions, first aid procedures are not required.

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion: Under normal conditions, first aid procedures are not required.

Notes to Physician: Not Applicable

5. FIRE FIGHTING MEASURES

| | |
|---|----------------|
| Flash Point/Range (F): | Not Determined |
| Flash Point/Range (C): | Not Determined |
| Flash Point Method: | Not Determined |
| Autoignition Temperature (F): | Not Determined |
| Autoignition Temperature (C): | Not Determined |
| Flammability Limits in Air - Lower (%): | Not Determined |
| Flammability Limits in Air - Lower (oz./ft3): | 0.07 |
| Flammability Limits in Air - Upper (%): | Not Determined |

Fire Extinguishing Media Water fog, carbon dioxide, foam, dry chemical.

Special Exposure Hazards Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special Protective Equipment for Fire-Fighters Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0
HMS Ratings: Flammability 0, Reactivity 0, Health 0

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment.

Environmental Precautionary Measures None known.

Procedure for Cleaning / Absorption Scoop up and remove.

7. HANDLING AND STORAGE

Handling Precautions Avoid creating or inhaling dust.

Storage Information Store away from oxidizers. Store in a dry location.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls Use in a well ventilated area.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (95%)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Safety glasses.

Other Precautions None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Solid
Color: Brown
Odor: Characteristic

9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|----------------|
| pH: | Not Determined |
| Specific Gravity @ 20 C (Water=1): | 1.1 |
| Density @ 20 C (lbs./gallon): | Not Determined |
| Bulk Density @ 20 C (lbs/ft ³): | Not Determined |
| Boiling Point/Range (F): | Not Determined |
| Boiling Point/Range (C): | Not Determined |
| Freezing Point/Range (F): | Not Determined |
| Freezing Point/Range (C): | Not Determined |
| Vapor Pressure @ 20 C (mmHg): | Not Determined |
| Vapor Density (Air=1): | Not Determined |
| Percent Volatiles: | Not Determined |
| Evaporation Rate (Butyl Acetate=1): | Not Determined |
| Solubility in Water (g/100ml): | Insoluble |
| Solubility in Solvents (g/100ml): | Not Determined |
| VOCs (lbs./gallon): | Not Determined |
| Viscosity, Dynamic @ 20 C (centipoise): | Not Determined |
| Viscosity, Kinematic @ 20 C (centistokes): | Not Determined |
| Partition Coefficient/n-Octanol/Water: | Not Determined |
| Molecular Weight (g/mole): | Not Determined |

10. STABILITY AND REACTIVITY

| | |
|--------------------------------------|-------------------|
| Stability Data: | Stable |
| Hazardous Polymerization: | Will Not Occur |
| Conditions to Avoid | None known. |
| Incompatibility (Materials to Avoid) | Strong oxidizers. |
| Hazardous Decomposition Products | None known. |
| Additional Guidelines | Not Applicable |

11. TOXICOLOGICAL INFORMATION

| | |
|---------------------------------|--|
| Principle Route of Exposure | Eye or skin contact, inhalation. |
| Inhalation | May cause mild respiratory irritation. |
| Skin Contact | None known. |
| Eye Contact | May cause mild eye irritation. |
| Ingestion | None known |
| Aggravated Medical Conditions | None known. |
| Chronic Effects/Carcinogenicity | No data available to indicate product or components present at greater than 1% are chronic health hazards. |
| Other Information | None known. |
| Toxicity Tests | |
| Oral Toxicity: | Not determined |
| Dermal Toxicity: | Not determined |

Inhalation Toxicity: Not determined
Primary Irritation Effect: Not determined
Carcinogenicity Not determined
Genotoxicity: Not determined
Reproductive / Developmental Toxicity: Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air) Not determined
Persistence/Degradability Biodegradable
Bio-accumulation Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: TLM96: > 1,000,000 ppm (Mysidopsis bahia) SPP @ 10 ppb
Acute Algae Toxicity: Not determined

Chemical Fate Information Not determined
Other Information Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR Not restricted

Air Transportation

ICAO/IATA Not restricted

Sea Transportation

IMDG Not restricted

Other Shipping Information

Labels: None

15. REGULATORY INFORMATION

US Regulations

| | |
|---|--|
| US TSCA Inventory | All components listed on inventory. |
| EPA SARA Title III Extremely Hazardous Substances | Not applicable |
| EPA SARA (311,312) Hazard Class | None |
| EPA SARA (313) Chemicals | This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372). |
| EPA CERCLA/Superfund Reportable Spill Quantity For This Product | Not applicable. |
| EPA RCRA Hazardous Waste Classification | If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA. |
| California Proposition 65 | All components listed do not apply to the California Proposition 65 Regulation. |
| MA Right-to-Know Law | Does not apply. |
| NJ Right-to-Know Law | Does not apply. |
| PA Right-to-Know Law | Does not apply. |

Canadian Regulations

| | |
|------------------------|-------------------------------------|
| Canadian DSL Inventory | All components listed on inventory. |
| WHMIS Hazard Class | Un-Controlled |

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

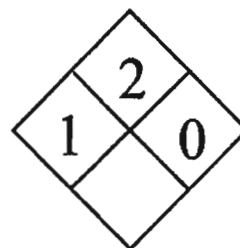
Additional Information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS



MATERIAL SAFETY DATA SHEET

SECTION I - MANUFACTURER

Integrity Industries, Inc.
2710 E. Corral St.
Kingsville, Texas 78363
Emergency Phone: (361) 595-5561

Revised Date: 06/05/2008
Supercedes: new

THIS DOCUMENT IS PREPARED PURSUANT TO THE OSHA HAZARDOUS COMMUNICATION STANDARD (29 CFR 1910.1200). ALSO, OTHER SUBSTANCE NOT DEEMED "HAZARDOUS" PER THIS MSDS MAY BE LISTED.

SECTION II - MATERIAL IDENTIFICATION

Trade Name: **SYNVERT Base Oil**
Synonyms/Other Designations: Synthetic Drilling Fluid / Polymer Suspension Base
Placard: Not Applicable
Hazard(s): non-hazardous

| <u>Component</u> | <u>CAS Number</u> | <u>Weight</u> |
|-----------------------|-------------------|---------------|
| Paraffin/Olefin blend | Mixture | 100% |

SECTION III - PHYSICAL & CHEMICAL DATA

Boiling Point: IBP > 300 °F
Specific Gravity (H2O=1): 0.766
Vapor Density (Air=1): n/a
Appearance: Clear, oily liquid

Pour Point: ND
Vapor Pressure (mm Hg @ 68 °F): 0.135
Solubility in H2O: Insoluble
Viscosity (cSt @104 °F): 1.4

SECTION IV - REACTIVITY

Stability: Stable
Incompatibility: Heat, sparks, open flame. May react with strong acids/strong oxidizing agents, chlorates, nitrates, peroxides.
Hazardous Decomposition Products: Oxides of carbon. Hazardous Polymerizations: will not occur

SECTION V - FIRE & EXPLOSION DATA

Flash Point (ASTM D-93): > 200 °F
Autoignition: n/a
Extinguishing Media: Water spray, Dry Chemical, Foam, CO2
Special Fire Fighting Procedures: Respirators/eye protection and full firefighting protective gear.
Unusual Fire Hazards: Remove containers from source of heat.

SECTION VI - EMERGENCY & FIRST AID DATA

Inhalation: Move to well ventilated area; if breathing difficulties persist after 15 minutes seek medical assistance.

Eye Contact: Wash eye thoroughly for 15 minutes; if irritation persists seek medical assistance.

Skin Contact: Wash affected area with soap & water for 15 minutes; if irritation persists seek medical assistance.

Ingestion: Do not induce vomiting and seek medical advice.

SECTION VII - HEALTH HAZARDS DATA

Acute: May irritate eyes, skin, respiratory, & gastrointestinal tract. **Chronic:** Repeated/prolonged skin contact may irritate/redden skin, progressing to dermatitis.

SECTION VIII - SPILL & DISPOSAL DATA

Accidental Spill Procedures: Absorb in inert material and dispose of according to local, state & federal regulations. Spill into water should be contained to avoid runoff into waterways.

Handling & Storage: Keep container closed and store in cool dry place. Emptied container still contains material which may ignite with explosive violence if exposed to open flame.

SECTION IX - SPECIAL PROTECTION DATA

Respiratory Protection: Respirator in confined areas.

Ventilation: Desired **Exhaust:** Mechanical

Protective Gloves: Solvent/chemical resistant gloves

Eye Protection: Safety glasses, goggles.

Other Protection: As required to avoid skin contact.

SECTION X - TRANSPORT INFORMATION

The following may not apply to all shipping situations. Consult 49 CFR for more mode-specific or quantity-specific data.

DOT Proper Shipping Name: Not regulated

DOT Hazard Class or Division: Not regulated

DOT Identification Number: N/A

DOT Packaging Group: III

Type Label(s) Required: none

Placard: Not applicable

***For Limited Quantity requirements see DOT regulation 49 CFR.**

SECTION XI - DISCLAIMERS

*** SOME INFORMATION PROVIDED HEREIN WAS DRAWN FROM SOURCES OTHER THAN INTEGRITY INDUSTRIES.**

THE INFORMATION PROVIDED HEREIN IS BELIEVED BY INTEGRITY INDUSTRIES, INC. TO BE CORRECT & RELIABLE; NO EXPRESSED OR IMPLIED WARRANTY IS PROVIDED HOWEVER.

*** INTEGRITY INDUSTRIES, INC. ASSUMES NO RESPONSIBILITY AND DENIES ALL LIABILITY FOR ANY LOSS, DAMAGE, OR EXPENSE CONNECTED WITH CUSTOMERS' METHOD OF HANDLING, STORAGE, USE, AND DISPOSAL OF THIS PRODUCT.**

*** THE MSDS INFORMATION PROVIDED HEREIN IS APPLICABLE ONLY TO THIS PRODUCT.**

Exhibit 7

Subject:

From: "Randis, Thomas" <trandis@state.pa.us>

Date: Fri, 05 Feb 2010 07:57:37 -0500

To: "David.Kovach@drbc.state.nj.us" <David.Kovach@drbc.state.nj.us>

CC: "Hawley, Robert" <rhawley@state.pa.us>, "Miller, Chad (DEP)" <chadmiller@state.pa.us>, "Engle, David" <daengle@state.pa.us>

Good Morning Dave,

Valley Joint SA was contacted regarding the acceptance of this top-hole water. The Authority is adamant that they have not taken any further drilling water/wastewater/fluids since DEP sent them a letter in April 2009 requesting a permit amendment if they want to continue accepting these types of wastewaters. It is possible that they accepted this material prior to this date. If Stone Energy is insistent that the top-hole water was disposed of at this facility, either it was prior to April 2009 or there is a disconnect in disposal sites. Thanks Tom

Thomas Randis | Environmental Group Manager
Department of Environmental Protection
208 West Third Street, Suite 101, Williamsport, PA 17701
Phone: (570) 327-3781 | Fax: (570) 327-3565
www.depweb.state.pa.us

-----Original Message-----

From: David Kovach [<mailto:David.Kovach@drbc.state.nj.us>]
Sent: Thursday, February 04, 2010 10:16 AM
To: Miller, Chad (DEP)
Subject: Valley Joint Sewer Authority in Athens, PA

Hi Chad,

Are you aware that the Valley Joint Sewer Authority in Athens, PA apparently accepted water produced during the drilling of the Stone Energy, Matoushek 1 natural gas well. Most of the water was fresh tophole water with potassium chloride as a drilling additive totalling approximately 270,000 gallons. Was the authority approved to take this water? Is there any concerns with accepting these types of wastes. Any help would be appreciated.

Thanks,
Dave

--
David Kovach, P.G.
Geologist, Project Review Section
Delaware River Basin Commission
(p) 609-883-9500 ext 264
(f) 609-883-9522
(e) david.kovach@drbc.state.nj.us

Subject: DRBC Data request

From: "Stiles, Kevin" <StilesEK@StoneEnergy.com>

Date: Mon, 25 Jan 2010 14:07:44 +0000

To: "'david.kovach@drbc.state.nj.us'" <David.Kovach@drbc.state.nj.us>

David:

My technical staff has assembled the information below to answer your questions of last Thursday 1.21. Please let us know if you require any additional information. Looking forward to seeing you at our hearing in February.

Best Regards/Kevin

Kevin Stiles
Appalachia Manager
Stone Energy
6000 Hampton Center Suite E
Morgantown WV 26505
337-291-7783
304-216-1083 Cell
StilesEK@StoneEnergy.com

Matoushek #1 top hole drilling summary:

- Drilled 24" hole from surface to 60'
- 0 – 50', till/gravel/pebbles, drilled on air, hole damp
- 50' – 60', bedrock, drilled on air, hole dry
- 24" conductor pipe set at 60'
- Drilled 17-1/2" hole from 60' to 710'
- 60' – 650', gray shale/siltstone, drilled on air/mist, hole damp
- **650' – 665', significant FW zone, ~3000 bbls FW to surface (aka 3000 bbls of tophole water)**
- 665' – 710', gray shale/siltstone, drilled on air/mist, hole wet from above FW zone
- 13-3/8" conductor casing set at 710' (cemented to surface)
- Drilled 12-1/4" hole from 710' to 1964'
- 710' – 1964', gray shale/siltstone, drilled on air/mist, hole damp, gained 1 to 1.5 bbl/hr water while drilling (~50 bbls FW to surface / tophole water)
- Note: since the hole was damp and "making water" just below the 13-3/8" shoe, the ~50 bbls of water came from near the shoe
- Note: no significant FW or salt water zones were encountered while drilling the 12-1/4" hole
- 9-5/8" surface casing set at 1964' (cemented to surface)
- Drilled 8-3/4" hole below 1964', drilled on air/dusted, hole dry, no water zones encountered

1) Depth of all fresh water horizons:

- 0 – 50', till/gravel/pebbles, hole damp
- 50' – 650', gray shale/siltstone, hole damp
- **650' – 665', significant FW zone (~3000 bbls of tophole water)**
- 665' – approximately 750', gray shale/siltstone, hole wet (~50 bbls of tophole water)

2) Depth of all salt water horizons:

- No significant salt water horizons were encountered

3) Disposal of salt water in 2) above:

- No significant salt water horizons were encountered

**Evaluation of Erosion and Sediment Control and Stormwater Management
for Gas Exploration and Extraction Facilities in Pennsylvania under
Existing Pennsylvania Regulations and Policies to Determine if Existing
Safeguards Protect Water Quality in Special Protection Waters of the
Delaware Basin
for the Delaware River Basin Commission (DRBC)
Consolidated Administrative Hearing on Grandfathered Exploration Wells**

November 15, 2010

Prepared for:

Delaware Riverkeeper Network

Prepared by:

**Michele C. Adams, P.E. LEED AP
Meliora Environmental Design, LLC
2114 Kimberton Road, P.O. Box 942
Kimberton, PA 19442**

EXECUTIVE SUMMARY

The construction and operation of Marcellus Shale Gas Extraction facilities, including wells intended for exploratory purposes, can have significant and adverse environmental impacts on the water quality of the Special Protection Waters of the Delaware River Basin. Specifically, impacts associated with erosion and sediment discharge and stormwater discharge during construction, operation, and after well closure can negatively and significantly impact water quality. The existing environmental regulations and policies of the Commonwealth of Pennsylvania, either as enacted by the Commonwealth or implemented by the Pennsylvania Department of Environmental Protection (PaDEP), do not provide adequate performance standards, review, implementation, or enforcement to protect the Commonwealth's water resources, including the Special Protection Waters of the Delaware River Basin. The Delaware River Basin Commission (DRBC) requirements for a Non-Point Source Pollution Control Plan are not sufficient to protect these water resources in lieu of adequate Pennsylvania requirements, leading to the possibility and likelihood of adverse environmental effects on water resources.

Additionally, the Pennsylvania erosion and sedimentation control and stormwater management regulations and policies, as applied to Oil and Gas facilities, are significantly less stringent and comprehensive and are subject to far less regulatory review than virtually any other construction or industrial activity in Pennsylvania. Construction and performance requirements and regulatory review requirements related to sediment control and stormwater management are far more rigorous for schools, highways, homes, and even geothermal energy wells than for Oil and Gas facilities.

By grandfathering the exploratory wells that were permitted by PaDEP prior to the June 14, 2010 and July 23, 2010 Supplemental Determinations of the DRBC, DRBC has effectively held these facilities to a lower environmental standard than that which is applied to other activities within Pennsylvania, as well as a lower standard than that which will presumably be applied to other oil and gas activities within the Delaware River Basin once its regulations are adopted. Since negative water quality impacts related to sediment discharge and stormwater

management from these facilities can and do impact existing water quality, these facilities cannot be exempt from the requirements to protect and maintain Special Protection Waters, or subject to lower regulatory requirements than other construction and industrial activities.

ANALYSIS AND OPINION

My name is Michele C. Adams, I am a professional engineer registered in the state of Pennsylvania and several other states. As indicated in the attached CV, I have twenty-six years of experience specializing in water resources, stormwater management, and site design engineering. I am one of the primary authors of the Pennsylvania Stormwater Best Management Practices Manual, and currently chair the calculations sub-committee for the Manual update. To form the opinions in this report, I reviewed the available Well Drilling Permit applications and supporting information for several of the exploratory wells in question, including but not limited to Davidson 1V, Woodland Management Partners 1 1, DL Teeple 1 1 and 1 2H, Geuther 1. I also reviewed a number of documents and reports that are listed at the end of this report as references.

It is my opinion, given with a reasonable degree of scientific certainty, that gas exploratory and extraction facilities can adversely impact water quality as a result of inadequate erosion and sedimentation control during construction and operation, and inadequate stormwater management for rate, volume, and discharge of pollutants. As discussed in this report, the current regulatory process for review, approval, and operation of these facilities, as administered by the Pennsylvania Department of Environmental Protection, fails to ensure design and implementation of both erosion control and stormwater management measures that are sufficient to protect water quality. The exploratory wells that have been permitted prior to the June 14, 2010 and July 23, 2010 Supplemental Determinations of the DRBC should not be held to lower standards than facilities that will be subject to the anticipated DRBC regulations.

Construction of Gas Exploratory and Extraction Facilities and Impacts to Water Quality as a Result of Inadequate Erosion and Sediment Control Measures

Impacts to water quality from the Gas Exploratory and Extraction facilities can occur during the construction of the facility, the operation of the facility, and as a result of inadequate restoration of the facility after operations have ceased.

During construction, the water quality impacts are related to the discharge of sediment-laden waters from disturbed areas and the increased amount and rate of runoff from disturbed areas. Disturbance is a result of:

- Construction of the pad site
- Construction of the entrance road
- Widening or paving of existing roads for access to the site
- Construction of pipeline facilities

The amount and type of area disturbed directly impacts the potential for erosive conditions and sediment discharge. Little specific information regarding the disturbed area is available in the permit application materials, for the specific wells in question as part of this Hearing that are less than five (5) acres in disturbance. However, 8-1/2" by 11" Well Location Plat diagrams provided within the PaDEP Well Permit applications (for two wells) indicate approximate areas of pad and entrance drive that can be measured from the diagrams. Based on these diagrams, the well pad and entrance driveway area are shown as 1.80 acres for the Teeple 1 1 well and 2.4 acres for the Woodland Management 1 1 well. In contrast, a page-sized copy of the Woodland Erosion & Sediment Control Plan (included as part of the "Preparedness, Prevention, and Contingency Plan") indicates approximately 4.7 acres of disturbance when this area is measured from the plan, significantly more than 2.4 acres. Approximately 1 acre of disturbance appears to be related to the entrance driveway. Because the Well Location Plat does not indicate the full area of disturbance, it provides virtually no information on the project's disturbance footprint. There is no information on the PaDEP "Permit Application for Drilling or Altering a Well" or available Well Location Plats regarding total acreage of disturbance. PaDEP would not have an estimate of the Total Area of Disturbance from the Well Location Plat. Facilities with less than 5 acres disturbance must prepare an

Erosion and Sediment Control Plan, but are not required to submit the Plan to PaDEP for review.

Information from the New York State Department of Environmental Conservation (NYSDEC), which regulates gas drilling in Marcellus Shale formations in New York State, (NY DEP) indicates that well sites generally involve two to five acres of disturbance per site, not including access roads. The area of disturbance is significant because it directly affects the potential amount of sediment-laden water that can occur if erosion and sediment control measures are not adequate.

In 2005, the U.S. Environmental Protection Agency (U.S. EPA) awarded a grant to the City of Denton, Texas, to monitor and assess the impact of gas well drilling on stormwater runoff. The results of this effort were published in December 2007 in a report titled “Demonstrating the Impacts of Oil and Gas Exploration on Water Quality and How to Minimize These Impacts Through Targeted Monitoring Activities and Local Ordinances”. With regards to the discharge of sediment during construction, this study determined that:

Gas well sites have the potential to produce sediment loads comparable to traditional construction sites.

- Total suspended solids (TSS) and turbidity event mean concentrations (EMC = pollutant mass / runoff volume) at gas sites were significantly greater than at reference sites (the median TSS EMC at gas sites was 136 times greater than reference sites).
- Compared to the median EMCs of storms sampled by Denton near one of their outfalls, the gas well site median EMC was 36 times greater.
- Gas site TSS EMCs ranged from 394 to 9898 mg/l and annual sediment loadings ranged from 21.4 to 40.0 tonnes/hectare/year (tonne = 1000 Kg; hectare = 10,000 square meters), and were comparable to previous studies of construction site sedimentation.

This study concludes that “Gas well sites have the potential to negatively impact surface waters due to increased sedimentation rates.” (US EPA ID No. CP-83207101-1, page 2).

In addition to the well pad site, roads that are constructed, widened, or altered for vehicle access to and from the well pad site can be a source of sediment and pollutants during both construction and operation. The U.S. EPA Publication

“Erosion, Sediment and Runoff Control for Roads and Highways” (EPA-841-F-95-008d) states that:

Runoff controls are essential to preventing polluted runoff from roads, highways, and bridges from reaching surface waters. Erosion during and after construction of roads, highways, and bridges can contribute large amounts of sediment and silt to runoff waters, which can deteriorate water quality and lead to fish kills and other ecological problems.

Heavy metals, oils, other toxic substances, and debris from construction traffic and spillage can be absorbed by soil at construction sites and carried with runoff water to lakes, rivers, and bays. Runoff control measures can be installed at the time of road, highway, and bridge construction to reduce runoff pollution both during and after construction. Such measures can effectively limit the entry of pollutants into surface waters and ground waters and protect their quality, fish habitats, and public health.

This publication (EPA-841-F-95-008d) identifies a number of pollutant types and sources related to Roads and Highways, as identified in Table 1.

Table 1. Typical pollutants found in runoff from roads and highways.

Erosion, Sediment and Runoff Control for Roads and Highways | Polluted Runoff | US EPA

| | Pollutant | Source |
|----------------------|-----------------------|---|
| Sedimentation | Particulates | Pavement wear, vehicles, the atmosphere and maintenance activities |
| Nutrients | Nitrogen & Phosphorus | Atmosphere and fertilizer application |
| Heavy Metals | Lead | Leaded gasoline from auto exhausts and tire wear |
| | Zinc | Tire wear, motor oil and grease |
| | Iron | Auto body rust, steel highway structures such as bridges and guardrails, and moving engine parts |
| | Copper | Metal plating, bearing and brushing wear, moving engine parts, brake lining wear, fungicides & insecticides |
| | Cadmium Chromium | Tire wear and insecticide application Metal plating, moving engine parts and brake lining wear |

| | | |
|---------------------|----------------------------|--|
| | Nickel | Diesel fuel and gasoline, lubricating oil, metal plating, bushing wear, brake lining wear and asphalt paving |
| | Manganese | Moving engine parts |
| | Cyanide | Anti-caking compounds used to keep deicing salt granular |
| | Sodium, calcium & chloride | Deicing salts |
| | Sulphates | Roadway beds, fuel and deicing salts |
| Hydrocarbons | Petroleum | Spills, leaks, antifreeze and hydraulic fluids and asphalt surface leachate |

Based on these two studies, the construction of Gas Exploration and Extraction facilities and associated construction and/or improvement of roads can negatively impact water quality, and these facilities have the same potential as other construction activities to degrade water quality. However, Pennsylvania does not apply the same standards of performance or regulatory oversight to Gas Exploration and Extraction facilities as is applied to other construction activities, and therefore the DRBC's Supplemental Determination of June 14, 2010 is incorrect in determining that the "existing safeguards" applied to "wells subject to state regulation as to their construction and operation" is sufficient to prevent water quality impacts from construction.

Specifically, the "safeguards" applied in the Pennsylvania regulatory process for Gas Exploration and Extraction facilities fail to address a number of concerns, and this can be seen in the application requirements for Erosion and Sediment Control Permits.

Gas Exploration and Extraction facilities that result in disturbance of fewer than five (5) acres are not required to obtain an Erosion and Sediment Control Permit. For these facilities, a Permit Application for Drilling or Altering a Well (5500-PM-OG0001) is sufficient. An Erosion and Sediment Control Plan must be developed, but is not subject to regulatory review and approval before construction. This is in contrast to most other construction activities, which are subject to erosion and sediment control requirements at 1 acre under the Pennsylvania Chapter 102 requirements and NPDES requirements. For Oil and Gas facilities that are fewer than 5 acres in disturbance, an Erosion & Sediment

Control plan is required, but it is not subject to regulatory review prior to construction.

Significantly, the permit application requirements in the PaDEP “Application for an Erosion and Sediment Control Permit (ESCP)” for projects that are not already addressed under an NPDES permit, are different than the PaDEP application for Oil and Gas Facilities (Notice of Intent for Coverage under the Erosion & Sediment Control General Permit for Earth Disturbance Associated with Oil and Gas Exploration, Production, Processing or Treatment Operations or Transmission Facilities ESCGP-1). This is significant because the permit application is essentially for the same item, namely, an Erosion and Sediment Control Permit. There are also significant differences between the application for coverage under the General (PAG-02) NPDES Permit or Individual NPDES Permit for Stormwater Discharges Associated with Construction Activities. There is only a General Permit option for Oil and Gas facilities, regardless of whether or not the facility is located in Special Protection Waters. Other construction activities require an Individual Permit within Special Protection Waters.

A comparison of permit application requirements for non-oil and gas facilities, as compared to the permit application requirements for Oil and Gas facilities, is provided in Table 2. This table also indicates the comparable requirements for the permit application for Drilling or Altering a Well (for oil and gas projects disturbing fewer than 5 acres).

As can be seen from this table, the requirements for a “standard” ESCP REVIEW THIS application are significantly more stringent than the requirements for an Oil and Gas facility ESCP application for coverage under a general permit. For oil and gas facilities with fewer than five acres of disturbance, virtually no information is required related to the amount of area disturbed and erosion control measures.

Table 2. Comparison of Erosion and Sediment Control Permit Application Requirements for “Non” Oil and Gas Facilities, Oil and Gas Facilities, and Oil and Gas Facilities under 5 acres disturbance.

| | NOI for Coverage under the General (PAG-02) NPDES Permit or Application for an Individual NPDES Permit for Stormwater Discharges Associated with Construction Activities | Application for Erosion & Sediment Control Permit | NOI for Coverage under the Erosion & Sediment Control General Permit for Earth Disturbance Associated with Oil and Gas Exploration, Production, Processing or Treatment Operations or Transmission facilities | Permit application for Drilling or Altering a well |
|---|---|--|--|---|
| Required Information | | ESCP | ESCGP-1 | 5500-PM-OG001 |
| Project Description | yes | yes | yes | no |
| Project Area | yes | yes | yes | no |
| Total Disturbed Area | yes | yes | yes | no |
| Timetable for Phases (with acreage disturbed by phase) | yes | yes | yes | no |
| Description of Site | yes | yes | no | no |
| Explanation of consideration of site's Natural Resources in Location and Design of the project, E&S Plan, PCSM Plan) | yes | no | no | no |
| Identification of geologic formations or soil conditions that may cause pollution and description of BMPs to minimize its impact | yes | no | no | no |
| Identification of Pollutants other than sediment in stormwater | yes | yes | yes | no |
| PPC Plan required for use or storage of chemicals, solvents, hazardous wastes or material with potential to cause accidental pollution during earth disturbance | no | yes | yes | no |
| Explain whether fill will be imported, exported or if the site will balance | yes | no | no | no |
| Site Contact information (name, firm, title, etc.) | yes | yes | yes | no |
| Consultant for Project (name, address, etc.) | yes | yes | no | no |
| Compliance Review - Listing by permit number of other environmental permits issued by Department | yes | yes | no | no |
| Narrative to address existing or past violations of any environmental regulations or permits | yes, within last 5 years | yes, current and past violations | yes, within last 5 years | no |
| Post Construction Stormwater Management (PCSM) Plan required | yes | yes | No calculations or measurements required if Section D, 2e indicated as yes to both questions | no |
| Consistency letters required for ACT 167 and Municipal Ordinances | yes | no | no | no |
| Off-Site Discharge Analysis | yes | no | no | no |
| PCSM BMPs must be consistent with... | Act 167 OR PA Stormwater Manual and/or Other Design Standard | | Act 167, local ordinances, or BMPs will manage net increase in runoff volume resulting from 2-year/24-hour frequency storm | |

There are a number of site-specific conditions that can directly affect the potential for erosion and pollutant discharge during construction activity, including the total area of disturbance, the soil type and potential for erosion, the topographic slopes, and the proximity to surface waters. None of this information is available for regulatory review before construction for Oil and Gas facilities of fewer than 5 acres. Additionally, there is no opportunity for regulatory reviewers to determine if measures such as reducing the area of disturbance and restoring disturbed areas promptly will be implemented.

The potential impacts to water quality can be seen in the existing D.L. Teeple 1 1 well, located in Manchester Township, Wayne County and owned by Newfield Appalachia PA LLC (permit # 37-127-20013, issued on April 23, 2010), shown as Figure 1. This well is located in the Shehawken Rattlesnake Creek, designated in Pennsylvania as High Quality (HQ). The permit application for this well indicates under Item 8 of the "Permit Application for Drilling or Altering a Well" that the well site is not within 100 feet (horizontally) of a stream, spring, or water body of water delineated on the most current 7-1/2 minute topographic map. As can be seen by the overlay of the Well Location Plat onto a USGS 7-1/2 minute quadrangle map, the well pad is not within 100 feet of a body of water as indicated on the USGS 7-1/2 minute quad, but it is situated at the top of a hill surrounded on three sides by streams and wetlands that are delineated on the quad map. The site is bordered on the western side by S.R. 191, and a wetland can be seen just over 100 feet downhill from the construction entrance.

Given the topography and surrounding surface waters at the Teeple 1 1 site, there is significant potential for discharge of sediment and other pollutants to surface waters if erosion and sediment control measures are not actively maintained and implemented.

This well location was cited on 5/26/2010 for a violation of Chapter 102. 4 for "Failure to minimize accelerated erosion, implement E&S Plan, maintain E&S controls. Failure to stabilize site until total restoration under OGA Sec 206(c)(d)." This violation was issued just over one month after the permit was issued. A second violation was also issued on 5/26/2010 under Pa Code 78 for an improperly lined pit.

The Pennsylvania Oil and Gas Act (58 P. S. § 601.205(b)) states that “no well site may be prepared or well drilled within 100 feet measured horizontally from any stream, spring, or body of water as identified on the most current 7-1/2 minute topographical quadrangle map of the United States geological survey or within 100 feet of any wetlands greater than one acre in size”. This question is asked in Item 8 of the PaDEP Permit Application for Drilling or Altering a Well. However, surface waters are defined in Chapter 93 as “Perennial and intermittent streams, rivers, lakes, reservoirs, ponds, wetlands, springs, natural seeps and estuaries...”. Many of these features will NOT be mapped on a USGS quad as blue lines, or they will not be mapped adequately. Luna B. Leopold, former Chief Hydrologist for the U.S. Geological Survey, writes in his book A View of the River (Harvard University Press, 1994) that the USGS instructions regarding blue lines on quad maps “do not reflect any statistical characteristic of streamflow occurrence. The specifications that the blue line terminate no higher than about 1,000 feet from the watershed divide does not reflect differences in hydrologic performance among various combinations of climate, topography, and geology” and “blue lines on a map are drawn by non-professional, low-salaried personnel ...they are drawn to fit a rather personalized aesthetic.” (page 228). In other words, blue lines on 7-1/2 minute USGS quads are not scientific representations of surface waters or even perennial or intermittent streams. Therefore, reliance of these “blue lines” does not represent adequate identification and setback from surface waters as defined under Pa Code Chapter 93. The current Pennsylvania permitting process for Oil and Gas facilities is not sufficiently protective of surface waters.

The preparation of an Erosion and Sediment Control Plan under the requirements for Oil and Gas facilities also does not guarantee that the measures represented on the plan will be adequate to protect water quality. For example, on the Erosion and Sediment Control permit application for Oil and Gas facilities (ESCGP-1), Section E: Special Protection Waters lists “cost effective best management practices (BMPs) that will be used to meet the requirements of Pa Code Chapter 93. Under this list is included “Roads stabilized with crushed rock and/or vegetation.” In other words, roads constructed of crushed rock are considered to be a “best management practice” adequate for protection of

Special Protection Waters. In virtually all other construction projects that are subject to Chapter 102 requirements, the construction of roads – including crushed rock roads – is considered earth disturbance that requires its own erosion and sediment control measures (as well as stormwater management measures).

The Pennsylvania Center for Dirt and Gravel Road Studies provides information on measures to maintain gravel roads in a manner to reduce the discharge of pollutants and protect water quality. Penn State's Center for Dirt and Gravel Road Studies (Center) recently completed a research project for the Chesapeake Bay Commission (Sheetz, Summary Statement) that begins to quantify sediment production from gravel roads and sediment reductions from several commonly used practices. This study found that:

Runoff Rates from Existing Roads:

The five "existing condition" tests done for this study found sediment production rates ranging from 0.7-12.2 pounds of sediment runoff in a single 30 minute, 0.55 inches simulated rainfall. The 0.7 pound event was generated from a flat narrow farm lane with grass growing between the wheel tracks. The 12.2 pound event was generated from a wider, mixed limestone/clay road at a 4-5% slope. This highlights the great variability in erosion rates based on specific site conditions. Using the average sediment runoff rate of 5.6 pounds per event, a single 30 minute 0.55 inch rain event moving across Pennsylvania can be conservatively expected to generate over 3,000 tons* of sediment from the State's 20,000+ miles of public unpaved roads.

In other words, gravel roads are a source of sediment pollution, rather than a "best management practice" for Special Protection Waters as listed on the ESCGP-1 application.

Review of the page-sized copy of the "Woodland Management Partners Well Pad Erosion & Sediment Control Plan" indicates that, for the approximately 850 linear feet of new entrance driveway to the well pad, there are no erosion and sediment control measures, i.e., no silt fence, compost sock, etc. Roads for other construction projects are subject to management requirements for erosion and sediment control, but under ESCGP-1, gravel roads are considered a "best management practice".

Roads and gravel roads for gas exploration and extraction facilities are not the only construction items that are regulated differently for oil and gas facilities than they are for other construction sites, and that have significant potential to adversely impact water quality. Recently, PaDEP began imposing requirements on the construction of geothermal energy wells. Geothermal wells are generally not more than several hundred feet deep. PaDEP has begun imposing requirements for separate Erosion and Sediment Control Plans specific to the construction of geothermal wells and the handling of material from these wells. This includes requirements for dewatering material from the wells, protecting the water resources from discharge of pollutants, and reducing site disturbance. Gravel roads for geothermal well construction must also include measures such as silt fence or compost sock (and are not considered a best management practice). Detailed guidance for E&S measures related to the construction of geothermal wells will be included in the updated Erosion and Sediment Control Manual, and reflect that both well construction and gravel road construction and use are significant sources of nonpoint source pollutants. This is in stark contrast to the ESCGP-1 representation of gravel roads as a best management practice.

In summary, the current state regulations under which the wells in question were permitted do not guarantee that the measures designed or implemented are sufficient to protect water quality from construction-related impacts due to erosion and sedimentation. These wells should not be excluded under the June 14, 2010 and July 23, 2010 Supplemental Determinations.

Gas Extraction Facilities and Impacts to Water Quality as a Result of Inadequate Stormwater Management

The discharge of stormwater runoff and the pollutants conveyed in stormwater runoff also negatively impact surface water quality. Stormwater impacts at Oil and Gas facilities, including both exploratory and extraction well sites, are a result of:

- Increased runoff (volume and rate) from roads
- Increased runoff (volume and rate) from pad site areas
- Increased pollutants from truck movement
- Pollutants from pad materials

- Air deposition of pollutants
- Inadequate handling of drilling materials
- Decreased stormwater recharge
- Decline of adjacent vegetation
- Degradation of roads
- Erosion of pad
- Failure to restore site to natural conditions

The stormwater impacts on water quality and stream health include:

- Increased flooding as a result of increased stormwater flow rates and volumes of runoff
- Increased frequency of runoff discharges
- Thermal impacts from disturbed surfaces and removal of vegetation
- Changes in receiving water stream channel geometry, and corresponding increases in sediment loads
- Discharge of pollutants
- Decreased stream baseflow as a result of reduced recharge

In addition to sediment discharges, the December 2007 U.S. EPA report “Demonstrating the Impacts of Oil and Gas Exploration on Water Quality and How to Minimize These Impacts Through Targeted Monitoring Activities and Local Ordinances,” noted that discharges of stormwater from oil and gas facilities include a number of pollutants. The Summary Document for this report states:

Other pollutants in gas well runoff were found in high concentrations:

- EMCs of total dissolved solids, conductivity, calcium, chlorides, hardness, alkalinity and pH were higher at gas well sites compared to reference sites, and differences were statistically significant for all parameters except conductivity.
- Generally, the presence of metals was higher at gas well sites compared to reference sites and EMCs were statistically significantly greater for Fe, Mn and Ni.
- Overall, the concentrations of metals tend to be higher at gas well sites compared to both nearby reference sites and as measured in runoff from local mixed-use watersheds (EMCs were statistically significantly greater for Fe, Mn and Ni).
- Total petroleum hydrocarbons (TPH) were not detected in any of the samples collected at gas well sites or reference sites.

The Summary Document for this study further concluded that:

- Gas well sites have the potential to negatively impact surface waters due to increased sedimentation rates and an increase in the presence of metals in stormwater runoff.

- Pad sites also have the potential to produce other contaminants associated with equipment and general site operations.
- Gas wells do not appear to result in high concentrations of petroleum hydrocarbons in runoff, but accidental spills and leaks are still a potential source of impact.

Furthermore, the Summary Document noted that:

The proximity to surface water conveyances is an important consideration for minimizing water impacts, i.e., flat, heavily vegetated areas distant from surface waters are usually less of a concern than those areas close to waters that have highly erodible soils, steeper slopes and little vegetation.

Given the potential for stormwater impacts to water quality from Oil and Gas exploratory and extraction facilities, the requirements for stormwater management and water quality protection should be at least as rigorous as the requirements for other land development and industrial activities.

However, the Erosion and Sediment Control General Permit for Oil and Gas facilities (ESCGP-1) essentially provides these facilities with a waiver from providing stormwater management calculations and data. Specifically, Section D.2.e of ESCGP-1, titled "Site Restoration Plan and Post Construction Stormwater BMPs", requires the applicant to answer yes or no to two questions:

1. The approximate original contours of the project site will be maintained or replicated and the disturbed areas will be revegetated or otherwise stabilized with pervious material.
2. PCSM BMPs which: use natural measures to eliminate pollution, do not require extensive construction efforts, promote pollution reduction, and are capable of controlling the net increase in the volume and rate of stormwater runoff from a 2-year/24-hour storm event will be employed and the net increase in the volume of post construction runoff is infiltrated and/or dissipated away from surface waters of the Commonwealth.

If the answer to both of these questions is "yes," the applicant does not need to provide supporting calculations and data, essentially receiving a waiver of the

requirements for detailed stormwater management calculations and implementation of adequate stormwater management measures. Such waivers are not available for other industrial and commercial projects, which must design PCSM measures based on factors such as disturbed area, slopes, soil types, etc., and which must provide detailed calculations to determine that stormwater BMPs are correctly sized and located.

Even if one of these questions is answered as “no” and post construction stormwater calculations and data are required, that is not an assurance that the calculations and stormwater plan will protect water quality, or be subject to the same level of regulatory review as other construction projects.

For example, the permit application for the Davidson 1V Well Pad Site indicates that the site will NOT be returned to the original contours and revegetated with pervious material, and therefore, stormwater calculations are required. However, the accompanying stormwater calculations indicate that there will be less stormwater runoff after well pad construction than before. This is not a result of BMPs, but rather a result of applying engineering coefficients (Cover Complex values) that indicate that the site will be more pervious. It is shown in Figure 1 that Essentially, areas that are to be revegetated are calculated as “brush” that produces less runoff than woods in good condition. However, the “Brush Seed Mixture” that is specified is primarily a grass and groundcover seed mix, and does not represent established “brush”, which is shown in Figure 1. A more appropriate runoff coefficient that represents lawn and soils that have been graded would indicate a much greater volume of runoff than is presented. This is shown in Figure 2.

SITE STABILIZATION CHART:

| BRUSH SEED MIXTURE | | | |
|---------------------|-------------------|-----------------------|------------------|
| BOTANICAL NAME | COMMON NAME | PERCENTAGE OF MIXTURE | APPLICATION RATE |
| LOLIUM MULTIFLORUM | ANNUAL RYEGRASS | 35 | 20 LBS / ACRE |
| PHLEUM PRATENSE | TIMOTHY | 25 | |
| ANDROPOGON GERARDII | BIG BLUESTEM | 10 | |
| ELYMUS VIRGINICUS | VIRGINIA WILD RYE | 10 | |
| LESPEDEZA BICOLOR | BICOLOR LESPEDEZA | 5 | |
| HELIANTHUS ANNUS | COMMON SUNFLOWER | 5 | |
| LATHYRUS SYLVESTRIS | LATHCO FLAT PEA | 5 | |
| VIBURNUM DENTATUM | ARROW WOOD | 3 | |
| SAMBUCUS CANADENSIS | ELDERBERRY | 2 | |

* SEEDING DATES: APRIL 1--JUNE 15 & AUGUST 16--SEPTEMBER 15

Figure 1. Brush Seed Mixture that is primarily grasses

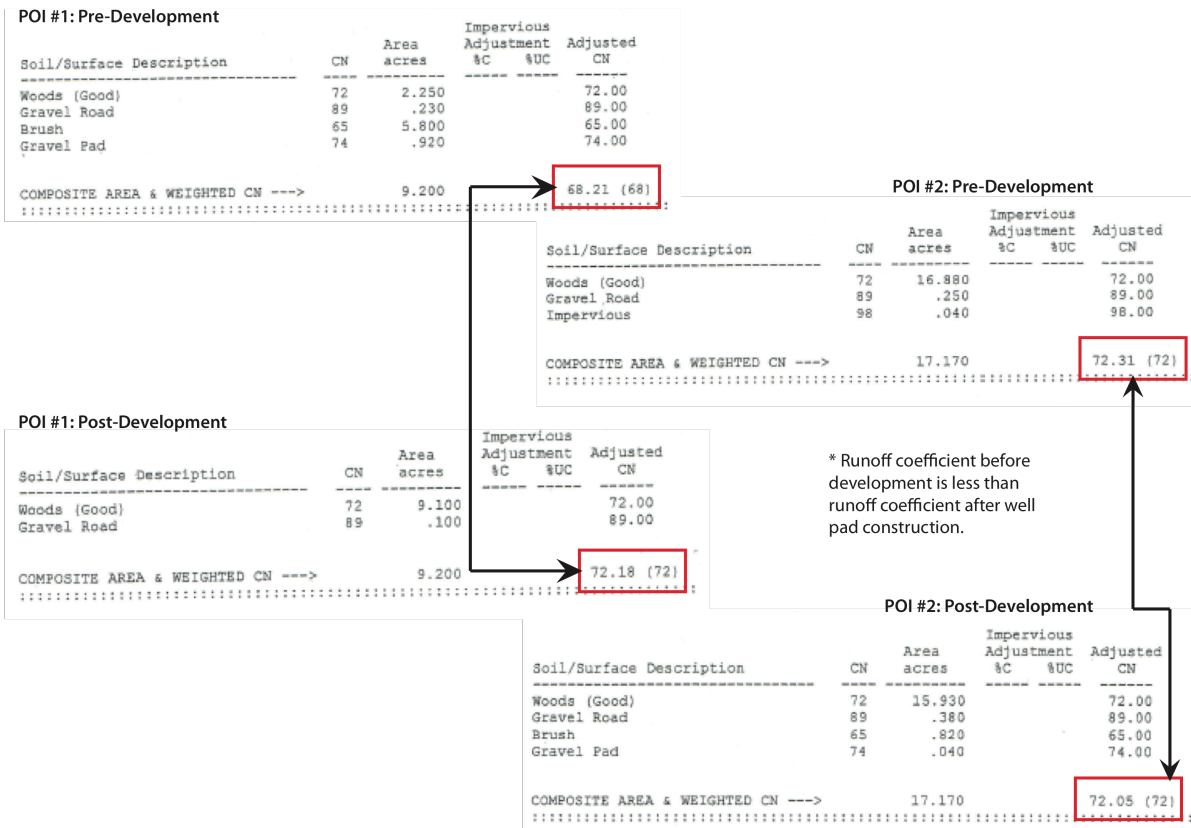


Figure 2: Runoff Curve Number for pre and post-development conditions exhibiting increased runoff after construction

Similarly, the well pad itself is given a very low runoff value, presumably since it is paved with a stone bed. However, the detail provided for the Davidson 1V Well Pad indicates that the stone is not appropriate for a stormwater bed as described in the Pennsylvania Stormwater Best Management Practices Manual, and additionally that the bed will be built partially on fill material, which is also not an acceptable technique in the Manual. The designs documented in the Post-Construction Stormwater Management Plan for Davidson 1V do not support the engineering calculations and assumptions that have been submitted. Therefore, the estimates of stormwater runoff rate and volume will be greater than documented within the Plan.

In addition, Section E of ESCGP-1, titled "Special Protection Waters" lists fourteen "cost effective best management practices that will be used to meet the requirements of 25 Pa Code Chapter 93." These include:

1. Minimize earth disturbance
2. Earth moving activities limited during rainstorms and spring thaw
3. No direct discharge to surface water
4. Designed temporary and permanent BMPs for surface water diversion
5. Other
6. Alternative site analysis
7. Roads stabilized with crushed rock and/or vegetation
8. Immediate stabilization
9. Prompt site restoration
10. Stabilized upslope diversion
11. Permanently stabilized ditches and channels
12. Rock lined culvert inlets and outlets
13. Proper vegetative cover techniques
14. 100 ft riparian buffer

None of these measures are sufficient to provide stormwater management and protect water quality for sites that have 5 acres or more of disturbance, and as discussed earlier, measures such as stabilizing roads with gravel can create, rather than mitigate, pollution and increased runoff. The net effect of Section E

and Section D.2.e of ESCGP-1 is to waive stormwater management requirements for these facilities, or approve calculations that are technically incorrect. "Restoration" activities are not required to restore site soils to pre-construction levels of performance, and as a result of disturbance, altered vegetation, and soil compaction, "restored" sites will continue to generate increased volumes and rates of stormwater runoff.

Oil and Gas facilities are given a further exemption from environmental standards applied to other facilities under Pa 25 Code Chapter 102.14, which requires a 150 foot riparian buffer in Special Protection Waters. Oil and gas activities are given an exemption "so long as any existing riparian buffer is undisturbed to the greatest extent possible."

For Oil and Gas facilities with fewer than five acres of disturbance (and not required to apply for permit coverage with ESCGP-1), there are essentially no regulatory processes or safeguards in place to assure that stormwater management measures are adequate, and essentially no safeguards or consideration of factors such as slopes, soil types, amount of vegetation and protection of existing vegetation.

Conclusion

The Supplemental Determination of June 14, 2010 stated that:


[T]hese wells are subject to state regulations as to their construction and operation...In light of these existing safeguards...this Supplemental Determination does not prohibit any natural gas well project from proceeding if the applicant has obtained a state natural gas well permit for the project on or before the date of issuance set below.

A review of the regulatory safeguards applied to these wells, specifically the existing Pennsylvania regulations and PaDEP policies, indicates that the safeguards do not guarantee protection of the water quality of Special Protection Waters with regards to Erosion and Sediment Control and Stormwater Management. As such, these wells should have been included in the May 19, 2010 Determination of the Executive Director Concerning Natural Gas Extraction Activities in Shale Formations within the Drainage Area of Special Protection Waters.

The December 2007 EPA report “Demonstrating the Impacts of Oil and Gas Exploration on Water Quality and How to Minimize These Impacts Through Targeted Monitoring Activities and Local Ordinances” specifically recommended that “States or local governments should consider regulating sediment and associated pollutants in stormwater runoff” and suggested as a Recommended Approach to “develop regulations similar to current NDPES requirements for construction sites” for Oil and Gas facilities.

To the extent that the Executive Director’s decision making process relied upon the adequacy of Pennsylvania regulations to protect the water quality of the Basin, it was based upon a mistaken premise of fact.

The opinions expressed in this report are stated to a reasonable degree of scientific and professional certainty.



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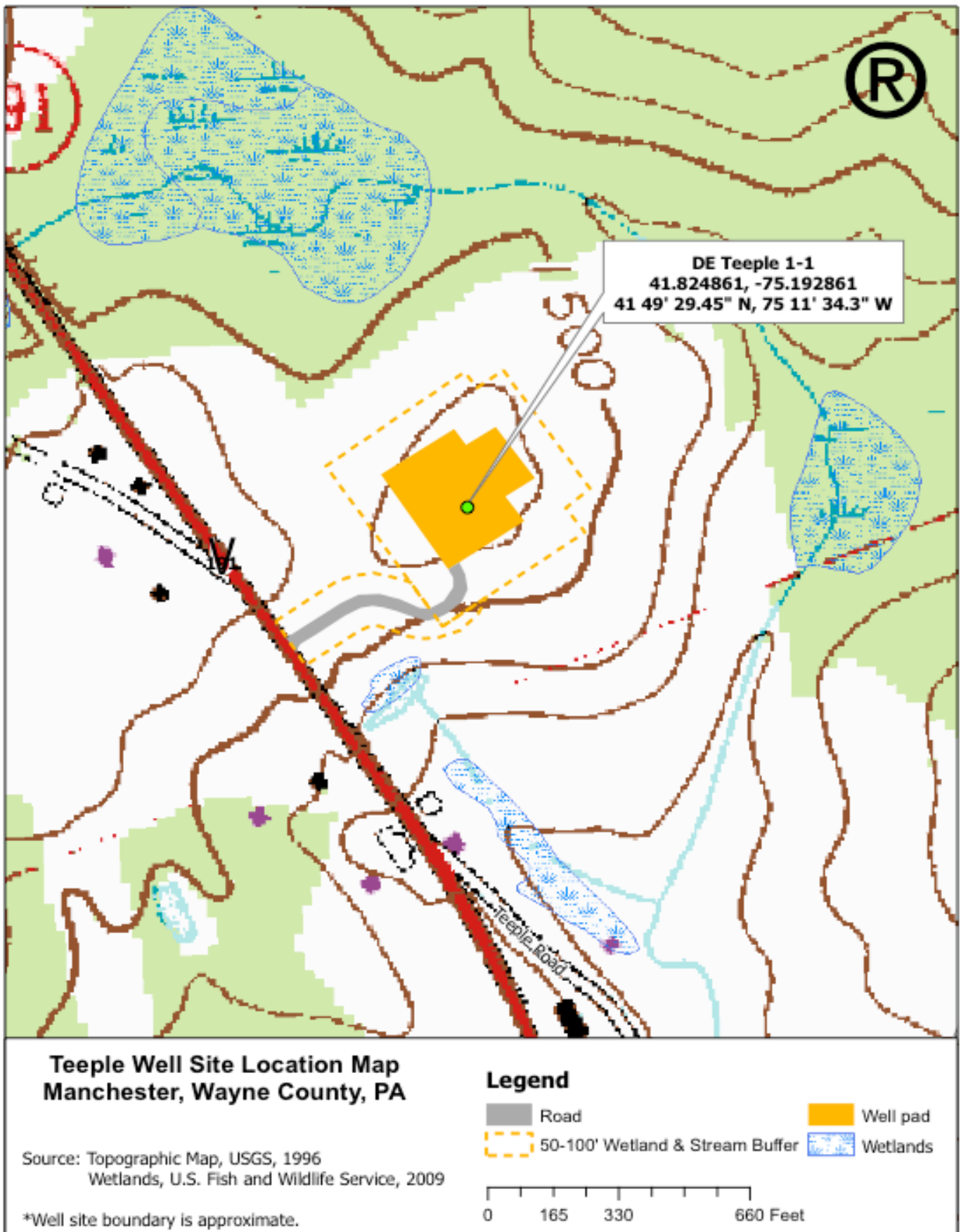
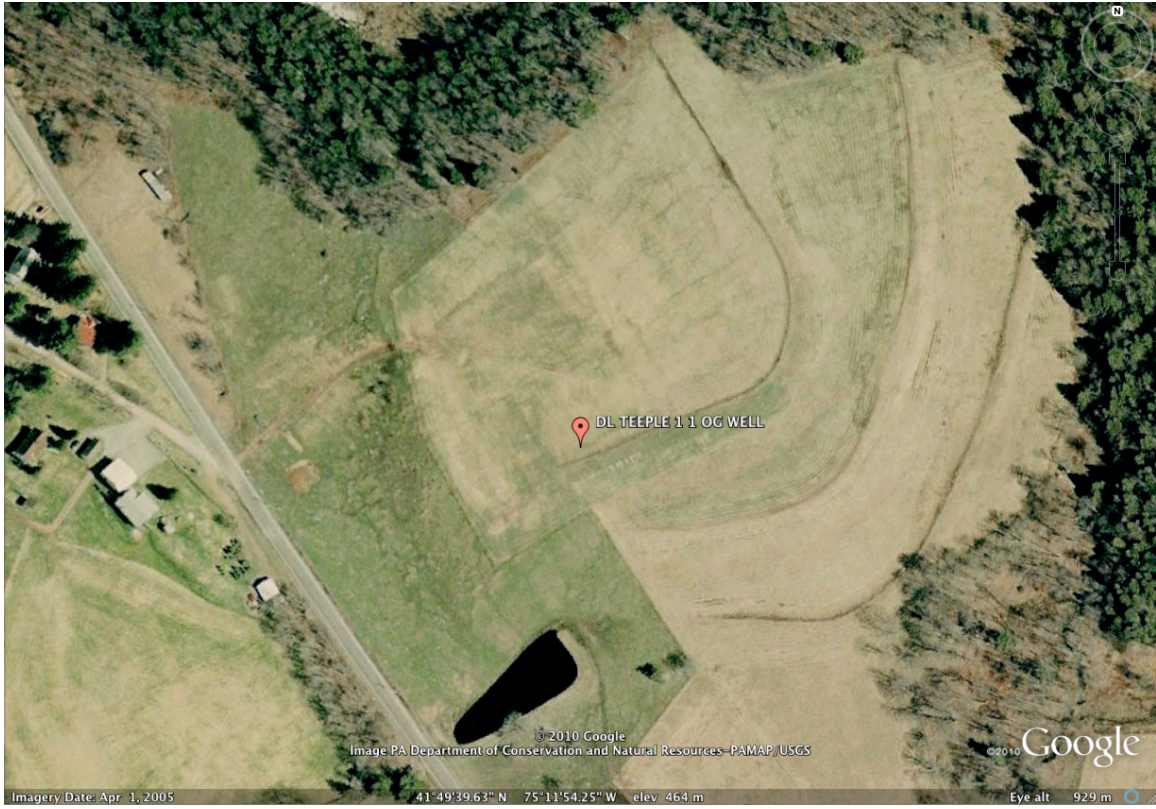


Figure 3. D.L. Teeple 1 1 well, located in Manchester Township, Wayne

County



REFERENCES

1. Chandlerof, Stephanie; League of Women Voters of Indiana “Marcellus Shale Natural Gas Extraction Study 2009-2010 Study Guide V: Regulation and Permitting of Marcellus Shale Drilling”, League of Women Voters of Pennsylvania, 2010
2. Delaware River Basin Commission “Special Protection Waters, Stone Energy Corporation, Matoushek 1 Well Site Shale Gas Exploration and Development Project Clinton Township, Wayne County, Pennsylvania”, Docket No. D-2009-18-1, February, 2010
3. Harvey Consulting, LLC Recommendations for Robson 1 Gas Well Chesapeake Appalachia, LLC Pennsylvania State Department of Environmental Protection Permit 37-127-20008-00. March 15, 2009
4. Kosnik, Renee L.; Oil and Gas Accountability Project and Earthworks “The Oil and Gas Industry’s Exclusions and Exemptions to Major Environmental Statutes”, October, 2007
5. Kovach, David "Cabot #2 Well", E-mail to James Eichstadt, August 4, 2009
6. Leopold, Luna B.; “A View of the River”, Harvard University Press, Cambridge, MA, 1994
7. Pennsylvania Department of Environmental Protection; Commonwealth of Pennsylvania Department of Environmental Protection Oil and Gas Management Program, “Notice of Intent for Coverage Under the Erosion and Sediment Control General Permit (ESCGP-1) for Earth Disturbance Associated with Oil and Gas Exploration, Production, Processing or Treatment Operations or Transmission Facilities”, Application 5500-PM-OG0005, Revised December, 2009
8. Pennsylvania Department of Environmental Protection; Commonwealth of Pennsylvania Department of Environmental Protection Oil and Gas Management Program, “Well Location Plat” For Matoushek 1, Submitted by Stone Energy Corporation, Permit Number 37-127-20006-00, March 6, 2008
9. Pennsylvania Department of Environmental Protection; Commonwealth of Pennsylvania Department of Environmental Protection Oil and Gas Management Program, “Well Permit” For DL Teeple 1 1, Submitted by Newfield Appalachia PA LLC, Permit Number 37-127-20013, April 23, 2010
10. Pennsylvania Department of Environmental Protection; Commonwealth of Pennsylvania Department of Environmental Protection Oil and Gas Management Program, “Well Permit” for DL Teeple 1 2H, Submitted by Newfield Appalachia PA LLC, Permit Number 37-127-20018-00, May 25, 2010

11. Pennsylvania Department of Environmental Protection; Commonwealth of Pennsylvania Department of Environmental Protection Oil and Gas Management Program, "Well Permit" For Geuther 1, Submitted by Stone Energy Corporation, Permit Number 37-127-20007-00, April 28, 2010
12. Pennsylvania Department of Environmental Protection; Commonwealth of Pennsylvania Department of Environmental Protection Oil and Gas Management Program, "Well Permit" For HL Rutledge 1 1, Submitted by Newfield Appalachia PA LLC, Permit Number 37-127-20012-00, April 29, 2010
13. Pennsylvania Department of Environmental Protection; Commonwealth of Pennsylvania Department of Environmental Protection Oil and Gas Management Program, "Well Permit" For Woodland MGMT Partners 1 1, Submitted by Newfield Appalachia PA LLC, Permit Number 37-127-20017-00, May 27, 2010
14. Pennsylvania Department of Environmental Protection "Erosion and Sediment Control General Permit For Earth Disturbance Associated With Oil & Gas Exploration, Processing or Treatment Operations or Transmission Facilities Otherwise known as... ESCGP-1", Received from http://files.dep.state.pa.us/Water/Watershed%20Management/WatershedPortalFiles/2007AnnualTraining/stormwater_permit_presentation2.pdf
15. Pennsylvania Department of Environmental Protection "Pennswood Oil & Gas LLC (272597) Preston 38 LLC OG Well", Pennsylvania's Environment Facility Application Compliance Tracking System, August 26, 2010
16. Pennsylvania Department of Environmental Protection "Pennswood Oil & Gas LLC (272597) Stockport ASSN 1", Pennsylvania's Environment Facility Application Compliance Tracking System, August 26, 2010
17. Scheetz, Dr. Barry E. and Steven M. Bloser; Center for Dirt and Gravel Road Studies, The Pennsylvania State University, University Park, PA 16802; "Environmentally Sensitive Maintenance Practices for Unpaved Roads: Sediment Reduction Study" Prepared for Chesapeake Bay Commission c/o Senate of Pennsylvania G-05 North Office Building Harrisburg, PA 1712, FINAL REPORT June 30, 2008, Revised August 29, 2008 and Summary Statement
18. Tetra Tech NUS Inc. "Preparedness, Prevention, and Contingency Plan, Wayne County Field, Wayne County, Pennsylvania", Prepared for Newfield Appalachia PA LLC, May 2010
19. United States Environmental Protection Agency "Erosion, Sediment and Runoff Control for Roads and Highways", Office of Water (4503F) EPA-841-F-95-008d, December 1995
20. United States Environmental Protection Agency, Final Report for Catalog

of Federal Domestic Assistance Grant Number 66.463 Water Quality Cooperative Agreement for Project Entitled “Demonstrating the Impacts of Oil and Gas Exploration on Water Quality and How to Minimize these Impacts Through Targeted Monitoring Activities and Local Ordinances” and “Summary of the Results of the Investigation Regarding Gas Well Site Surface Water Impacts”, ID No. CP-83207101-1, Kenneth E. Banks, Ph.D. Manager, Division of Environmental Quality and David J. Wachal, M.S. Water Utilities Coordinator

21. URS Corporation “Erosion and Sediment Control Plan for the Proposed Davidson 1V Well Site, Scott Township, Wayne County, Pennsylvania”, Submitted for Hess Corporation, April 2010
22. URS Corporation “Post-Construction Stormwater Management Plan, Hess Marcellus Shale Site- Davidson 1V, 149 Harris Road, Scott Township, Wayne County, Pennsylvania”, Prepared for Hess Corporation, April 23, 2010

Reference 1

**League of Women Voters of Pennsylvania
Marcellus Shale Natural Gas Extraction Study
2009-2010
STUDY GUIDE V**

**REGULATION AND PERMITTING OF MARCELLUS SHALE
DRILLING**

OVERVIEW

Regulation of Marcellus Shale drilling operations is complex. It involves authorities at federal, state, and municipal levels. The regulatory enigma is perhaps best summed up by Dr. Roxana Witter of the Colorado School of Public Health, Denver, Colorado:

Natural gas is such a unique industry in that there are tens of thousands of point sources, hundreds of thousands across the country. They are essentially hundreds of thousands of factories. The industry is completely different in terms of monitoring or regulating it because it is not like a single, stationary factory or refinery. I don't think public-health researchers or the regulatory agencies have gotten their hands around that problem.
(Vaughn, 2009, October 4)

Because of the rapid push to develop natural gas from Marcellus Shale, various authorities and agencies have been forced to balance significant, long-term concerns with industry demands for expedient reviews and acceptance of drilling permits. Economic concerns, coupled with imperatives to reduce carbon dioxide and promote energy independence, accelerate the timelines required to achieve the essential goals of clear parameters and failsafe enforcement.

In Pennsylvania, the main regulatory entities include, but are not necessarily limited to:

Federal:

- U.S. Environmental Protection Agency (EPA)
- U.S. Fish and Wildlife Service
- U.S. Forest Service
- U.S. Department of Interior - Bureau of Land Management
- Occupational and Safety Health Administration (OSHA)

State:

- PA Department of Environmental Protection (DEP) - Bureau of Oil and Gas Management,
Bureau of Air Quality
- PA Department of Conservation and Natural Resources (DCNR)
- PA Fish and Boat Commission
- PA Emergency Management Agency (PEMA)
- PA Department of Labor and Industry
- PA Department of Transportation (PennDOT)

Municipal/Regional:

- Susquehanna River Basin Commission (SRBC)

Delaware River Basin Commission (DRBC)
PA Municipalities
PA County Courts
PA County Conservation Districts (Note: DEP withdrew the involvement of Conservation Districts in the permitting and review process as of April 2009.)

The above agencies uphold numerous laws and regulations pertinent to Marcellus Shale gas operations including the following:

Federal

Clean Water Act (CWA) - regulates surface water quality, pollutant discharges, and storm water runoff; implements National Pollutant Discharge Elimination System (NPDES) permitting

Safe Drinking Water Act (SDWA) - regulates supply of public drinking water (but does not regulate private wells serving under 25 people); authorizes EPA to determine national standards for maximum allowed contaminant levels; regulates Underground Injection Control (UIC) program to protect ground water from injected contaminants; grants states authority (“primacy”) to implement the SDWA within their boundaries; provides funding for water system improvements

Energy Policy Act of 2005 - includes two exemptions relevant to shale gas drilling: (1) amended the SDWA by clearly excluding hydraulic fracturing from the definition of “underground injection” and (2) amended the CWA to effectively exempt “uncontaminated storm water discharges from oil and gas field activities” from federal NPDES permits (*U.S. Storm water rules*, 2006, January 4)

Clean Air Act - authorizes EPA to set limits on particular air pollutants; authorizes EPA to limit air pollutant emissions from point sources

Endangered Species Act - supports the conservation of threatened and/or endangered plants, animals, and their respective habitats

Resource Conservation and Recovery Act (RCRA) - authorizes EPA to manage the generation, transportation, treatment, storage, and disposal of hazardous waste (Certain oil and gas exploration and production wastes are exempt from Subtitle C of RCRA, but may be covered under Subtitle D or regulations other than RCRA.) (*Ground Water Protection . . .*, 2009, April, p. 38)

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, also known as Superfund) - taxes chemical and petroleum industries; authorizes direct federal response in the event of releases or threatened releases of hazardous substances that may pose a danger to public health or the environment

Emergency Planning and Community Right to Know Act (EPCRA) - protects public health, safety, and the environment from chemical hazards through requirements for planning and reporting

Occupational Safety and Health Act - requires employers to maintain a safe and healthy work environment; administered by the Occupational Safety and Health Administration (OSHA)

Note: Some federal laws (including the SDWA, RCRA, and CERCLA) contain exemptions relevant to Marcellus Shale operations. These are usually very specific in nature and do not necessarily exempt

the industry from complying with other sections of the same law or act, nor do they preclude the states' rights to regulate the same.

Pennsylvania

Oil and Gas Act - regulates oil and gas exploration and production, including permitting, drilling, operating, casing, plugging, reporting, financial responsibility, registration, restoration, and gas storage

Oil and Gas Conservation Law – includes special regulations for “conservation wells” that are wells at least 3,800 feet deep and penetrate the Onondaga formation

Coal and Gas Resource Coordination Act - sets forth means of coordinating activities of coalmine and non-conservation gas well operators

Clean Streams Law - authorizes DEP to control water pollution, especially through regulation of discharges to state waters; provides for DEP's implementation of the federal NPDES program in the state; sets forth enforcement policies and penalties for violations

Solid Waste Management Act - authorizes DEP to regulate solid wastes, including municipal, residual (non-hazardous industrial), and hazardous wastes

Dam Safety and Encroachment Act - regulates activities in, along, or across bodies of water

Safe Drinking Water Act - authorizes DEP to enact the federal SDWA within Pennsylvania; authorizes DEP to set maximum allowable levels for contaminants which the EPA has not yet addressed; does not give the state authority to regulate underground injection wells as PA has opted for a direct federally implemented program (Pennsylvania Department of Environmental Protection, n.d., Ch. 2, p. 12)

Water Resources Planning Act – establishes a state water plan that periodically compiles data on how much water is available, how much is currently being used, how much will be used in the future, and where water use will exceed the available water supply (Swistock, B. & Blanchet, H., n.d.)

Worker and Community Right to Know Act - mandates that employers and chemical suppliers provide identification and hazard data for substances used in any workplace

Vehicle Code - sets forth weight restrictions on vehicles and roadways, as well as posting and bonding requirements

Municipalities Planning Code - addresses zoning, subdivision, and land development at the local level

The Role of the Pennsylvania Department of Environmental Protection

The bulk of Marcellus Shale gas regulatory authority in Pennsylvania falls on the State's Department of Environmental Protection and its Bureau of Oil and Gas Management. DEP's website describes this bureau as:

. . . responsible for the statewide oil and gas conservation and environmental programs to facilitate the safe exploration, development, and recovery of Pennsylvania's oil and gas reservoirs in a manner that will protect the Commonwealth's natural resources and the environment. The bureau develops policy . . . and programs for the regulation of oil and gas development and production, . . . oversees the oil and gas permitting and inspection programs; develops statewide regulation and standards; conducts training programs for industry; and works with the Interstate Oil & Gas Compact Commission and the Technical Advisory Board. (Pennsylvania Department of Environmental Protection, 2009, October 23)

In this capacity, DEP reviews and approves bond and well permits; inspects drilling operations, wells, and environmental controls; permits and inspects waste management; enforces state laws pertaining to resource management, well construction, and waste management; responds to complaints concerning water quality issues; and provides industry-relevant training programs.

To better guide operators in the state's requirements, DEP has created the *Oil and Gas Operators Manual*. This handbook summarizes statutes, regulations, DEP assistance, and procedures relevant to oil and gas operations. It contains information on permitting, drilling, best management practices (BMPs) for erosion and sediment control, environmental controls, waste management practices, plugging of wells, and associated activities. Copies of laws and regulations, forms, bonding guidelines, and information on oil and gas wastewater permitting are included as appendices (Pennsylvania Department of Environmental Protection, n.d.).

In its enforcement capacity, DEP has several tools at its disposal. For example, recently DEP has taken the following actions: issued a cease and desist order to U.S. Energy Development Corporation for numerous repeat violations; fined Gas Field Specialist Inc. for residual wastewater violations; and imposed a temporary stop order on all hydraulic fracturing operations by Cabot Oil and Gas in Susquehanna County after three spills occurred within one week. In each of these instances, accountability was clear-cut. However, this is not always the case. Whether from negligence or accident, violations will occur and, most likely, increase with the expansion of natural gas production. As in the case of Pennsylvania's coal legacy, circumstances can become aggravated over time or responsibility cannot easily be determined. Companies come and go, landowners sell their property, corporate officers transfer, and bankruptcies occur. These events make DEP's enforcement role most challenging.

PERMITS AND APPROVALS

Before drilling a Marcellus Shale well, an operator must obtain several permits and approvals. As of October 2009, these include:

- Well Drilling Application

- Water Management Plan (This supersedes former Application Addendum)

- Erosion, Sediment and Storm Water Control Plan or Permit

 - (A plan is allowable when earth disturbance occurs on fewer than five acres; permit is required if earth disturbance occurs on five or more acres.)

- Preparedness, Prevention and Contingency Plan

- Water Withdrawal Permits

- Obstruction and Encroachment Permit

- Water Quality Management Permit (This is for pit impoundments of a treatment facility.)

- Air Quality Permits (Depending on scope of project, separate permits may be needed for generators, compressors, gas flaring, and diesel trucks.)

In addition, a well site bond must be posted before any drilling activity occurs. This is one way "to ensure that the operator will adequately perform the drilling operations, address any water supply problems the drilling activity may cause, reclaim the well site, and properly plug the well upon abandonment" (Pennsylvania Department of Environmental Protection, 2009, October). To comply with state Vehicle Code regulations a roadway bond is usually required as well.

As interest in Marcellus Shale gas exploration and drilling has steadily climbed, so too has the DEP's related workload. Through August 2009, the number of Marcellus Shale drilling permits granted by the DEP showed a 45 percent gain over the total number of similar permits issued for the

entire 2008 year (Stouffer, 2009, September 1). A new fee structure took effect in April 2009. It raises the initial permit cost for a Marcellus Shale well from a flat \$100 to \$900. There is also a sliding scale surcharge based on well bore type and length. The higher fees help provide funding not only for the increased volume of permit reviews and site inspections but also for the addition of more than 30 new staff members to perform related duties.

Although the DEP handles most shale gas regulatory issues, two federal-interstate compact government agencies also have jurisdiction: The Susquehanna River Basin Commission (SRBC) and the Delaware River Basin Commission (DRBC) have legal authority over water quality and quantity regulation in their respective areas. Because of the large amount of water required for hydraulic fracturing and the equally high volume of industrial-classified wastewater resulting from drilling activities, these commissions are very concerned about natural gas extraction operations. As a result, to drill within SRBC or DRBC areas, operators must apply for and obtain additional approvals from these respective commissions and submit them to the DEP.

The Water Management Plan (listed above) is another important component of the permitting process. Developed through the cooperative efforts of the DEP, SRBC, and DRBC, this plan helps address the high volume of water necessary for drilling, particularly in areas that are not covered by the SRBC and DRBC, i.e., in the Ohio, Potomac, Erie, and Genesee Basins. It contains a set of statewide permitting rules for water withdrawal, usage, treatment, and disposal. Additionally, it requires operators to provide a description of anticipated impacts of drilling and water withdrawals on water resources.

The Role of Municipalities

Municipal regulation of shale gas drilling is extremely limited due to preemption by the Pennsylvania Oil and Gas Act. Aside from road bonding and maintenance agreements, local officials have very little control over the location of wells, on-site safety, water supply protection, permit notification, and well-site bonding. While zoning, subdivision, and/or land development ordinances may be used “to guide growth and development that results from the gas boom and to protect community assets” (Pennsylvania Department of Conservation and Economic Development, n.d.), they cannot be used to regulate gas operations already covered by the Oil and Gas Act. Attempts to clarify their authority, or lack thereof, have left municipalities without recourse except through court action.

For example, local officials have gone to court to reconcile their legislative powers as set forth in the state’s Municipal Planning Code with the largely preemptive state Oil and Gas Act. In February 2009, the Pennsylvania Supreme Court handed down decisions in two pivotal cases, *Huntley & Huntley v. Borough Council of the Borough of Oakmont* and *Range Resources-Appalachia, LLC v. Salem Township*. Although far from identical, both rulings validate some degree of municipal authority through traditional zoning ordinances that designate particular land uses. Not surprisingly, the rulings also leave room for interpretation. But, Holly M. Fishel of the Pennsylvania State Association of Township Supervisors (PSATS) pointed out, “These are important rulings for local government because oil and gas well drilling is now treated like every other use and subject to reasonable land use regulations” (2009, August 19). Elam Herr, a director of the same association further said, “We are not asking to regulate drilling, which would duplicate state regulations, but to have oversight of well locations, like other uses” (Hawbaker, 2009, January).

The PSATS has identified several other salient issues. These include: road damage caused by extensive heavy truck use and 30-year-old road bonding limits far below current repair costs; the lack of notification requirements to the appropriate municipalities and counties once DEP has granted a permit; possible contamination of private water wells; insufficient number of treatment facilities for wastewater; limited resources and expertise available to local and volunteer fire departments for handling well fires; and the current exclusion of oil and gas reserves from property tax assessment (coal and other minerals are allowed to be assessed with a property tax).

The Role of Conservation Districts

Pennsylvania's County Conservation Districts, dedicated to conserving the state's natural resources, are involved at the regional level. These districts are designated "to work in close cooperation with landowners and occupiers, agencies of Federal and State Government, other local and county government units and other entities . . ." Conservation District Law, n.d., Section 2, "Declaration of Policy"). Until April 2009, these well-informed agencies served an important role as part of the review and permitting process with oversight over erosion, sedimentation, and storm water control. As of that date, with virtually no advanced notice, DEP rescinded the involvement of conservation districts by creating a more "efficient" centralized system. Now all reviews are performed by one of DEP's own regional offices. Some question these revised procedures and believe that each conservation district had the local expertise needed for protecting public health and the environment. Others wonder if DEP's staff understands the limitation of the local areas and if recent staff increases are sufficient to manage the ever-increasing workload.

ISSUES AND CONCERNS

Federal Water Issues

Federal regulations address pertinent water issues involved in natural gas extraction from Marcellus Shale. Currently, Congress is considering two bills that address hydraulic fracturing. One is in the Senate (S. 1215) and the other is in the House (H.R. 2766). This Fracturing Responsibility and Awareness of Chemicals (FRAC) Act seeks, among other things, to require drilling companies to fully disclose all chemicals used in their hydraulic fracturing operations and places hydraulic fracturing under the jurisdiction of the federal government. It would remove an exemption from the federal Safe Drinking Water Act (SDWA) for hydraulic fracturing which was inserted in the Energy Policy Act of 2005. Currently, "the EPA does not have authority to investigate the fracturing process under the Safe Drinking Water Act" (Lustgarten, 2009, August 25). Opponents of the FRAC Act maintain that the states already adequately regulate hydraulic fracturing. Proponents argue that federal oversight is imperative to protecting the nation's water supply, especially as it will facilitate broad EPA impact studies. On October 29, 2009, the House approved an appropriations bill that provides for a new EPA study on hydraulic fracturing and its impacts on drinking water supplies. The bill is pending Senate approval and signature by President Obama.

State Water Issues

Compared to some states, Pennsylvania has relatively comprehensive hydraulic fracturing regulations (Wiseman, 2009, Spring) that require full chemical disclosure. A summary of Marcellus Shale fracturing solutions is available at the DEP's website. The specific quantities used in any given solution, however, are still considered proprietary information.

Despite the state regulations already in place, there is "one critical yet overlooked aspect in Pennsylvania, the lack of a requirement to monitor groundwater quality in a drilling zone" (McConnell, 2009, June 10). Testing for water quality before, during, and after drilling is voluntary. Although the state's Clean Streams Law would cover groundwater if pollution did occur, "this state law . . . does not require proactive water quality testing, including aquifers, making pollution detection difficult" (McConnell, 2009, June 10). Compounding the issue is the fact that groundwater contamination by hydraulic fracturing has not been definitively confirmed nor disproved (Gjelten, 2009, September 23).

Another area of growing concern is the elevated level of total dissolved solids (TDS) polluting Pennsylvania's waterways. Sources of TDS range from storm water runoff to sewage and industrial discharges, including gas well drilling. Pennsylvania's water systems are even less able to handle TDS

due to the chronic discharges from abandoned coal mines. Starting in the fall of 2008, samples taken at the Monongahela River exceeded water quality limits for TDS. Although remedial steps have been taken, the problem persists.

In April 2009, the DEP proposed new limits for high TDS wastewater discharges to be in place by January 2011. Until that date, the DEP plans to follow an interim Permitting Strategy that “will focus on those new sources that have the greatest potential to adversely affect the quality of Pennsylvania’s receiving streams. Currently, those sources are wastewaters generated from fracturing and production of oil and gas wells in the Marcellus Shale formation” (Pennsylvania Department of Environmental Protection, 2009, April 11, p.4). This plan addresses the important issue of cumulative effects:

. . . a strategy for permitting these discharges also must involve an allocation strategy to address those situations in which multiple discharges cause or contribute to downstream water quality standards violations, even if only predicted through modeling. An allocation strategy is the plan to allocate the assimilative capacity of the watershed (the acceptable loading in lbs/d of TDS and/or chlorides) among multiple sources. (Pennsylvania Department of Environmental Protection, 2009, April 11, p. 4)

If implemented, this provision would be a significant, new direction for state regulations. As Jan Jarrett, president and CEO of PennFuture testified, “Neither the Oil and Gas Act nor the Oil and Gas regulations in Chapter 78 require, or even contemplate, that DEP will assess the probable cumulative impacts of gas drilling on the natural resources . . .” (2009, March 31, p. 12). This DEP proposal for new limits on high TDS wastewater discharges is being studied and evaluated by the Chapter 95 Task Force. This special group, composed of representatives of industry, environmental, and state agencies, was formed under the guidance of the Water Resources Advisory Committee (one of several DEP advisory groups). Another joint effort is embodied in the Marcellus Shale Wastewater Partnership, a collaborative venture between the DEP and natural gas industry. However, unlike the Chapter 95 Task Force, no members from the environmental sector are involved in this partnership that primarily focuses on wastewater and new technologies designed for its treatment. With regard to erosion, sediment control and storm water management, the DEP has submitted relevant proposed changes. According to Acting Secretary of the DEP John Hanger, “We are shifting the focus of water quality protection from reviewing paperwork to holding permittees more accountable, conducting more on-the-ground inspections to verify that best management practices are being implemented and maintained, and increasing protections for our waterways” (Pennsylvania Department of Environmental Protection, 2009, August 31). One aspect of the proposal is a permit-by-rule option aimed at shortening the permit processing time for “eligible low-risk construction projects” (Pennsylvania Department of Environmental Protection, 2009, August 31). The 90-day public comment period on this particular proposal is scheduled to close November 30, 2009.

Air Quality Issues

Wells drilled after 1980 have been exempted from the National Emission Standards for Hazardous Air Pollutants (NESHAP), which falls under the Clean Air Act. NESHAP regulates small sources of toxic air pollution grouped in close proximity. With this exemption, natural gas and oil drill sites are not treated as an aggregated unit if they are located outside of areas with a population of one million or more (Horwitt, 2009, March; Mall, Buccino, & Nichols, 2007, October; Legal Information Institute, n.d.). Since most Marcellus Shale natural gas wells will not occur in urban areas of this population density, air quality permits will be granted per “point source,” e.g., a compressor engine, a dehydrator. Each of these point sources, basically pieces of mechanical equipment, typically meets the DEP administrative and technology standards. Permits are thus granted routinely within 30 days (Barbara

Hatch, personal communication, August 5, 2009). However, with multiple Marcellus wells likely being drilled in a restricted geographic area, the aggregate pollution of the many small sources of air pollution could become problematic. This has been the experience in Colorado (Earthworks, 2006). To underscore the importance of this issue, the National Park Service has warned its employees of this potential source of air pollution in the Eastern United States (National Park Service, 2008).

To determine the nature and extent of air pollution, air quality monitors are needed. Providing air quality monitors involves both the Federal EPA and the Commonwealth DEP. EPA sets the criteria for air quality monitor placement and the Commonwealth has the ability to place additional monitors in specific places. Currently, many of the counties in which natural gas is being extracted from Marcellus Shale have few, if any, such monitoring devices. As a result, there is no data regarding the nature of air quality prior to drilling, during drilling, and/or during production.

Streamlining the Process

Numerous application forms, coupled with long lead times, have become costly and frustrating to both companies and authorities alike leading to pressure to streamline the process. But streamlining only makes sense if it can be done without sacrificing regulatory integrity. A case in point occurred in August and September 2009 when the Chesapeake Bay Foundation filed appeals with the PA Environmental Hearing Board. The charges assert that the DEP granted drilling permits (for Fortuna Energy Inc. and Ultra Resources, Inc.) without adequately evaluating erosion and sediment control ramifications. The Foundation specifically cited an expedited permitting option implemented by the DEP in April 2009. Matt Royer, an attorney for the Chesapeake Bay Foundation, pointed out that this procedure does not require the DEP to do a technical review concerning “the environmental impacts on wetlands or streams . . . which is illegal under state and federal clean streams law” (Hopey, 2009, September 10). In response to the Chesapeake Bay Foundation's action, the DEP re-evaluated the questionable permits. Its investigation found enough deficiencies to warrant revocation of the permits. As a result of this action by a “watchdog” group, DEP also issued violation notices to several licensed professionals responsible for upholding regulations.

Within its jurisdiction, the SRBC has also addressed the need for expediency. One of its main objectives has been "to streamline the approval process for consumptive use, yet simultaneously require all consumptive water users in the basin to comply with monitoring, reporting, and mitigation requirements. This allows the SRBC to better manage the cumulative impact of such consumptive use" (Susquehanna River Basin Commission, 2009, January, p. 3).

CLOSING

Owing in part to its multi-tiered framework, Marcellus Shale gas drilling regulation is inherently problematic. On an extremely simplified level, much of the confusion and debate revolves around at least one of the following:

- the scope and content of the regulations themselves;
- the process creating the regulations;
- the enforcement of the regulations; and
- accountability for violations.

In addition to vigilant oversight and related enforcement, the nature of regulation and monitoring of natural gas extraction from Marcellus Shale will determine its legacy. It is imperative that all agencies – municipal, regional, state, and federal – work together to preserve the public good and provide clear guidance to the natural gas industry.

Reference 2

This DRAFT Docket has been prepared for the purposes of the scheduled public hearing and may be substantially modified as a result of the public hearing process prior to Commission action.
2/9/2010

DOCKET NO. D-2009-18-1

DELAWARE RIVER BASIN COMMISSION

Special Protection Waters

**Stone Energy Corporation, Matoushek 1 Well Site
Shale Gas Exploration and Development Project
Clinton Township, Wayne County, Pennsylvania**

PROCEEDINGS

This docket is issued in response to an Application submitted to the Delaware River Basin Commission (DRBC or Commission) by Stone Energy Corporation (Stone) on February 13, 2009 for review and approval of a Marcellus Shale natural gas exploration and development project referred to as the Stone-Matoushek Site (Well Site or Well Pad) which contains a single vertical shale gas well referred to as the Matoushek 1 Well (M1) in Clinton Township, Wayne County, Pennsylvania. On March 14, 2008, the Pennsylvania Department of Environmental Protection (PADEP) Oil and Gas Management Program approved its oil and gas Well Permit for the well (Well Permit No. 37-127-20006-00).

The Application was reviewed for approval under Section 3.8 of the *Delaware River Basin Compact*. The Wayne County Planning Commission and Clinton Township have been notified of pending action on this docket. A public hearing on this project was held by the DRBC on February 24, 2010.

A. DESCRIPTION

1. Purpose. The purpose of this project is for the approval of natural gas exploration and development activities of the M1 well from the Marcellus Shale Formation.

2. Natural Gas Well Location. The existing M1 well is located at latitude 41° 41' 6.39" North and longitude 75 ° 21' 58.21" West on the north central portion of an approximate 116-acre parcel (Tax Map Parcel Number 06-1-0212-0016) in Clinton Township, Wayne County, Pennsylvania. The M1 well is situated in the central portion of an approximate 250 foot by 300 foot existing well pad constructed in an agricultural

field between Bethany Turnpike (SR 670) to the north, Johnson Creek Road to the west, and Creamton Drive (SR 247) to the east and the south in Clinton Township, Wayne County, Pennsylvania. The well site is located approximately 0.8 miles southwest of Red Schoolhouse Corner (the intersection of Bethany Turnpike and Creamton Drive).

The M1 well is located in the outcrop area of the Upper Devonian-age Catskill Formation in the Johnson Creek and West Branch Lackawaxen River watersheds in Clinton Township, Wayne County, Pennsylvania. The surficial material at the site is mapped as Wisconsin Till.

3. Area Served. This Docket applies to natural gas exploration and development activities only to the M1 well located on the Well Site. For the purpose of this docket, natural gas exploration and development activities include or are associated with: Well site and associated access road construction, air rotary/mud rotary natural gas well drilling, natural gas well construction and testing, support vehicle tire cleaning, dust control on access roads, storage of fresh water, hydraulic fracturing well stimulation, hydraulic fracturing chemical storage, flow-back water storage, transport and disposal of all domestic and non-domestic wastewaters and site reclamation on the well pad surrounding the M1 well. Any additional wells proposed at the M1 well site or any property leased by Stone requires separate DRBC docket approval.

4. Definitions.

Conductor casing- A short length of large-diameter pipe used to stabilize the upper portion of the borehole.

Domestic wastewater- Sanitary waste collected in portable self-contained toilets.

Drill cuttings- Rock cuttings and related mineral residues generated during the drilling of an oil or gas well.

Flowback- Return of fluids used in the stimulation process to the surface. While a large proportion of flowback returns to the surface shortly after hydraulically fracturing a well, flowback may return to the surface along with produced water over the production life of the well.

Natural gas exploration and development activities- All activities necessary for the development of and extraction of natural gas including but not limited to well pad and associated access road construction, air rotary/mud rotary natural gas well drilling, natural gas well construction and testing, support vehicle tire cleaning, dust control on access roads, storage of fresh water, hydraulic fracturing well stimulation, hydraulic fracturing chemical storage, flow-back water storage, transport and disposal of all domestic and non-domestic wastewaters, and site reclamation.

Non-Domestic wastewater- Brines, produced water, hydraulic fracturing flowback and any water containing brines, drilling muds, stimulation fluids, well servicing fluids, oil, production fluids or drilling fluids, and cement mixer or cement truck washout water.

Produced water- Water and other fluids brought to the surface during production of oil or gas.

Production casing- A string of pipe other than surface casing and coal protective casing which is run for the purpose of confining or conducting hydrocarbons and associated fluids from one or more producing horizons to the surface.

Surface casing- A string of pipe which extends from the surface and that segregates and protects fresh groundwater and stabilizes the hole.

Tophole water- Water that is brought to the surface while drilling through the strata containing fresh groundwater and water that is fresh groundwater or water that is from a body of surface water. Tophole water may contain drill cuttings typical of the formation being penetrated but is not polluted or contaminated by additives, brine, oil or man induced conditions.

Well site- The area occupied by the equipment or facilities necessary for or incidental to the drilling, production or plugging of a well.

5. Physical Features.

a. **Site Description.** The M1 well site is located in the Glaciated Low Plateau Section of the Appalachian Plateaus Physiographic Province. This area is characterized by rounded hills and valleys of low to moderate relief. The well pad is located in the northern portion of an open field with wooded areas to the north and west of the drilling site. Access to the drilling site is provided by an improved existing farm road located along the perimeter of the open area with an entrance to Creamton Road.

The drilling site is located on a crest of a low-relief ridge at an approximate elevation of 1,545 feet above mean sea level (MSL). Drainage at the drilling site slopes west toward Johnson Creek, located approximately 3,000 feet from the drilling site, and south toward an unnamed tributary of the West Branch Lackawaxen River, located approximately 1,400 feet from the drilling site. Slopes in the immediate area surrounding the drilling site range from approximately 2 to 4 percent. Based on U.S. Fish and Wildlife Service (FWS) National Wetlands Inventory database, the closest mapped wetlands are located at the headwaters of the unnamed tributary of West Branch Lackawaxen River, approximately ¼ mile east of the well location. The well location conforms to the setback limitations from existing buildings, water wells, streams, springs, bodies of water, and wetlands greater than 1 acre in size as required by Pennsylvania Oil and Gas Act Chapter 2 Section 601.205 *Well Location Restrictions*.

b. Well Pad and Well Description. The existing well pad is an approximate 250 foot by 300 foot level area containing an existing well and a lined fresh water impoundment. The perimeter of the well pad contains an earthen berm. The pad area and access roads were first stripped of topsoil to expose firm sub-base material. The topsoil has been stockpiled around the well pad. Coarse aggregate was used where additional stabilization was necessary. In order to control runoff and minimize soil erosion, a diversion swale was constructed on the upslope (north) side of the drilling pad and filter fabric fencing was used on the down-slope sides of the well pad. The docket holder indicated that design and construction of the drilling pad incorporated non-structural and structural best management practices (BMPs). BMP's utilized at the site included siting the well/disturbed area outside of sensitive and special value features and minimizing total disturbed area during clearing, grading, and grubbing. Structural BMP's included, silt fencing, road stabilization with geosynthetics and coarse aggregate, seeding and mulching, straw bail barriers, and temporary drains and swales. The Erosion and Sediment Control Plan was posted at the entrance of the site during well construction.

The M1 well is a vertical well drilled between May 9, 2008 and June 2, 2008 to a total depth of 8,350 feet below ground surface for the purpose of natural gas extraction. The well was air drilled from the ground surface to a depth just above the Marcellus Shale. The Marcellus Shale was cored with 3 % potassium chloride (KCl) water. Drilling muds were not used in the construction of the well. The deepest freshwater was encountered in the Devonian-age Catskill Formation at a depth of approximately 665 feet. Drill cuttings and fluids were captured in a lined drill pit excavated in the drilling pad in proximity to the well. Tanks were used to store tophole water during the drilling of the gas well. After drilling, the cuttings were solidified by mixing with cement and disposed of in the lined drill pit in accordance with PA Code § 78.61.

The M1 well log included as part of the Application indicates that the well was constructed in accordance with PADEP Chapter 78 Subchapter D regulations. The well contains a total of three (3) strings of nested casing (conductor casing, surface casing, and production casing). The conductor casing (13 3/8-inch diameter) was installed in a 17 1/2 inch borehole and extends from the ground surface to a depth of 710 feet. The entire annular space was filled with cement. The surface casing (9 5/8-inch diameter) was placed in a 12 1/4-inch diameter borehole and extends from the ground surface to a depth of 1,964 feet. The entire length of the annular space was filled with cement. The surface casing was pressure tested to a maximum pressure of 1,500 pounds per square inch (psi) for 5 minutes. The purpose of the pressure test is to ensure the integrity of the cemented surface casing to effectively isolate fresh water bearing zones from the wellbore prior to drilling through deeper, non-fresh water or other fluid-bearing zones. The production casing (5 1/2-inch diameter) was placed in an approximate 8-inch diameter borehole from the ground surface to a depth of 8,350 feet (bottom of the drilled well). The annular space was filled with cement from the production casing seat at 8,350 feet up to a depth of 5,500 feet.

The M1 well and well site were constructed in accordance with PA Chapter 78 and PADEP Permit No. 37-127-20006-00.

c. **Access Roads.** An improved existing farm road was used to access the well site containing M1. The improved access road is approximately 30 feet in width and 1,200 feet in length and stabilized with compacted crushed stone aggregate. Silt fencing was installed along the length of the road. The total acreage of the access road is approximately 0.8 acres.

d. **Drill Cuttings and Water Containment/Disposal.** During drilling, drilling fluids and cuttings were contained in a drill pit excavated and maintained in accordance with PA Chapter 78 Subchapter C. The water generated during drilling was removed from the drill pit and disposed of at Valley Joint Sewer Authority in Athens, PA. The drill cuttings were solidified and disposed of in the M1 Well drilling pit in accordance with the requirements of PA Chapter 78 Subchapter C.

e. **Water Source/Water Storage Facility.** The docket holder will only utilize water from the DRBC approved surface water withdrawal located on the West Branch Lackawaxen River (WBLR) to support the natural gas exploration and development project at the M1 well. The surface water withdrawal project (Docket No. D-2009-13-1) is being processed concurrently with the M1 Well docket. Fresh water used for site activities will be stored in a 0.8 million gallon capacity, lined, earthen impoundment constructed and maintained in accordance with PA Chapter 78.

f. **Onsite Chemical Storage Facilities.** All chemicals, fuels, lubricants, etc. required for natural gas exploration and development at the site will be properly stored on the well pad in accordance with the Preparedness Prevention and Contingency Plan (PPC Plan) as required by 25 PA Code Chapters 91.34 and 78.55.

g. **Wastewater Containment, Sampling, Transport, Treatment and Disposal.**

i. **Non-Domestic Wastewater.** Non-domestic wastewater shall be stored on site in a manner to prevent its release except in accordance with this docket. Approximately 6,200 barrels of non-domestic wastewater and top-hole water generated during the drilling of the well was removed from the drill pit via vacuum-truck and transported to a disposal facility. Stone informed the Commission that hydraulic fracturing flowback generated from additional work at the site shall be transferred to steel tanks for storage, reuse, or disposal. As such, the use of steel tanks for non-domestic wastewater storage is required at the M1 Well Site as stated in Condition No II.u. in the Decision Section of this docket. The docket holder is encouraged to reuse the flow-back water for well stimulation in accordance with Condition II.m. in the Decision section of this docket. Non-domestic wastewater that cannot be reused for well stimulation will be removed from the site via tanker truck and conveyed to treatment and disposal facilities approved by the DRBC (if in the DRB and subject to Commission approval) as

well as by the applicable state/Federal agency (if inside or outside of the DRB). No on-site discharge of such non-domestic wastewaters, other than as allowed in this docket is permitted.

ii. Domestic Wastewater. Domestic wastewater shall be stored on site in portable self-contained toilets and in a manner to prevent its release onsite. All domestic wastewater shall be conveyed to treatment and disposal facilities approved by the DRBC (if in the DRB and subject to Commission approval) as well as by the applicable state/Federal agency (if inside or outside of the DRB).

iii. Sampling and Record Keeping. Prior to removal from the M1 Well Site, all non-domestic wastewater shall be sampled and the results recorded in accordance with the Operation Plan required by Condition No. II.e. in the Decision section of this docket. Samples shall be representative of the non-domestic wastewater that shall be transported to the DRBC and State-approved off-site treatment and disposal facility. The chemical analysis of non-domestic wastewater must include the following: acidity, alkalinity (total as CaCO_3), aluminum, ammonia nitrogen, arsenic, barium, benzene, beryllium, biochemical oxygen demand, boron, bromide, cadmium, calcium, chemical oxygen demand, chlorides, chromium, cobalt, copper, ethylene glycol, gross alpha, gross beta, hardness (total as CaCO_3), iron-dissolved, iron-total, lead, lithium, magnesium, manganese, MBAS (surfactants), mercury, molybdenum, nickel, nitrite-nitrate nitrogen, oil & grease, pH, phenolics (total), radium-226, radium-228, selenium, silver, sodium, specific conductance, strontium, sulfates, thorium, toluene, total dissolved solids, total kjeldahl nitrogen, total suspended solids, uranium, and zinc. Domestic wastewater can be transported offsite without sampling; however, it may be subject to sampling at or by the treatment facility.

iv. Wastewater Treatment and Disposal. All wastewater, domestic and non-domestic shall be conveyed to the treatment facility designated in the M1 Well Site Operation Plan or as otherwise approved in writing by the DRBC Water Resource Branch Manager as well as by the applicable state/Federal agency (if inside or outside of the DRB).

h. Supporting Ancillary Facilities. The proposed ancillary facilities include Stone's WBLR surface water withdrawal point and the off-site wastewater treatment facilities that will accept the domestic and non-domestic wastewater. Additional facilities will be required to convey and process the natural gas from M1 Well Site including pipelines, compressor stations, separators/liquid storage tanks, etc, however, the locations of these facilities have not been specified.

i. Cost. The overall cost of this project is estimated to be \$3,000,000.00.

B. FINDINGS

This docket is issued in response to an Application submitted to the Delaware River Basin Commission (DRBC or Commission) by Stone Energy Corporation (Stone) for review and approval of a natural gas exploration and development project at its M1 Well site in Clinton Township, Wayne County, Pennsylvania. The Commission recognizes that each natural gas well also will be subject to the review of the environmental agency of a signatory state in which the project is located. The Commission staff coordinates with and, where feasible, will utilize the review process and approvals of the applicable state or federal agency to minimize duplication of effort and redundant requirements imposed on project sponsors.

On June 6, 2008 the Executive Director of the DRBC issued a determination to Stone by certified letter that natural gas exploration and development at the M1 Well site may have substantial impacts on the water resources of the Delaware River Basin (DRB). As such, the DRBC requested that an Application for the M1 Well Site be submitted to the Commission for review and approval.

Stone drilled and cased the M1 well without Commission approval. On December 10, 2008, a settlement agreement between Stone and the Commission required Stone to submit an application to the DRBC for review and approval of the well and to pay a fine as specified in the settlement agreement.

On February 13, 2009, Stone submitted an application to the Commission for approval of the M1 Well. Additional information pertaining to the Application was submitted to the Commission on June 11, 2009.

On May 19, 2009, the Executive Director issued the “*Determination of the Executive Director Concerning Natural Gas Extraction Activities In Shale Formations Within The Drainage Area of Special Protection Waters*” that clarified which natural gas related activities require Commission review and approval (EDD).

SPECIAL PROTECTION WATERS

The project is located in the area of the Delaware River Basin that is designated by the Commission as Special Protection Waters (SPW) as set forth in the DRBC *Water Quality Regulations* (WQR). The SPW designation and associated regulations are designed to protect waters with exceptional value including without limitations existing high water quality in applicable areas of the Delaware River Basin. Article 3.10.3A.2.e.1). and 2). of the *WQR, Administrative Manual - Part III*, requires that projects subject to review under Section 3.8 of the Compact that are located in the drainage area of Special Protection Waters must submit for approval a Non-Point Source Pollution Control Plan (NPSPCP) that controls the new or increased non-point source loads generated within the portion of the docket holder’s service area which is also located within the drainage area of Special Protection Waters.

The M1 Well Site is located within the drainage area to SPW. Therefore, the NPSPCP plan requirement is applicable to this project. This project includes the constructed well pad (completed), well drilling (completed), and well stimulation through hydraulic fracturing. Water necessary for the well stimulation at the M1 Well Site is being processed concurrently with this docket (Docket No. D-2009-013-1). The docket holder submitted a general NPSPCP with the Application. However, no additional site construction activities, well stimulation, or water staging approved by this docket shall take place at the M1 Well Site until a site specific NPSPCP including measures to control stormwater both during and post construction on the site has been submitted to the Commission and approved by the Executive Director and any other necessary federal, state, and local authorizations have been issued.

WATER STORAGE

Water brought to the M1 Well Site from the Commission-approved West Branch Lackawaxen River site will be stored in a lined impoundment constructed and maintained in accordance with PADEP Chapter 78. Under no circumstances shall any material other than surface water originating from a Commission-approved source or precipitation be stored or be allowed to enter the impoundment. If water in this storage facility or the storage facility comes into contact with hydraulic fracturing chemicals, flow back water, or other chemicals and contaminants, all water in the storage facility shall be considered non-domestic wastewater and handled as discussed below.

Unused water from any of the docket holder's Commission approved M1 well natural gas development and extraction site activities in the DRB may be transported to and used at other Commission-approved well pads targeting shale formations controlled by the docket holder in the DRB, with the written approval of the Executive Director. Such transfers shall also be reported to the Commission.

No water, fracturing fluids, flowback water, or otherwise (e.g. cement mixer wash-out, truck wash water, etc.) shall be discharged to waters of the DRB except in accordance with written approvals from the Executive Director and/or the appropriate state agency (Condition II.g. in the Decision section of this docket).

WELL STIMULATION

The docket holder has indicated that the vertical Marcellus shale gas well at the M1 Well Site will be stimulated for production through slick-water hydraulic fracturing. The docket holder has advised the Commission that the well stimulation will involve the injection of approximately 1.0 million gallons (mg) of water with propping agents (i.e. sand of various grain sizes) and hydraulic fracturing additives through the steel production casing into the Marcellus Shale formation underlying the lease holding(s) at approximately 8,200 feet below land surface (elevation 6,655 feet below mean sea level).

The injection will occur at the M1 Well over a period of approximately three days at injection pressures from 5,500 pounds per square inch (psi) to 7,000 psi. Injection of the hydraulic fracturing additives and solutions detailed in the Application into the target formation is acceptable to the Commission as the M1 well was installed by the docket holder in accordance with PA Chapter 78 Subsection D, and approved by the PADEP in Permit No. 37-127-20006-00.

WASTEWATER

Flowback Water

Following well stimulation, Stone estimates that approximately 30% of the estimated 1.0 million gallons of water used for hydraulic fracturing will be returned to the surface as flowback. Flowback from the M1 Well will be piped from the wellhead directly into steel frac tanks for temporary storage on the M1 Well Site, in accordance with Condition II.u. in the Decision Section of this docket.

Treatment and Reuse of On-site Generated Wastewaters

Treatment and reuse of onsite generated non-domestic wastewaters is not proposed at this site. However, the docket holder is encouraged to use the flowback water for well stimulation in accordance with Condition II.m. in the Decision section of this docket.

Recovered fracturing fluids may be recycled for use in natural gas well stimulation activities at the docket holder's Commission-approved natural gas well pads in the DRB with written approval of the Executive Director. Any reuse shall also be reported to the Commission in accordance with the reporting requirements in the Decision Section of this docket. Otherwise, no recovered fracturing fluids shall be used for any purpose other than hydraulic fracturing at natural gas wells targeting shale formations.

Wastewater Disposal

The docket holder has indicated that all non-domestic wastewater including flowback water will be removed from the site via tanker truck and conveyed to treatment and disposal facilities located outside of the DRB. Such disposal is an exportation of wastewater subject to review and approval under Article 2.3 of the Commission's Water Code. Currently, there are no wastewater treatment and disposal facilities within the DRB that are approved to accept these non-domestic wastewaters. In addition docket Condition No. II.m. in the Decision section of this docket requires the docket holder to implement a continuous program to encourage water conservation in all types of use within the facilities served by this docket including the reuse and recycling of flowback waters. The Decision section of this docket also contains conditions concerning the offsite disposal location and the tracking and reporting of non-domestic wastewaters transported from the project site. Therefore, the Commission staff recommends approval of the proposed exportation of non-domestic wastewater. No on-site discharge of such non-domestic wastewaters, other than as allowed in this docket is permitted. Any such

discharge shall be reported to the Project Review Section of the DRBC in accordance with Condition No. II.q. in the Decision Section of this docket.

The docket holder has indicated that domestic wastewater shall be collected in portable, self-contained toilets. When necessary, the toilets will be transported to the sewage treatment facility approved in the Operation Plan (described below). No on-site discharge of such domestic wastewaters is permitted.

The project is designed to conform to the requirements of the *Water Code* and *Water Quality Regulations* of the DRBC.

The natural gas well associated with this project was designed and constructed to conform to the casing and cementing requirements of Sections 78.81-.87 of the PADEP Oil and Gas Regulations. It has been determined by the Commission that these casing and cementing requirements satisfy the Basinwide Groundwater Requirements located in Section 3.40 of the Commission's Water Quality Regulations. These casing construction requirements are designed to sufficiently protect the designated uses of the ground waters of the Delaware River Basin.

The cuttings generated during drilling of the M1 well were solidified and buried in a lined pit on-site in accordance with PA Chapter 78 regulations. Non-domestic wastewater generated during drilling of the M1 well was removed from the site and disposed of at Valley Joint Sewer Authority in Athens, PA.

The DRBC estimates that the well stimulation through hydraulic fracturing, results in a consumptive water use of 100 percent of the total water used. The DRBC definition of consumptive use is defined in Article 5.5.1.D of the *Administrative Manual – Part III – Basin Regulations – Water Supply Charges*.

M1 WELL SITE OPERATION PLAN

In accordance with Condition II.e. of the Decision section of the docket, at least 45 days prior to the scheduled initiation of any activity at the M1 Well Site, the docket holder shall submit an Operation Plan (OP) for the M1 Well Site to the Executive Director. The OP shall include the specifics of the site operations, detailing at a minimum, the procedures necessary to comply with the conditions in the Decision section of this docket. In accordance with Condition II.e., no additional construction or natural gas development and extraction activities at the M1 Well Site is permitted until the OP is approved in writing by the Executive Director. The following shall also be included in the M1 Well Site Operations Plan:

Pre-Alteration Groundwater Quality Survey Plan. Prior to initiation of hydraulic fracturing at the M1 Well, the docket holder will submit a pre-hydraulic fracturing groundwater quality survey plan, receive Executive Director approval, and conduct the groundwater quality survey. The plan shall include an inventory and the locations of any

artificial penetrations including groundwater wells within a 1,000 ft radius of the project well. If no existing wells are identified within this distance, the search radius should be extended up to 2,000 feet from the gas well. The plan shall indicate the proposed sampling procedures to be conducted at a representative number of identified wells spaced around the proposed natural gas well. Prior to hydraulic fracturing at the M1 Well, water samples shall be collected and the samples submitted to a PADEP-certified laboratory for analysis of the following parameters: acidity, alkalinity (total as CaCO₃), aluminum, ammonia nitrogen, arsenic, barium, benzene, beryllium, boron, bromide, cadmium, calcium, chlorides, chromium, cobalt, copper, ethylene glycol, gross alpha, gross beta, hardness (total as CaCO₃), iron-dissolved, iron-total, lead, lithium, magnesium, manganese, MBAS (surfactants), mercury, molybdenum, nickel, nitrite-nitrate nitrogen, oil & grease, pH, phenolics (total), radium-226, radium-228, selenium, silver, sodium, specific conductance, strontium, sulfates, thorium, toluene, total dissolved solids, total kjeldahl nitrogen, total suspended solids, uranium, and zinc.

Wastewater Storage and Handling Details. The OP shall include the details of how domestic and non-domestic wastewater will be stored and handled on the project site.

Wastewater Disposal Locations. The OP shall include a list of the treatment sites where these domestic and non-domestic wastewaters will be disposed. The facility locations, state permit numbers, and acceptance agreements shall be included in the OP.

Measuring, Recording, and Records Maintenance System. The docket holder shall develop and submit with the OP a measuring, recording, and records maintenance system. The measuring, recording, and records maintenance system will include the proposed means with which to measure and record the amount of all water transported to the site by truck or any other means, the amount of water used at the site, the amount of water and fracturing fluids/ chemicals used in the natural gas well stimulation process, the amount of flowback recovered after stimulation, the amount and chemical composition of non-domestic wastewaters produced and stored at the site, and the amount and chemical composition of non-domestic wastewaters transported off-site for treatment and disposal. The method of sampling and analysis of non-domestic wastewater shall also be detailed in this plan. Measuring and record keeping activities shall be required for all non-domestic wastewater including produced water and flowback separated from the natural gas during the operational life of the natural gas well. The system will also record the truck number, license plate number and disposal location for each truck load of non-domestic wastewater transported off site.

Reporting System. The docket holder shall include in the OP the method for complying with the reporting requirements in accordance with docket conditions II.k. and II.l. in the decision section of the docket.

Preparedness Prevention and Contingency Plan (PPC Plan). The docket holder shall submit with the OP the PPC Plan that is required for Oil & Gas Wells as outlined in 25 PA Code Chapters 91.34 and 78.55.

The project does not conflict with the Comprehensive Plan and is designed to prevent substantial adverse impact on the water resources related environment, while sustaining the current and future water uses and development of the water resources of the Basin.

C. DECISION

I. Effective on the approval date for Docket No. D-2009-18-1 the project and the appurtenant facilities described in the Section A “Description” shall be added to the Natural Gas Database maintained by the DRBC.

II. The project and appurtenant facilities as described in the Section A “Description” are approved pursuant to Section 3.8 of the *Compact*, subject to the following conditions:

a. Docket approval is subject to all conditions, requirements, and limitations imposed by the PADEP in Well Drilling Permit No. 37-127-20006-00, and such conditions, requirements, and limitations are incorporated herein, unless they are less stringent than the Commission’s.

b. The lease holding, well pad site, and natural gas well, and operational records shall be available at all times for inspection by the DRBC.

c. The docket holder shall submit a Non-Point Source Pollution Control Plan (NPSPCP) for the M1 Well Site in accordance with Section 3.10.3.A.2.e, of the DRBC Water Quality Regulations to the Executive Director of the DRBC at least 45 working days prior to the scheduled initiation of any additional site clearing or construction at the well pad site. The NPSPCP and erosion and sedimentation control plan shall be designed in accordance with the more stringent of Commission and PADEP requirements. Prior to commencing any site clearing or construction work at the M1 Well Site, the docket holder shall obtain Executive Director’s written approval for the NPSPCP, as well as, any other necessary federal, state, and local authorizations. The NPSPCP shall describe erosion and sedimentation controls to be implemented at the site and shall include measures to control stormwater both during and post construction. The post-construction portion of the plan shall describe the final site conditions including a pre- and post-construction project hydrograph analysis, permanent facilities, equipment, access roads, and all sediment and erosion and stormwater control structures necessary after final site restoration has been achieved.

d. Sound practices of excavation, backfill and reseedling shall be followed at the well pad site and any associated appurtenances to minimize erosion and prevent non-point source pollutants from leaving the site. The docket holder shall abide by all state and local erosion and sediment control and storm water management control legislation.

e. **M1 WELL SITE OPERATION PLAN (OP).** As described in the Findings section of this docket, the docket holder shall submit the OP for approval in writing by the Executive Director. No activities other than those required to maintain or correct existing erosion and sedimentation controls shall be conducted at the M1 Well Site until the OP plan has been approved. The OP plan shall include the following:

- i. Pre-alteration groundwater quality survey plan.
- ii. Wastewater storage and handling details.
- iii. Wastewater disposal locations.
- iv. Measuring, Recording, and Records Maintenance System.
- v. Reporting system.
- vi. Preparedness Prevention and Contingency Plan (PPC Plan).

f. The docket holder shall demonstrate to the satisfaction of the Commission that all surface waters that are withdrawn for the purposes of hydraulic fracturing this well including, but not limited to flow-back fluids, produced brines, and drilling fluids have been treated and disposed of in accordance with applicable state and federal law.

g. No unused water withdrawn from the source approved for use at this well site, fresh or otherwise shall be discharged to waters of the DRB without the written approval of the DRBC and the appropriate state agency. All domestic and non-domestic wastewaters shall be treated at an approved treatment and discharge facility as provided for in the OP in Condition II.e. above.

h. Nothing herein shall be construed to exempt the docket holder from obtaining all necessary permits and/or approvals from other State, Federal or local government agencies having jurisdiction over this project or activities conducted under this project.

i. Upon completion of construction of the approved project, the docket holder shall submit a statement to the DRBC, signed by the docket holder's engineer or other responsible agent, advising the Commission that the construction has been completed in compliance with the approved plans, giving the final construction cost of the approved project and the date the project is placed in operation.

j. This docket approval shall expire three years from date below unless prior thereto the docket holder has commenced operation of the subject project or has expended substantial funds (in relation to the cost of the project) in reliance upon this docket approval.

k. The project natural gas well hydraulic fracturing volume and flow-back discharge volume shall be metered with an automatic continuous recording device

or equivalent that measures to within 5 percent of actual flow. An exception to the 5 percent performance standard, but no greater than 10 percent, may be granted if maintenance of the 5 percent performance is not technically feasible or economically practicable. A record of hydraulic fracturing stimulation volume and flow-back discharge volume from the project natural gas well shall be maintained, and monthly totals shall be reported to the DRBC after completion of natural gas well stimulation activities and shall be available at any time to the Commission if requested by the Executive Director.

l. The volume of all non-domestic wastewaters removed from the M1 Well Site shall be recorded and maintained and monthly totals shall be reported to the DRBC in accordance with the approved OP.

m. The docket holder shall implement to the satisfaction of the Commission, the continuous program to encourage water conservation in all types of use within the facilities served by this docket approval. This includes the reuse and recycling of flow-back waters to the greatest extent possible at the site. The docket holder will report to the Commission on the actions taken pursuant to this program and the impact of those actions as requested by the Commission.

n. No brines, flowback, produced waters or any other waste shall be used for any well, well pad site, or lease area not contained within this docket unless approved in writing by the Executive Director.

o. A complete application for the renewal of this docket, or a notice of intent to cease the operations (withdrawal, discharge, etc.) approved by this docket by the expiration date, must be submitted to the DRBC at least 12 months prior to the expiration date below (unless permission has been granted by the DRBC for submission at a later date), using the appropriate DRBC application form. In the event that a timely and complete application for renewal has been submitted and the DRBC is unable, through no fault of the docket holder, to reissue the docket before the expiration date below, the terms and conditions of this docket will remain fully effective and enforceable against the docket holder pending the grant or denial of the application for docket approval.

p. The issuance of this docket approval shall not create any private or proprietary rights in the water of the Basin, and the Commission reserves the rights to amend, alter or rescind any actions taken hereunder in order to insure the proper control, use and management of the water resources of the Basin.

q. The docket holder shall report to the Commission Project Review Section Supervisor any violation of the docket conditions within 48-hours of the occurrence or upon the docket holder becoming aware of the violation. In addition, the docket holder shall report in writing any violations of the approved operations plan or any other docket conditions to the DRBC Project Review Section Supervisor within three days of reporting the incident. The docket holder shall also provide a written explanation of the causes of the violation within 30 days of the violation and shall set forth the

action(s) the docket holder has taken to correct the violation and protect against a future violation.

r. If the monitoring required herein, or any other data or information demonstrates that the operation of this project significantly affects or interferes with any designated uses of ground or surface water, or if the docket holder receives a complaint regarding this project, the docket holder shall immediately notify the Executive Director of any complaints and unless excused by the Executive Director, shall investigate such complaints. The docket holder shall direct phone call notifications of complaints involving water resources to the DRBC Project Review Section at 609-883-9500, extension 216. Oral notification must always be followed up in writing directed to the Executive Director. In addition, the docket holder shall provide written notification to all potentially impacted users of wells or surface water users of the docket holder's responsibilities under this condition. Any ground or surface water user which is substantially adversely affected, rendered dry or otherwise diminished as a result of the docket holder's project withdrawal, shall be repaired, replaced or otherwise mitigated at the expense of the docket holder. A report of investigation and/or mitigation plan prepared by a hydrologist shall be submitted to the Executive Director as soon as practicable or within the time frame directed by the Executive Director. The Executive Director shall make the final determination regarding the validity of such complaints, the scope or sufficiency of such investigations, and the extent of appropriate mitigation measures, if required.

s. The Executive Director may modify or suspend this approval or any condition thereof, or require mitigating measures pending additional review, if in the Executive Director's judgment such modification or suspension is required to protect the water resources of the Basin.

t. For the duration of any drought emergency declared by either Pennsylvania or the Commission, water service or use by the docket holder pursuant to this approval shall be subject to the prohibition of those nonessential uses specified by the Governor of Pennsylvania, the Pennsylvania Emergency Management Council, PADEP, or the Commonwealth Drought Coordinator to the extent that they may be applicable, and to any other emergency resolutions or orders adopted hereafter by the Commission.

u. All non-domestic wastewaters including, but not limited to, brines, flow-back water, produced waters, etc. must be temporarily stored on-site in steel, water-tight tanks at a minimum unless the docket holder has received written approval from the Executive Director to use an alternative method of storage. All wastewaters will be removed from the site in accordance with the approved OP.

v. The Commission has determined that the review of the reports and requests for modifications and approvals developed under the above docket and any amendments or changes thereto will continue to cause the Commission to expend exceptional efforts and costs. As such, Commission staff will continue to maintain a record of all time and expenses associated with the post-docket approval reviews of the project and associated deliverables. A fee in the amount of 100% of these costs will be

assessed on a quarterly basis. In the event of a docket amendment or renewal, the larger of actual project review costs or the calculated project review fee will be charged.

w. The docket holder and any other person aggrieved by a reviewable action or decision taken by the Executive Director or Commission pursuant to this docket may seek an administrative hearing pursuant to Articles 5 and 6 of the Commission's *Rules of Practice and Procedure*, and after exhausting all administrative remedies may seek judicial review pursuant to Article 6, section 2.6.10 of the *Rules of Practice and Procedure* and section 15.1(p) of the Commission's *Compact*.

BY THE COMMISSION

APPROVAL DATE: , 2010

EXPIRATION DATE: , 2020

DRAFT

Reference 3

Robson 1 Gas Well Chesapeake Appalachia, LLC
Pennsylvania State Department of Environmental Protection
Permit 37-127-20008-00, Issued 2/26/09

March 15, 2009

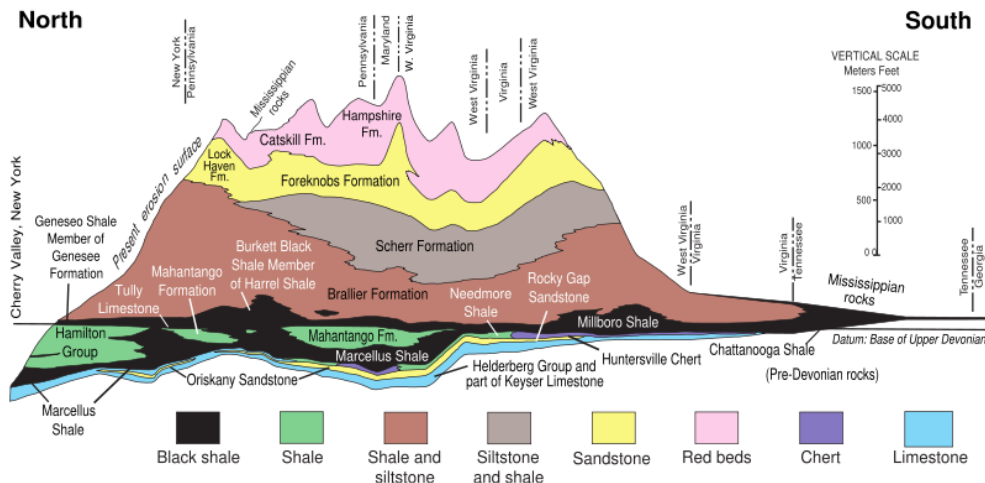
1. At the particular GIS location of the Robson well, at what depth (top and bottom) is the Marcellus? At what depth (top and bottom) is the Oriskany?

Well Location: Chesapeake Appalachia, LLC's permit application requested to drill a 8898 ft. True Vertical Depth (TVD) well into the Oriskany formation at latitude 41° 37' 39.52" N, and longitude 75° 12' 11.68" W, in Wayne County, Oregon Municipality, Pennsylvania. See attached Google Earth Maps that show the actual well location. The well is proposed to be drilled 4.55 miles NE of Honesdale, Pennsylvania.



The application provided no information on geologic formation depths, well design or wellbore construction path. This lease was unitized, and in doing so, geologic information would have been submitted to the State of Pennsylvania. I was not able to locate the unit application on the web (if needed this could be requested and would likely provide more detailed, site specific geologic information).

However, general geologic stratigraphy is available for this region from the State of Pennsylvania and the USGS, showing the Oriskany Sandstone lies beneath the Marcellus Shale in Wayne County.



The Oriskany Sandstone and the Marcellus Shale are both Devonian aged formations. The Marcellus Shale lies above the Oriskany Sandstone and is believed to be the source rock for the Oriskany Sandstone gas accumulations in places where the Oriskany Sandstone geology created a good structural trap such an anticline to contain the gas. In general, shales are believed to be a common source rock for gas. Gas from shale accumulations may migrate in the subsurface and be stored in more porous sandstone formations, if a structural trap is available in the sandstone formation to contain the gas. The Needmore Shale (which lies above the Oriskany Sandstone, and below the Marcellus Shale) is also believed to be a potential gas source rock (see USGS Figure 47).

This area of Wayne County is known to be Oriskany structural play (see USGS Figure 48). Although the Oriskany Sandstone is known to be present in Wayne County, whether it contains gas is not well known. Most of the Oriskany gas fields developed to date are located several hundred miles to the west.

The bottom of the Devonian Formation at the Robson 1 Well area is approximately 10,000' deep (see USGS Figure 4). In this area, the USGS predicts the Marcellus Shale to be a mature gas source rock (see USGS Figure 31), rather than a gas development source itself (see USGS Figure 13). While Marcellus Shale in Wayne County may provide the source rock for gas stored in the Oriskany Sandstone, it is not predicted by the USGS to be a good area shale gas recovery itself (see USGS Figure 15).

The State of Pennsylvania oil and gas field map of 2007 (see Map 10) shows no known deep gas fields in the Wayne County area. Thus, I assume this well must be an exploratory well, seeking to determine if the Oriskany deep gas play extends east of known western gas fields in Pennsylvania.

I was not able to locate any maps showing the exact depth of the Oriskany or Marcellus formations, but the Devonian formation is believed to be at least 10,000 feet deep. The Oriskany is not the deepest formation in the Devonian. There are other shale and limestone formations in the Devonian that underlie the Oriskany. Thus, if the Devonian is at least 10,000 feet deep in Wayne County, it would make sense that the Oriskany would be shallower at a depth of 8898' TVD.

The State of Pennsylvania maps show the Marcellus Shale is approximately 150-250 thick and overlies the Oriskany sandstone formation in the Wayne County area.¹

2. Description of the Oriskany as a porous sandstone layer - is this an accurate description for it wherever the Oriskany label is applied? Is this an accurate description for it at the Robson site?

Yes. The USGS characterizes the Oriskany as a lower Devonian sandstone formation.

The Oriskany Sandstone is a white to light gray, texturally mature, coarse-grained to medium-grained quartz sandstone (Edmunds and Berg, 1971; Patchen and Harper, 1996), whose type section is located at Oriskany Falls, New York (Vanuxem, 1839). The

¹ *Pennsylvania* Geology, Bureau of Topographic and Geologic Survey, Pennsylvania Department of Conservation and Natural Resources, Vol. 38, No. 1, Spring 2008

Oriskany Sandstone and equivalent stratigraphic units are more quartz-rich and coarser-grained to the east, and intergranular cement is more abundant to the east (Patchen and Harper, 1996). In most places, the sandstones are cemented by calcite, and silica cement is common near the top of the formation at some locations (Edmunds and Berg, 1971; Patchen and Harper, 1996).²

The State of Pennsylvania reports that the Oriskany Sandstone was a significant source of commercial natural gas in New York and Pennsylvania in the 1930s.³ The Oriskany gas was typically developed several hundred miles west of Wayne County.

The U.S. Geological Survey (USGS) recently completed an assessment of the technically recoverable undiscovered hydrocarbon resources of the Appalachian Basin Province. The assessment province includes parts of New York, Pennsylvania, Ohio, Maryland, West Virginia, Virginia, Kentucky, Tennessee, Georgia and Alabama. The assessment was based on six major petroleum systems, which include strata that range in age from Cambrian to Pennsylvanian. The USGS reports that Devonian Shale-Middle and Upper Paleozoic TPS contains some of the more productive source rocks and reservoirs for hydrocarbons in the Appalachian Basin Assessment Province. USGS notes that Devonian shale (such as the Marcellus Shale) may contain gas in the eastern part of Pennsylvania because they are autogenic (self-sourced) gas reservoirs, however, the gas may have migrated and been stored in sandstone formations such as the Oriskany Sandstone, a mature, quartzose sandstone, which is known to be up to 360' thick. The USGS characterizes the Oriskany formation as a sandstone formation that collected gas in structural traps located along the crests of anticlines.⁴

² U.S. Department of the Interior, U.S. Geological Survey, Open-File Report Series 2006-1237, Assessment of Appalachian Basin Oil and Gas Resources: Devonian Shale–Middle and Upper Paleozoic Total Petroleum System, by Robert C. Milici and Christopher S. Swezey. 2006.

³ *Pennsylvania Geology*, Bureau of Topographic and Geologic Survey, Pennsylvania Department of Conservation and Natural Resources, Vol. 38, No. 1, Spring 2008

⁴ U.S. Department of the Interior, U.S. Geological Survey, Open-File Report Series 2006-1237, Assessment of Appalachian Basin Oil and Gas Resources: Devonian Shale–Middle and Upper Paleozoic Total Petroleum System, by Robert C. Milici and Christopher S. Swezey. 2006.

**Reference 4
(Excerpt)**



The Oil and Gas Industry's Exclusions and Exemptions to Major Environmental Statutes



The Oil and Gas Industry's
Exclusions and Exemptions to
Major Environmental Statutes

Renee Lewis Kosnik, MSEL, JD
Research Director, Oil and Gas Accountability Project

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A PROJECT OF EARTHWORKS
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Earthworks 1612 K St. N.W., #808 ■ Washington DC 20006
www.earthworksaction.org

Executive Summary

The oil and gas industry enjoys sweeping exemptions from provisions in the major federal environmental statutes intended to protect human health and the environment. These statutes include the:

- **Comprehensive Environmental Response, Compensation, and Liability Act**
- **Resource Conservation and Recovery Act**
- **Safe Drinking Water Act**
- **Clean Water Act**
- **Clean Air Act**
- **National Environmental Policy Act**
- **Toxic Release Inventory under the Emergency Planning and Community Right-to-Know Act**

This lack of regulatory oversight can be traced to many illnesses and even deaths for people and wildlife across the country. There are a variety of chemicals used during the many phases of oil and gas development. These chemicals also produce varying types of waste throughout these processes. Because of the exemptions and exclusions, toxic chemicals and hazardous wastes are permeating the soil, water sources and the air threatening human health to an alarming extent. In order to adequately remedy the negative impacts on human health and the environment, the following recommendations must be addressed:

- 1) Crude oil and petroleum must be covered under the *Comprehensive Environmental Response, Compensation, and Liability Act* in order to protect human health and the environment from spills and leaks of hazardous and carcinogenic materials on well sites. This is the only way to currently assist overburdened federal and state programs in light of the exponential growth of oil and gas development in the United States.
- 2) To protect human health and the environment, oil field wastes must be regulated under the *Resource Conservation and Recovery Act* in order to ensure the proper handling and disposal of hazardous and carcinogenic wastes generated by oil and gas development. Otherwise, the petroleum industry will continue to dispose of oil field waste in ways that can pollute soil, surface and groundwater.
- 3) Hydraulic fracturing must be regulated by the Environmental Protection Agency under the *Safe Drinking Water Act* in order to adequately protect the United State's drinking water supply from the harmful chemicals used during this process. This recommendation includes a total ban on the use of diesel fuel as one of the additives in the hydraulic fracturing process.
- 4) Stormwater discharges from all oil and gas development must be regulated under the *Clean Water Act* by the federal government in

order to provide the states with a proper foundation from which to build adequate stormwater programs that will protect human health and the environment from expanding oil and gas development.

Emissions from all oil and gas facilities must be aggregated under the *Clean Air Act* in order to ascertain the true hazardous effect on air quality. Also, hydrogen sulfide must be re-established as a hazardous air emission under the Clean Air Act in light of the current available data regarding its negative impacts on human health and the environment.

Because of the disruptive nature of oil and gas activities on human health and the environment, none of these activities ought to qualify for the categorical exclusion under the *National Environmental Policy Act*. All oil and gas activities must be assessed for impacts on the environment under the more comprehensive environmental assessment and environment impact statement in order to properly fulfill the intentions of the statute.

The petroleum industry must be made to disclose the chemicals used during the development stages under the *Toxic Release Inventory within the Emergency Planning and Community Right-to-Know Act*, in order to ensure that human health and the environment can be protected from these often-hazardous and carcinogenic substances.

One of the goals for the Oil and Gas Accountability Project is to help communities and citizens better understand and protect themselves from the health and environmental impacts associated with toxic oil and gas chemicals and wastes. The following report explains these exemptions, how they apply to oil and gas development, and the consequences to human health and the environment that are left behind. To learn more about the devastating impacts of oil and gas development, read *Oil and Gas at Your Door? A Landowner's Guide to Oil and Gas Development* and *Our Drinking Water At Risk: What EPA and the Oil And Gas Industry Don't Want Us to Know About Hydraulic Fracturing*, available at: www.ogap.org.

Reference 5

Subject: Cabot #2 Well
From: David Kovach <David.Kovach@drbc.state.nj.us>
Date: Tue, 04 Aug 2009 17:05:30 -0400
To: jimmy@arbor-resources.com

Dear Mr. Eichstadt,
I am writing concerning the application for the Cabot #2 well submitted to the Commission by Arbor Operating, LLC (Arbor) on April 16, 2009. As you are aware, on May 19, 2009, the Executive Director of the DRBC issued a determination concerning proposed and existing natural gas wells and associated appurtenances completed in the Marcellus Shale and other shale formations in the drainage area of Special Protection Waters in the Delaware River Basin. As the Cabot #2 natural gas well that Arbor has proposed lies within the drainage area to the special protection waters known as the Lower Delaware and is proposed to be drilled into a shale formation, it is covered under the Executive Director determination. As Arbor has stated that they propose to develop the well if a viable quantity of natural gas is discovered, the well is not therefore being drilled solely for exploratory purposes and is again covered under the Executive Directors Determination. The well may not be covered under the determination if a cap and plug plan is submitted to the Commission and it is affirmed that the well will be properly abandoned upon completion and collection of necessary exploratory data. The groundwater withdrawal rate of significantly less than 100,000 gpd during any consecutive 30-day period detailed in the application is not specifically covered by DRBC regulations, but all water supplies, no matter what the withdrawal volume, will be considered from a potential impact/interference standpoint when an application for a natural gas well in Marcellus or other shale proposed in special protection waters is being reviewed.

The application for the Cabot #2 well as submitted requires additional information if natural gas development at the well is to be considered for DRBC approval. These include, but are not necessarily limited to the following:

- 1) A revised applicant statement and appropriate fee, related to the actual total project costs that would include the drilling and construction of the Cabot #2 well.
- 2) The necessary information included in the attached draft natural gas project submission requirements word document.

If the well will be used solely for exploratory purposes, then an appropriate cap and plug plan must be submitted to the Commission affirming that the well will be properly abandoned upon completion and collection of necessary scientific data.

Please contact me if you have any further questions,
Dave

--
David Kovach, P.G.
Geologist, Project Review Section
Delaware River Basin Commission
(p) 609-883-9500 ext 264
(f) 609-883-9522
(e) david.kovach@drbc.state.nj.us

Shale gas drilling project submission requirements.doc

Content-Type: application/msword
Content-Encoding: base64

**Reference 6
(Excerpt)**

A View of the River

Luna B. Leopold

*Harvard University Press
Cambridge, Massachusetts
London, England*

of the stream systems throughout the year. The most useful supporting evidence is the information obtained from local residents.

. . . All perennial streams are published regardless of length.

All intermittent streams are published that are longer than 2,000 feet. . . . In applying these rules they should be modified where necessary to produce a consistent portrayal, especially in the extension of streams in headwater drainage.

. . . Streams at the source and upper part of a drainage system are an integral and important part of a complete drainage system. In general, headwater drainage shown on the published map should terminate no higher than about 1,000 feet from the divide, or at the upper confluence of streams, whichever appears most appropriate.

These instructions to the staff preparing a topographic map show that the headward limits of the blue lines do not reflect any statistical characteristic of streamflow occurrence. The specification that the blue line terminate no higher than about 1,000 feet from the watershed divide does not reflect differences in hydrologic performance among various combinations of climate, topography, and geology. Rather, the choice of what is to be shown as an interrupted blue line is based on "consistent portrayal," as the instructions state. The geomorphologist must provide a personal rationale and evidence for designation of first-order tributaries in any given area.

It would be desirable to have some criteria resulting from field studies that would give specific statistical or physical significance to the type of line used on a topographic map. The criteria might stem from a study on the frequency or duration of flow in channels of different sizes or drainage areas. For example, it would be useful if one knew that the solid blue line became dash-dot where a streamflow changed from 90 percent of the time to 80 percent. This change might be a function of drainage area within a given physiographic or lithologic unit. The determination would have to be specific, but also easy in mapmaking practice.

I tried to devise a way of defining hydrologic criteria for the channels shown on topographic maps and developed some promising procedures. None were acceptable to the topographers, however. I learned that the blue lines on a map are drawn by nonprofessional, low-salaried personnel. In actual fact, they are drawn to fit a rather personalized aesthetic. It is surprising that geographers, long interested in mapmaking, have not considered this problem and devised some useful and simple rules based on generalizations from field facts.

In Figure 12.6 appear three versions of the drainage network of Watts Branch above Viers Pasture near Rockville, Maryland. The first map

Figure 12.6
1965 topo
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Europe

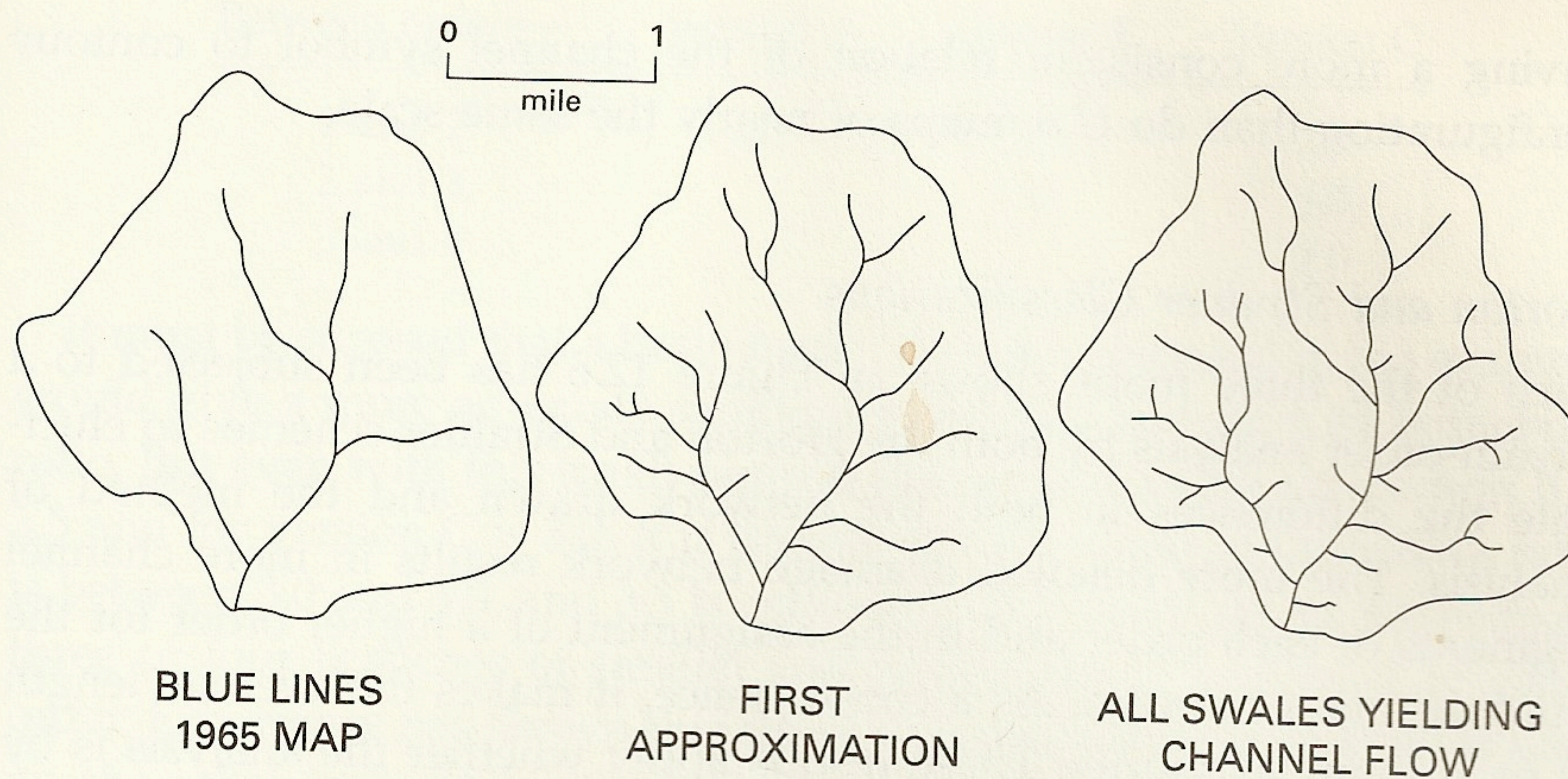


Figure 12.6 Three versions of the channel network. At left, blue lines printed on a 1965 topographic map; at center, a more detailed net; at right, careful analysis of the contour pattern to include all significant swales or draws. Watts Branch, Maryland; drainage area 3.7 square miles.

shows the drainage net depicted by blue lines on the 1965 edition of the topographic map. This net includes both solid blue and dot-dash blue lines, indicating streams as depicted on the published quadrangle map.

The middle version is the drainage net derived from study of the contour lines of the topographic map, in an effort to draw a stream channel in the principal contour reentrants. The channels are drawn in a consistent manner, so that the same contour configuration applies to each draw or swale considered important enough to be represented as a channel.

Finally, the third version is an attempt to add to the drainage net all swales considered prominent enough to yield channel flow during storms, an admittedly subjective choice. For consistency, headwater tips of tributaries shown in the second version are extended headward to be comparable in drainage area and distance from divide to the smallest newly added channels.

The three maps show the differences in drainage network that might logically be derived from the same topographic map. From both field experience and network analysis, preference would be for the third or most detailed version. To construct such a complete map, however, requires considerable time in excess of what is needed for the second, intermediate version. Such extra effort may be precluded if a network map is required for a large area. Either the second or the third version is preferable for nearly all purposes to the first. Comparable maps for some European countries, especially Belgium, are close to the second version,

Reference 7



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATERSHED MANAGEMENT
BUREAU OF OIL AND GAS MANAGEMENT

| |
|--------------------------|
| OFFICIAL USE ONLY |
| ID # _____ |
| Date Received _____ |

**NOTICE OF INTENT FOR COVERAGE
UNDER THE EROSION AND SEDIMENT CONTROL GENERAL PERMIT (ESCGP-1)
FOR EARTH DISTURBANCE ASSOCIATED WITH OIL AND GAS EXPLORATION,
PRODUCTION, PROCESSING OR TREATMENT OPERATIONS OR TRANSMISSION FACILITIES**

READ THE STEP-BY-STEP INSTRUCTIONS PROVIDED IN THIS PERMIT APPLICATION PACKAGE BEFORE COMPLETING THIS FORM.
PLEASE PRINT OR TYPE INFORMATION IN BLACK OR BLUE INK.

| | | | | | |
|--|------------------------------|--|----------------------------------|------------------------------------|----------|
| APPLICATION TYPE | NEW <input type="checkbox"/> | RENEWAL <input type="checkbox"/> | REVISED <input type="checkbox"/> | EXPEDITED <input type="checkbox"/> | |
| SECTION A. E&S PLANNING REQUIREMENTS | | | | | |
| 1. Total Project Area (Acres): _____ | | Total Disturbed Area (Acres): _____ | | | |
| 2. Project Name | | | | | |
| 3. Project Type | | | | | |
| <input type="checkbox"/> Oil/Gas Well <input type="checkbox"/> Pipeline/Transmission Facility <input type="checkbox"/> Processing Facility <input type="checkbox"/> Treatment Facility | | | | | |
| <u>Project Description</u> | | | | | |
| _____ | | | | | |
| _____ | | | | | |
| _____ | | | | | |
| 4. Please provide the latitude and longitude coordinates for the center of the project. The coordinates should be in degrees, minutes and seconds (dd mm ss.ss) | | | | | |
| Latitude ____degrees ____minutes ____seconds | | Longitude ____ degrees ____ minutes ____ seconds | | | |
| Reference Datum: <input type="checkbox"/> North American Datum 1983 <input type="checkbox"/> North American Datum 1927 <input type="checkbox"/> World Geodetic System 1984 | | | | | |
| Horizontal Collection Method: <input type="checkbox"/> GPS <input type="checkbox"/> Interpolated from U.S.G.S. topo map <input type="checkbox"/> DEP's eMAP | | | | | |
| 5. U.S.G.S. 7.5 min. Quad Map Name _____ | | | | | |
| 6. Will the project be conducted as a phased permit project? <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, Include Master Site Plan | | | | | |
| Estimated Timetable for Phased Projects <input type="checkbox"/> Additional sheet(s) attached | | | | | |
| Phase No. or Name | Description | Total Area | Disturbed Area | Start Date | End Date |
| | | | | | |
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| 7. Existing and previous land use | |
| 8. Other Pollutants: Will the stormwater discharge contain pollutional substances other than sediment? <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, explain and provide any available quantitative data. | |
| 9. Will fuels, chemicals, solvents, other hazardous waste or materials be used or stored on site during earth disturbance activities? Yes <input type="checkbox"/> No <input type="checkbox"/> (If yes, a PPC Plan is required) | |
| 10. Receiving Water/Watershed Name <hr style="width:80%; margin-left:0;"/> Chapter 93 Designated Use or Existing Use Stream Classification <input type="checkbox"/> High Quality <input type="checkbox"/> Exceptional Value <input type="checkbox"/> Other Secondary Water | Name of Municipal or Private Separate Storm Sewer Operator |

SECTION B. APPLICANT INFORMATION

| | | | | |
|---|------------|-------|---------|-----|
| Applicant's Last Name | First Name | MI | Phone | FAX |
| Organization Name or Registered Fictitious Name | | | Phone | FAX |
| Mailing Address | City | State | ZIP + 4 | |
| Co-Applicant's Last Name | First Name | MI | Phone | FAX |
| Organization Name or Registered Fictitious Name | | | Phone | FAX |
| Mailing Address | City | State | ZIP + 4 | |

SECTION C. SITE INFORMATION

| | | | | |
|-------------------------------------|--------------|--------------------------|--------------------------|--------------------------|
| Site Name | | | | |
| Site Location | | | | |
| Site Location -- City | State | ZIP+4 | | |
| Detailed Written Directions to Site | | | | |
| County | Municipality | City | Boro | Twp |
| | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

SECTION D. SITE RESTORATION PLAN AND POST CONSTRUCTION STORMWATER BMPS
See the Attached Instructions on how to Complete This Section

| |
|---|
| 1. Site restoration should be designed to use natural measures to eliminate pollution, infiltrate runoff, not require extensive construction and maintenance efforts, promote pollutant reduction, preserve the integrity of stream channels, and protect the physical, chemical and biological qualities of the receiving water. |
|---|

Check those that apply:

- The Site Restoration Plan and PCSM BMPs are developed to be consistent with an Act 167 Stormwater Management Plan approved by the Department after January 2005.
- The Site Restoration Plan and PCSM BMPs are developed to be consistent with existing local ordinances.
- The Site Restoration Plan and PCSM BMPs were developed to employ water quality design features and the PCSM BMPs will manage any net increase in stormwater runoff volume resulting from the 2-year/24-hour frequency storm.

2. Site Restoration Plan Contents

- a. Written narrative Yes No
- b. Plan drawings Yes No
- c. Identification and location of PCSM BMPs. Such PCSM BMPs should address: (1) infiltration; (2) volume and rate control; and (3) water quality treatment Yes No
- d. Operation and maintenance procedures Yes No
- e. Supporting calculations and measurements (when necessary): Yes No

Supporting calculations and measurements are required only if the answers to both questions 1 and 2 below are NO.

- 1) The approximate original contours of the project site will be maintained or replicated insuring the preservation of the pre-construction drainage pattern and features; and the disturbed areas will be re-vegetated or otherwise stabilized with pervious material. Yes No
- 2) PCSM BMPs will be employed which: use natural measures to eliminate pollution, do not require extensive construction and maintenance efforts, promote pollutant reduction, and are capable of controlling the net increase in the volume and rate of stormwater runoff from a 2-year/24-hour storm event, and the net increase in the volume of post construction runoff is infiltrated and/or dissipated away from surface waters of the Commonwealth. Yes No

If the responses to both questions 1 and 2, above are NO, please provide the requested post construction stormwater information in the Data Table for Supporting Calculations and Measurements below:

3. Explain how post construction stormwater runoff volume will be managed if BMPs will not infiltrate the total net increase in stormwater runoff volume. (Net increase volume = Post construction runoff volume minus Pre-construction runoff volume):

- N/A (check N/A only if BMPs **will** infiltrate all of the Net Change in Runoff)

- 4. Are there existing post construction stormwater management BMPs at this Location/Site? Yes No
Do you plan to use and/or expand these existing post construction stormwater management BMPs? Yes No N/A

5. **SUMMARY TABLE FOR SUPPORTING CALCULATION AND MEASUREMENT DATA**
See the Instructions on how to Complete This Section

- Check this box if supporting calculations and measurements are NOT required in accordance with Section D.2.e on the preceding page.

| Design storm frequency _____ Rainfall amount _____ inches | Pre-construction | Post Construction | Net Change |
|---|------------------|-------------------|------------|
| Impervious area (acres) | | | |
| Volume of stormwater runoff (acre-feet) without planned stormwater BMPs | | | |
| Volume of stormwater runoff (acre-feet) with planned stormwater BMPs | | | |
| Stormwater discharge rate for the design frequency storm | | | |

SUMMARY DESCRIPTION OF POST CONSTRUCTION STORMWATER BMPs

6. In the lists below, check the BMPs identified in the Site Restoration Plan. The primary function(s) of the BMP listed in the functions column (infiltration/recharge; detention/retention; water quality). Additional functions may be added if applicable to that BMP. List the stormwater volume and area of runoff to be treated by each BMP type when calculations are required. If any BMP in the Site Restoration Plan is not listed below, describe it in the space provided after "Other".

| BMP | Function(s) | Volume of stormwater treated | Acres treated |
|---|-------------------------|------------------------------|-------------------------|
| Bio-infiltration areas <input type="checkbox"/> Infiltration Trench <input type="checkbox"/> Infiltration Bed <input type="checkbox"/> Infiltrated Basin | Infiltration/Recharge | _____ _____ _____ | _____ _____ _____ |
| Natural Area Conservation <input type="checkbox"/> Streamside Buffer Zone <input type="checkbox"/> Wetland Buffer Zone <input type="checkbox"/> Sensitive Area Buffer Zone <input type="checkbox"/> Pre-Construction Drainage Pattern Intact | Infiltration/Recharge | _____ _____ _____ | _____ _____ _____ |
| Stormwater Retention <input type="checkbox"/> Constructed Wetlands <input type="checkbox"/> Wet Ponds <input type="checkbox"/> Retention Basin | Detention/Retention | _____ _____ _____ | _____ _____ _____ |
| Sediment and Pollutant Removal <input type="checkbox"/> Vegetated Filter Strips <input type="checkbox"/> Brush Barriers <input type="checkbox"/> Detention Basins | Water Quality Treatment | _____ _____ _____ | _____ _____ _____ |
| Access Road Design <input type="checkbox"/> Road Crowning <input type="checkbox"/> Ditches <input type="checkbox"/> Turnouts <input type="checkbox"/> Culverts <input type="checkbox"/> Roadside Vegetated Filter Strips | Infiltration/Recharge | _____ _____ _____ | _____ _____ _____ |
| Stormwater Energy Dissipaters <input type="checkbox"/> Level Spreaders <input type="checkbox"/> Riprap Aprons <input type="checkbox"/> Upslope Diversions <input type="checkbox"/> _____ | Infiltration/Recharge | _____ _____ _____ | _____ _____ _____ |

SECTION E: SPECIAL PROTECTION WATERS

List the reasonable and cost effective best management practices (BMPs) that will be used to meet the requirements of 25 Pa. Code Chapter 93. Recommended Special Protection Watershed BMPs are found in the Oil and Gas Operators Manual.

| | | |
|--|---|--|
| <input type="checkbox"/> Minimize disturbed area | <input type="checkbox"/> Alternative Site Analysis | <input type="checkbox"/> Permanently stabilized ditches and Channels |
| <input type="checkbox"/> Earth Moving activities limited during rainstorms and spring thaw | <input type="checkbox"/> Roads stabilized with crushed rock and/or vegetation | <input type="checkbox"/> Rock lined culvert inlets and outlets |
| <input type="checkbox"/> No direct discharge to surface water | <input type="checkbox"/> Immediate Stabilization | <input type="checkbox"/> Proper vegetative cover techniques |
| <input type="checkbox"/> Designed temporary and permanent BMPs for surface water diversion | <input type="checkbox"/> Prompt site restoration | <input type="checkbox"/> 100 ft. vegetated riparian buffer |
| <input type="checkbox"/> Other | <input type="checkbox"/> Stabilized Upslope Diversion | |

SECTION F: COMPLIANCE REVIEW

Yes No

Is the applicant in violation of any existing permit, regulation, order, or schedule of compliance issued by the Department within the last 5 years? If yes, provide the permit number or facility name, a brief description of the violation, the compliance schedule (including dates and steps to achieve compliance) and the current compliance status. (Attach additional information on a separate sheets, when necessary)

SECTION G. CERTIFICATION BY PERSON PREPARING APPLICATION

I do hereby certify to the best of my knowledge, information, and belief, that the Erosion and Sediment Control and PCSM/Site Restoration Plan are true and correct, represent actual field conditions, and are in accordance with the 25 Pa. Code Chapters 78 and 102 of the Department's rules and regulations. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

| | | |
|-----------------------------------|---------------------------|-------------------|
| Print Name | Signature | Professional Seal |
| Company | | |
| Address | | |
| Phone | | |
| Most Recent DEP Training Attended | Location _____ Date _____ | |

EXPEDITED REVIEW PROCESS

In addition to the certification required above applicants using the expedited permit review process must attach an E&S and PCSM/Site Restoration Plan developed and sealed by a licensed professional engineer, surveyor or professional geologist. The plans shall contain the following certification:

I do hereby certify to the best of my knowledge, information, and belief, that the Erosion and Sediment Control and PCSM/Site Restoration Plan and Post Construction BMPs are true and correct, represent actual field conditions and are in accordance with the 25 Pa. Code Chapters 78 and 102 of the Department's rules and regulations. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

SECTION H. APPLICANT CERTIFICATION

Applicant Certification. I certify under penalty of law that this document and all attachments were prepared by me or under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. The responsible official's signature also verifies that the activity is eligible to participate in the permit, and that the applicant agrees to abide by the terms and conditions of the permit. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

| | |
|-----------------------------------|--|
| Print Name and Title of Applicant | Print Name and Title of Co-Applicant (if applicable) |
| Signature of Applicant | Signature of Co-Applicant |
| Date Application Signed | Date Application Signed |

Notarization

| | |
|---|------------------------------|
| Sworn to and subscribed to before me this | Commonwealth of Pennsylvania |
| _____ day of _____, 20_____ | County of _____ |
| Notary Public | My Commission expires _____ |

AFFIX SEAL


**NAME, ADDRESS AND PHONE NUMBER OF INDIVIDUAL TO BE CONTACTED
IF ADDITIONAL INFORMATION IS REQUIRED**

| | |
|---------|-------|
| Name | |
| Address | Phone |

Reference 8

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Oil and Gas Management Program
WELL LOCATION PLAT

| | | |
|--------------------|---|---------|
| DEP USE ONLY | DEP Application Tracking # AS# 636450 | 3/11/08 |
| | Permit # 12-7-20006 | |

| |
|---|
|  Denotes location of well on topo map. |
| True Latitude: NORTH 41° 41' 06.39" |
| True Longitude: WEST 75° 21' 58.21" |

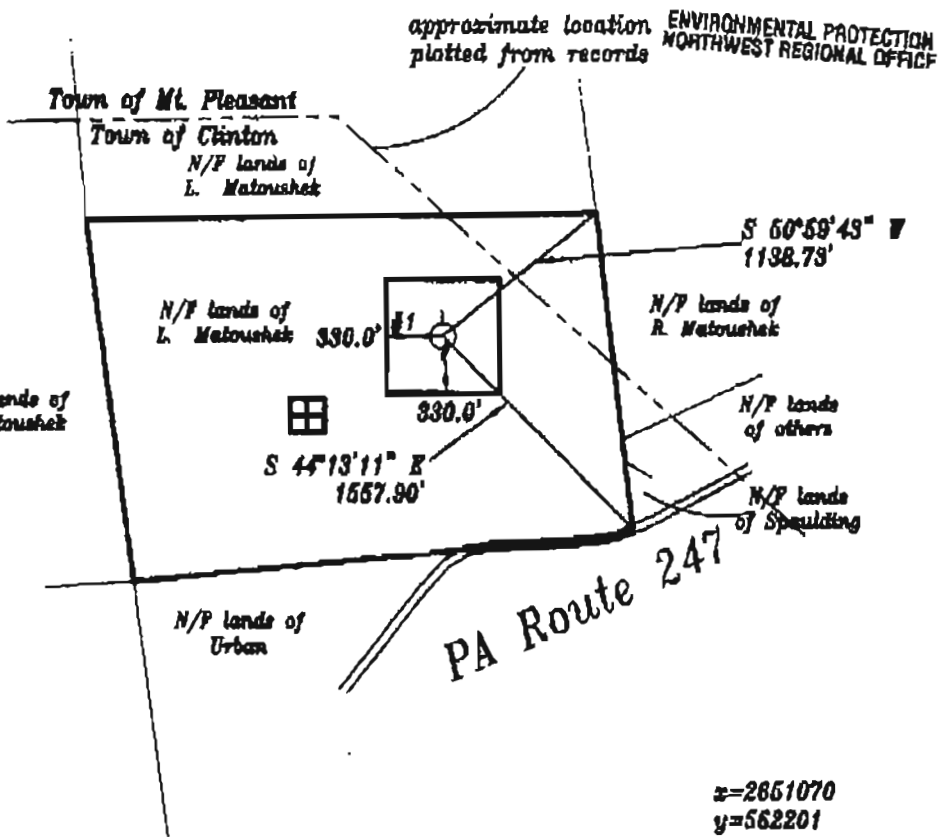
Well is located on topo map 8496 feet south of latitude 41 ° 42 ' 30 "

RECEIVED
MAR 06 2008

Well is located on topo map

8998 feet west of longitude

75 ° 20 ' 00 "




NORTH
D. Michael Conover

Surveyor or Engineer: D. Michael Conover, License # 028272 E, Phone # (716) 379-7815, Exp. # 6669, Date: Rev. 3/3/08, December 12, 2007, Scale: 1" = 1000', Tract Acreage: 139.45 AC

| | | | |
|--|--|---|---|
| Lat. & Long. Method: Static GPS, Accuracy: ± 10 ft., Datum: NAD 83 | | Elevation Method: Staked, Accuracy: ± 10 ft., Datum: 1988 Quad: Dec. 11, 2007 | |
| Applicant/Well Operator Name: Stones Energy Corporation | | Well (Farm) Name: Matoushek | Well # / Serial #: 1 / 1 |
| Address: PO Box 5280 Lafayette, LA. 70506 | | County - Code: Wayne | Municipality: Clinton / Mt. Pleasant |
| Surface Landowner: Louis Matoushek | | 1866 712 Quadrangle Map Name: Aldenville , Map Section: 4 | |
| Surface Lessee: | | Angle & Course of Deviation (Drilling): | Surface Elevation: 1545 ± , Anticipated Total Depth: 8150 ± |
| Surface Owner of Water Purveyor with a Water Supply within 1,000 ft. | Approximate Course and Distance to Water Supply: | Owner, Lessee, or Operator of Workable Coal Seam: | Name of Coal Seam Owned, Leased, or Operated: |
| | | | |
| | | | |
| | | | |

Reference 9



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

WELL PERMIT

| DEP USE ONLY | |
|--|-------------------|
| Permittee's eFACTS ID 277879 | Auth ID 826657 |
| Watershed Name Shehawken Rattlesnake Creek | Quality HQ |

| | | | |
|---|---|---|---|
| Permittee NEWFIELD APPALACHIA PA LLC | OGO.# OGO-67425 | Permit Number 37-127-20013- | Date Issued 04/23/2010 |
| Address 363 N SAM HOUSTON PKWY E STE 2020 | | Farm Name & Well Number DL TEEPLE 1 1 | Well Serial # |
| | | Municipality Manchester | County Wayne |
| HOUSTON, TX 770602424 | | 7½' Quadrangle Name Long Eddy | Map Section # 1 |
| Phone (281) 847-6031 | Project # | Latitude 41-49-39.9000 | Longitude -75-11-53.3300 |
| Surf Elev at Site 1516 feet | Anticipated Total Depth 8350 feet | Well Type GS | Offset distances referenced to NE corner of map section. South 2304 feet West 8580 feet |

This permit covering the well operator and well location shown above is evidence of permission granted to conduct activities in accordance with the Oil and Gas Act and the Oil and Gas Conservation Law, if the well is subject to that act and any rules and regulations promulgated thereunder, subject to the conditions contained herein and in accordance with the application submitted for this permit. This permit does not convey any property rights.

This permit and the permittee's authority to conduct the activities authorized by this permit are conditioned upon operator's compliance with applicable law and regulations.

Notification must be given to the district oil and gas inspector, the surface landowner and political subdivision of the date well drilling will begin at least 24 hours prior to commencement of drilling activities.

The permittee hereby authorizes and consents to allow, without delay, employees or agents of the Department to have access to and to inspect all areas upon presentation of appropriate credentials, without advance notice or a search warrant. This includes any property, facility, operation or activity governed by the Oil and Gas Act, the Oil and Gas Conservation Law, the Coal and Gas Resource Coordination Act and other statutes applicable to oil and gas activities administered by the Department. The authorization and consent shall include consent to the Department to collect samples of wastewaters or gases, to take photographs, to perform measurements, surveys, and other tests, to inspect any monitoring equipment, to inspect the methods of operation and disposal, and to inspect and copy documents required by the Department to be maintained. The authorization and consent includes consent to the Department to examine books, papers, and records pertinent to any matter under investigation pursuant to the Oil and Gas Act or pertinent to a determination of whether the operator is in compliance with the above referenced statutes. This condition in no way limits any other powers granted to the Department under the Oil and Gas Act and other statutes, rules and regulations applicable to these activities as administered by the Department.

This permit does not relieve the operator from the obligation to comply with the Clean Streams Law and all statutes, rules and regulations administered by the Department.

Special Permit Conditions:

This permit expires 04/23/2011 unless drilling is commenced on or before that date and prosecuted with due diligence.

Steve Mustafsa for S. Craig Lobins
Regional Oil and Gas Program Manager

Stephen Watson
Oil & Gas Inspector

2 Public Square
Wilkes-Barre, PA 18711-0790

570-826-2320
Telephone

RECEIVED

APR 29 2010

OIL & GAS



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL & GAS MANAGEMENT PROGRAM

| | |
|-----------------|---------------------------------|
| DEP USE ONLY | |
| AUTH # | CNC #1250 |
| Check # 7063245 | Amount \$1500.00 + 250 = \$1500 |

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL

| | | | | | |
|------------------------------------|---------------------------|-------|---------------------------------------|-----------------|-----------------------|
| Notes <i>Vertical Test Well</i> | OGO # | 67425 | Objection Date - Do not issue before: | Well Permit # | 127-20013 |
| | Bond # | 12382 | 4/5/10 | Special Cond. | A B C D E F |
| | C: 3/11/10 Re: 4/5/10 Ac: | | Date Approved: | Watershed Name: | Shehawken Rattlesnake |
| | INV: 4-22-10 | | 4/20/10 JS | Designation: | (HQ) EV Creek |

Please read instructions before you begin filling in this form.

| | | | | | |
|---|----------------------------|--------------------------|---|--|--|
| Applicant (Operator) Name Newfield Appalachia PA LLC | | DEP Client ID# 277879 | Phone 281-847-6031 | FAX 281-847-6160 | Check if new address. <input type="checkbox"/> |
| Mailing Address (Street or PO Box) 363 N. Sam Houston Pkwy E. Suite 2020 | | City Houston | State TX | Zip +4 77060-2424 | Country (if not USA) |
| (Well) Farm Name D.L. Teeple | Well # 1-1 | Serial # | PERMIT TYPE Check applicable. Application is to: <input checked="" type="checkbox"/> Drill a new well <input type="checkbox"/> Deepen a well <input type="checkbox"/> Redrill a well <input type="checkbox"/> Alter a well <input type="checkbox"/> E&S Control Module <input type="checkbox"/> Other (specify) | TYPE OF WELL Check one. <input type="checkbox"/> Gas <input type="checkbox"/> Oil <input type="checkbox"/> Comb. (gas & oil) <input type="checkbox"/> Injection, recovery <input type="checkbox"/> Injection, disposal <input type="checkbox"/> Coalbed Methane <input type="checkbox"/> Gas Storage <input checked="" type="checkbox"/> Other (specify) vertical test well | APPLICATION FEE Check applicable. <input type="checkbox"/> Marcellus Well: Non-Vertical <input type="checkbox"/> Marcellus Well: Vertical <input type="checkbox"/> Non-Marcellus Well: Non-Vertical <input checked="" type="checkbox"/> Non-Marcellus Well: Vertical <input type="checkbox"/> \$200 (Home Use Well) <input type="checkbox"/> \$500 E&S Fee <input type="checkbox"/> \$ 0 (Rehab orphan) <input checked="" type="checkbox"/> Vertical: Length 8350 ft. <input type="checkbox"/> Marcellus: Length _____ ft. <input type="checkbox"/> Non-Vertical: Length _____ ft. Total Application Fee \$ 1500 |
| County WAYNE | Municipality MANCHESTER | Project # (from DEP) | | | |
| If you are applying for a permit to redrill, drill deeper, or alter a well that was previously permitted or registered, or for a well site that was previously permitted but not drilled, check this box <input type="checkbox"/> and enter the permit or registration number here: | | | | | |
| If applying for a permit to rework an existing well not registered or permitted, check this box <input type="checkbox"/> and enter date drilled, if known: _____ (see instructions) | | | | | |
| PNDI Attached: <input checked="" type="checkbox"/> Any "hit" must include accepted mitigation plan from applicable agency. | | | | | |

| COORDINATION WITH REGULATIONS AND OTHER PERMITS | Yes | No | DEP USE ONLY |
|---|-------------------------------------|-------------------------------------|-------------------------|
| 1. Will the well be subject to the Oil and Gas Conservation Law? If "No," go to 2). | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Date Stamps/Notes |
| a. If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Auth 826659 |
| b. Does the location fall within an area covered by a spacing order? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Site 731937 |
| 2. Will the well penetrate a workable coal seam? If "No," include justification and supporting documentation. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Cint 277879 |
| 3. If the well will penetrate a workable coal seam, and the well is a "non-conservation" gas well, does the location comply with the distance requirements of Section 7 of the Coal and Gas Resource Coordination Act? (At least 1,000 feet from all existing wells). | <input type="checkbox"/> | <input type="checkbox"/> | APS 715262 |
| a. If "No," is the required exception request attached? (Check here if re-working an existing well: <input type="checkbox"/> N/A) | <input type="checkbox"/> | <input type="checkbox"/> | Acct 674710 |
| 4. Will the well be drilled at a location where the coal has been removed? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | PF 728625 SF 10/0226 |
| 5. Will the well be drilled through an active (operating or projected) coalmine, or within 1,000 feet of the boundary? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. If "Yes," print the names of: Mine: _____ Operator: _____ | | | |
| 6. Will the well penetrate or be within 2,000 feet of an active gas storage reservoir boundary? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. If Yes, print the names of: Storage Field: _____ Operator: _____ | | | |
| 7. Is the proposed well location within the permitted area of a landfill? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 8. Will the well site be within 100 feet (measured horizontally) of a stream, spring or body of water identified on the most current 7 1/2' topographic map? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. If "Yes," is a request for a waiver (form 5500-FM-OG0057), and E&S control plan attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| 9. Will the well site be within 100 feet of a wetland or in a wetland? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. Is the well site within 100 feet of a wetland greater than one acre in size? | <input type="checkbox"/> | <input type="checkbox"/> | |
| If yes, is a waiver request (form 5500-FM-OG0057) and E&S control plan attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| 10. Will the well be drilled within 200 feet (horizontally) from any existing building or an existing water supply? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. If "Yes," is written consent from the owner attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| b. If written consent is not attached, is a variance request (form 5500-FM-OG0058) attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| 11. Will the well be located where it may impact a public resource as outlined in the "Coordination of a Well Location with Public Resources" form 5500-PM-OG0076? If yes, attach a completed copy of the form. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 12. Is the well site in a Special Protection High Quality (HQ) or Exceptional Value (EV) watershed? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |
| 13. Is this well part of a development where you need an Earth Disturbance Permit for Oil and Gas Activities disturbing more than 5 acres? If yes, attach a completed Erosion Sediment and Stormwater Control Module or list the number and date of the ESCGP-1 Approval. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |

| | | | |
|---|--|----------------------------|----------------|
| Signature of Applicant | The person signing this form attests that they have the authority to submit this application on behalf of the applicant, and that the information, including all related submissions, is true and accurate to the best of their knowledge. | | |
| Signature of Person Authorized to Submit Application <i>Donald F. Sleeth</i> | (Print or Type) Name of Signer: DONALD F. SLEETH | Title: Drilling Manager | Date 3-5-10 |
| Application Preparer/Contact: BETSY COLLINS | | Phone: 412-921-8250 | |

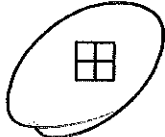


COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Oil and Gas Management Program
WELL LOCATION PLAT

| | | |
|--------------------|----------------------------|---------|
| DEP USE ONLY | DEP Application Tracking # | C: ACO |
| | Permit # 127-20013 | 4/19/10 |
| | Project # | C: |

| | |
|----------------------|---------------------------------------|
| | Denotes location of well on topo map. |
| True Latitude: NORTH | |
| 41 ° 49' 39.90" | |
| True Longitude: WEST | |
| 75 ° 11' 53.33" | |
| WELL NORTHING - Y | |
| 615,470.64 | |
| WELL EASTING - X | |
| 2,663,898.16 | |

Well is located on topo map 2,034 feet south of latitude 41 ° 50 ' 00 "

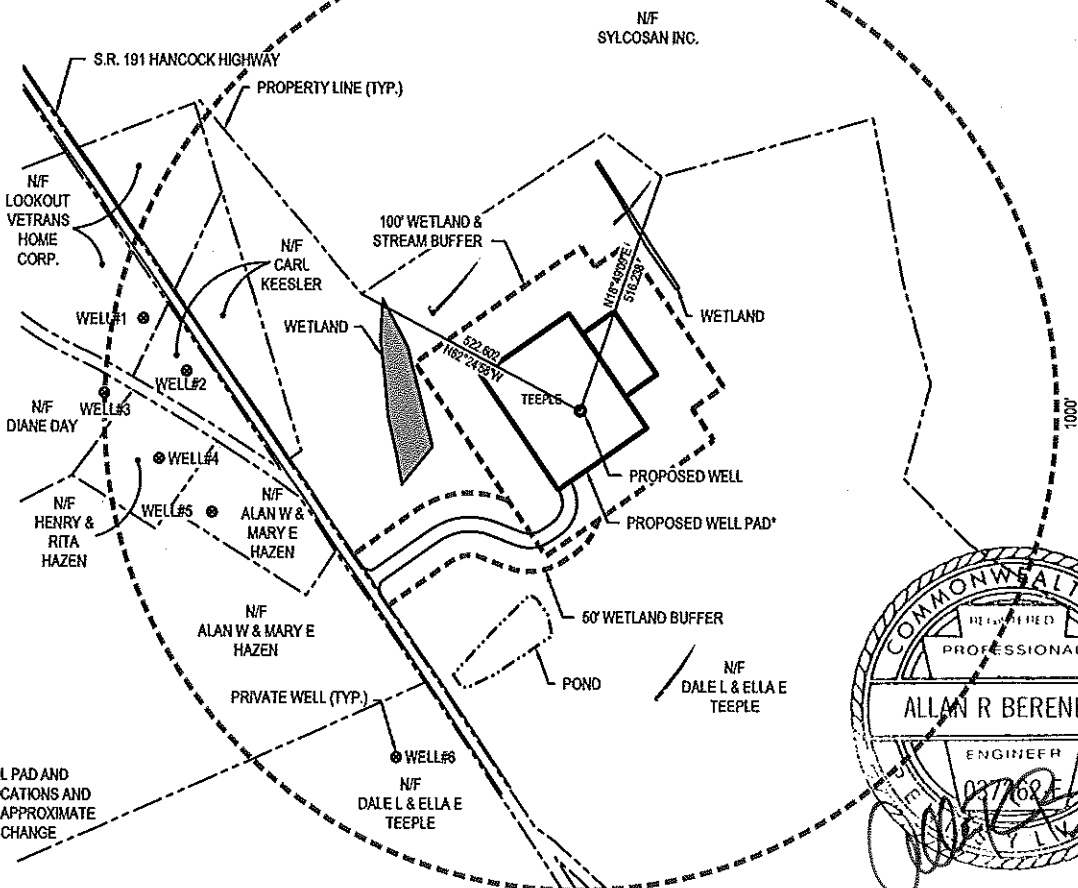


H Q She hawken
WATERSHED Rattlesnake Creek

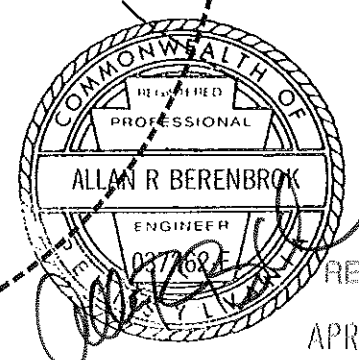
Well is located on topo map

8,580 feet west of longitude

75 ° 10 ' 00 "



* PROPOSED WELL PAD AND ACCESS ROAD LOCATIONS AND DIMENSIONS ARE APPROXIMATE AND SUBJECT TO CHANGE



Surveyor or Engineer **TETRA TECH** Phone # (412) 921-8873 Dwg. # 1 Date 4/16/2010 Scale 1" = 400'

| | | | | | |
|---|--|---|--|--|--|
| Lat. & Long Metadata Method GPS Accuracy +/- 1 ft. Datum NAD83 | | Elevation Metadata Method GPS Accuracy +/- 1 ft. Datum NAD83 | | Survey Date Jan. 2010 | |
| Applicant / Well Operator Name Newfield Appalachia PA LLC | | Well(Farm) Name D.L. Teeple | | Well # 1-1 | |
| Address 363 N. Sam Houston Parkway E., Suite 2020, Houston, TX 77060 | | County - Code Wayne | | Municipality Manchester | |
| Surface Landowner / Lessor Dale and Ella Teeple | | USGS 71/2 Quadrangle Map Name Long Eddy, NY | | Map Section 5 | |
| Target Formation(s) Onondaga | | Angle & Course of Deviation (Drilling) N/A | | Anticipated Total Depth TVD 8,350 TMD 8,350 | |
| Surface Owner or Water Purveyor with a Water Supply within 1,000 ft. | | Approximate Course and Distance to Water Supply | | Owner, Lessee, or Operator of Workable Coal Seam | |
| Lookout Veterans Home Corp. | | N78d 20' 44"W 938' | | N/A | |
| Carl Keesler | | N84d 27' 43"W 832' | | N/A | |
| Dale L & Ella E Teeple | | S27d 51' 49"W 818' | | N/A | |
| Alan W Mary E Hazen | | S74d 33' 6"W 802' | | N/A | |
| | | | | Name of Coal Seam Owned, Leased, or Operated | |
| | | | | N/A | |
| | | | | N/A | |
| | | | | N/A | |

R:_Marcellus Shale Projects\Newfield2679 - Newfield Wells\Well Plat Permits\Permit Drawings\Teeple Well Pad Plat Exhibit A.dwg PTT BENL HOPPE 4/16/2010 12:43:02 PM

Reference 10



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

WELL PERMIT

| | |
|------------------------------------|-------------------|
| DEP USE ONLY | |
| Permittee's eFACTS ID 277879 | Auth ID 830993 |
| Watershed Name Salt River Brook | Quality HQ |

| | | | |
|--|---|--|---|
| Permittee NEWFIELD APPALACHIA PA LLC | OGO.# OGO-67425 | Permit Number 37-127-20018-00 | Date Issued 05/25/2010 |
| Address 363 N SAM HOUSTON PKWY E | | Farm Name & Well Number DL TEEPLE 1 2H | Well Serial # |
| SUITE 2020 | | Municipality Manchester | County Wayne |
| HOUSTON, TX 77060-2424 | | 7 1/2' Quadrangle Name Long Eddy | Map Section # 5 |
| Phone (281) 674-2501 | Project # | Latitude 41-49-23.1900 | Longitude -75-11-39.3900 |
| Surf Elev at Site 1438 feet | Anticipated Total Depth 8140 feet | Well Type GS | Offset distances referenced to NE corner of map section. South 3725 feet West 7525 feet |

This permit covering the well operator and well location shown above is evidence of permission granted to conduct activities in accordance with the Oil and Gas Act and the Oil and Gas Conservation Law, if the well is subject to that act and any rules and regulations promulgated thereunder, subject to the conditions contained herein and in accordance with the application submitted for this permit. This permit does not convey any property rights.

This permit and the permittee's authority to conduct the activities authorized by this permit are conditioned upon operator's compliance with applicable law and regulations.

Notification must be given to the district oil and gas inspector, the surface landowner and political subdivision of the date well drilling will begin at least 24 hours prior to commencement of drilling activities.

The permittee hereby authorizes and consents to allow, without delay, employees or agents of the Department to have access to and to inspect all areas upon presentation of appropriate credentials, without advance notice or a search warrant. This includes any property, facility, operation or activity governed by the Oil and Gas Act, the Oil and Gas Conservation Law, the Coal and Gas Resource Coordination Act and other statutes applicable to oil and gas activities administered by the Department. The authorization and consent shall include consent to the Department to collect samples of wastewaters or gases, to take photographs, to perform measurements, surveys, and other tests, to inspect any monitoring equipment, to inspect the methods of operation and disposal, and to inspect and copy documents required by the Department to be maintained. The authorization and consent includes consent to the Department to examine books, papers, and records pertinent to any matter under investigation pursuant to the Oil and Gas Act or pertinent to a determination of whether the operator is in compliance with the above referenced statutes. This condition in no way limits any other powers granted to the Department under the Oil and Gas Act and other statutes, rules and regulations applicable to these activities as administered by the Department.

This permit does not relieve the operator from the obligation to comply with the Clean Streams Law and all statutes, rules and regulations administered by the Department.

Special Permit Conditions:

The permittee shall not withdraw or use water from water sources within the Commonwealth of Pennsylvania, for well fracing activities, unless the permittee does so in accordance with a Water Management Plan approved by the Department.

Permittee shall obtain a permit or Environmental Assessment approval from the Department prior to the construction of any dam, reservoir, water obstruction, and/or encroachment for which a permit or Environmental Assessment approval is required by 25 Pa. Code Chapter 105. Any dam embankment including centralized dam embankments utilized to impound freshwater or frac water associated with well fracing not requiring a permit pursuant to 25 Pa. Code Chapter 105 will be constructed in accordance with requirements of 25 Pa. Code §§ 78.56-78.63 and Department guidelines 5500-PM-OG0085 entitled, Design, construction and maintenance standards for dam embankments associated with impoundments for oil and gas wells.

Prior to fracturing the well, as part of its Preparedness, Prevention and Contingency Plan the permittee shall implement a Control and Disposal Plan for the control and disposal of fluids and residual wastes in accordance with 25 Pa. Code § 78.55. The Control and Disposal Plan shall identify the control and disposal methods and practices utilized to prevent pollutants from directly or indirectly reaching waters of the Commonwealth during the impoundment, production, processing and transportation of pollutants, including identification of the permitted processing or disposal facilities where residual wastes will be processed or disposed, in accordance with 25 Pa. Code §§ 78.55 and 91.34.

Prior to transport of the residual wastewater off site, chemical analysis and characterization of the waste shall be conducted and provided to the processing or disposal facility intended for acceptance of the waste in accordance with 25 Pa. Code § 287.54.

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The Operator shall run a complete angular deviation survey of the intentionally deviated well. The deviation survey is to be obtained by a responsible well surveying company and shall be filed with the Department within thirty (30) days after well drilling together with other regularly required reports.

This permit expires 05/25/2011 unless drilling is commenced on or before that date and prosecuted with due diligence.



Regional Oil and Gas Program Manager

Stephen Watson
Oil & Gas Inspector

2 Public Square
Wilkes-Barre, PA 18711-0790

570-826-2320
Telephone



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL & GAS MANAGEMENT PROGRAM

ESM10-127-0001
DEP USE ONLY
AUTH # NC
Check # 1067827 Amount \$ 3650.00
1067826 \$500.00

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL

| | | | |
|-------------------|-----------------------------------|---|---|
| Notes <i>M</i> | OGO # <i>67425</i> | Objection Date - Do not issue before: <i>4/26/10</i> | Well Permit # <i>127-20018 NC</i> |
| | Bond # <i>12382</i> | Date Approved: <i>5/21/10</i> <i>B.M.</i> | Special Cond. A B C D <u>E</u> F |
| | C: <i>4/13/10 mgs. 4/26/10 JL</i> | | Watershed Name: <i>SALT RIVER BROOK</i> |
| | INV: <i>5-24-10</i> | | Designation: <u>HQ</u> EV |

Please read instructions before you begin filling in this form.

| | | | | | |
|--|--|---------------------------------|------------------------------|-----------------------------|--|
| Applicant (Operator) Name <i>Newfield Appalachia PA LLC</i> | | DEP Client ID# <i>277879</i> | Phone <i>281-674-2501</i> | FAX <i>281-674-2902</i> | Check if new address. <input type="checkbox"/> |
| Mailing Address (Street or PO Box) <i>363 N. Sam Houston Pkwy E. Suite 2020</i> | | City <i>Houston</i> | State <i>TX</i> | Zip +4 <i>77060-2424</i> | Country (if not USA) |

| | | | | | |
|--|-----------------------------------|----------------------|--|---|--|
| (Well) Farm Name <i>D.L. Teepie</i> | Well # <i>1-2H</i> | Serial # | PERMIT TYPE Check applicable. Application is to: <input checked="" type="checkbox"/> Drill a new well <input type="checkbox"/> Deepen a well <input type="checkbox"/> Redrill a well <input type="checkbox"/> Alter a well <input checked="" type="checkbox"/> E&S Control Module <input type="checkbox"/> Other (specify) | TYPE OF WELL Check one. <input checked="" type="checkbox"/> Gas <input type="checkbox"/> Oil <input type="checkbox"/> Comb. (gas & oil) <input type="checkbox"/> Injection, recovery <input type="checkbox"/> Injection, disposal <input type="checkbox"/> Coalbed Methane <input type="checkbox"/> Gas Storage <input type="checkbox"/> Other (specify) | APPLICATION FEE Check applicable. <input checked="" type="checkbox"/> Marcellus Well: Non-Vertical <input type="checkbox"/> Marcellus Well: Vertical <input type="checkbox"/> Non-Marcellus Well: Non-Vertical <input type="checkbox"/> Non-Marcellus Well: Vertical <input type="checkbox"/> \$200 (Home Use Well) <input checked="" type="checkbox"/> \$500 E&S Fee <input type="checkbox"/> \$ 0 (Rehab orphan) <input type="checkbox"/> Vertical: Length _____ ft. <input checked="" type="checkbox"/> Marcellus: Length <i>13,548.8</i> ft. <input type="checkbox"/> Non-Vertical: Length _____ ft. Total Application Fee \$ <i>4,150</i> |
| County <i>WAYNE</i> | Municipality <i>MANCHESTER</i> | Project # (from DEP) | | | |

If you are applying for a permit to redrill, drill deeper, or alter a well that was previously permitted or registered, or for a well site that was previously permitted but not drilled, check this box and enter the permit or registration number here:

If applying for a permit to rework an existing well not registered or permitted, check this box and enter date drilled, if known: _____ (see instructions)

PNDI Attached: Any "hit" must include accepted mitigation plan from applicable agency.

| COORDINATION WITH REGULATIONS AND OTHER PERMITS | Yes | No | DEP USE ONLY |
|--|-------------------------------------|-------------------------------------|---|
| 1. Will the well be subject to the Oil and Gas Conservation Law? If "No," go to 2). a. If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary? b. Does the location fall within an area covered by a spacing order? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Date Stamps/Notes Auth <i>3309913</i> Site <i>733332</i> Cnt <i>277879</i> APS <i>777984</i> Acct <i>676740</i> PF <i>729789</i> SF <i>1012170</i> |
| 2. Will the well penetrate a workable coal seam? If "No," include justification and supporting documentation. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 3. If the well will penetrate a workable coal seam, and the well is a "non-conservation" gas well, does the location comply with the distance requirements of Section 7 of the Coal and Gas Resource Coordination Act? (At least 1,000 feet from all existing wells). a. If "No," is the required exception request attached? (Check here if re-working an existing well: <input type="checkbox"/> N/A) | <input type="checkbox"/> | <input type="checkbox"/> | |
| 4. Will the well be drilled at a location where the coal has been removed? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 5. Will the well be drilled through an active (operating or projected) coalmine, or within 1,000 feet of the boundary? a. If "Yes," print the names of: Mine: _____ Operator: _____ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 6. Will the well penetrate or be within 2,000 feet of an active gas storage reservoir boundary? a. If Yes, print the names of: Storage Field: _____ Operator: _____ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 7. Is the proposed well location within the permitted area of a landfill? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 8. Will the well site be within 100 feet (measured horizontally) of a stream, spring or body of water identified on the most current 7 1/2' topographic map? a. If "Yes," is a request for a waiver (form 5500-FM-OG0057), and E&S control plan attached? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 9. Will the well site be within 100 feet of a wetland or in a wetland? a. Is the well site within 100 feet of a wetland greater than one acre in size? If yes, is a waiver request (form 5500-FM-OG0057) and E&S control plan attached? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 10. Will the well be drilled within 200 feet (horizontally) from any existing building or an existing water supply? a. If "Yes," is written consent from the owner attached? b. If written consent is not attached, is a variance request (form 5500-FM-OG0058) attached? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 11. Will the well be located where it may impact a public resource as outlined in the "Coordination of a Well Location with Public Resources" form 5500-PM-OG0076? If yes, attach a completed copy of the form. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 12. Is the well site in a Special Protection High Quality (HQ) or Exceptional Value (EV) watershed? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |
| 13. Is this well part of a development where you need an Earth Disturbance Permit for Oil and Gas Activities disturbing more than 5 acres? If yes, attach a completed Erosion Sediment and Stormwater Control Module or list the number and date of the ESCGP-1 Approval. See Attached Module | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |

| | | | |
|---|--|---|------------------------|
| Signature of Applicant | The person signing this form attests that they have the authority to submit this application on behalf of the applicant, and that the information, including all related submissions, is true and accurate to the best of their knowledge. | | |
| Signature of Person Authorized to Submit Application <i>Donald F. Sleeth</i> | (Print or Type) | Name of Signer: <i>DONALD F. SLEETH</i> | Date <i>4-12-10</i> |
| Application Preparer/Contact: <i>ANDREW STRASSNER</i> | | Phone: <i>412-862-7963</i> | |

| | |
|---|--------------------------|
| Farm Name - Well # D.L. Teeple 1-2H | DEP ID# 277879 |
| Applicant Name Newfield Appalachia PA LLC | APS # |
| DEP USE ONLY | |

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL
 Page 2 --- Record of Notification / Written Consent

| Name: | Address: | Surface Landowner | Coal Owner | Coal Lessee | Coal Mine Operator | Gas Storage Operator | Operator | Within 1,000 feet | | | Notification | | | | |
|--|--|-------------------|------------|-------------|--------------------|----------------------|----------|-------------------|----------------|--------------------|----------------------------------|----------------|-----------------|-------------------|--|
| | | | | | | | | Surf Water | Water Purveyor | Coal Mine Operator | Note the means and attach proof. | | Written Consent | | |
| | | | | | | | | | | | Certified Mail Dates | Return Receipt | | Address Affidavit | |
| Dale L & Ella E Teeple | 13 Teeple Road Equinunk, Pa 18417-3514 | X | | | | | | X | | | | | | X | |
| Roger D & Patricia A Hazen | 3697 Hancock Hwy Equinunk, Pa 18417-3164 | | | | | | | X | | | | | | X | |
| Granville W & Charlene Teeple | 24 Sault River Road Equinunk, Pa 18417-3501 | | | | | | | X | | | | | 3-25-10 | 3-29-10 | |
| Cynthia F Rowe | 3743 Hancock Hwy Equinunk, Pa 18417-3166 | | | | | | | X | | | | | 3-25-10 | 3-29-10 | |
| Name: | Address: | | | | | | | | | | | | | | |
| Name: | Address: | | | | | | | | | | | | | | |
| Name: | Address: | | | | | | | | | | | | | | |

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 NORTHWEST REGIONAL OFFICE

Optional: Signature below indicates the party's approval of the well location, and waives the 15-day objection period. Check applicable box.

| | | | |
|--|------------------------|--|------|
| <input checked="" type="checkbox"/> Water Purveyor or <input checked="" type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| <i>Dale L Teeple</i> | <i>3-31-10</i> | | |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| Surface Landowner at proposed location <i>Dale L Teeple</i> | Date <i>3-31-10</i> | Coal Operator within 1,000 feet of proposed location | Date |
| Surface Landowner at proposed location <i>Dale L Teeple</i> | Date <i>3-31-10</i> | Gas Storage Operator within 2,000 feet | Date |

Signature below indicates written consent. Check applicable box.

| | |
|---|------|
| Owner of: <input type="checkbox"/> water supply, or <input type="checkbox"/> building within 200 feet | Date |
| Address (of above) | |
| Owner of: <input type="checkbox"/> water supply, or <input type="checkbox"/> building within 200 feet | Date |
| Address (of above) | |

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL & GAS MANAGEMENT PROGRAM

| | |
|---|--------------------------|
| Farm Name - Well # D.L. Teeple 1-2H | DEP ID# 277879 |
| Applicant Name Newfield Appalachia PA LLC | APS# |
| DEP USE ONLY | |

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL
Page 2 --- Record of Notification / Written Consent

| Name: | Address: | Surface Landowner | Coal Owner | Coal Lessee | Coal Mine Operator | Gas Storage Operator | Within 1,000 feet | | | Notification | | |
|--|---|--|------------|---|--------------------|----------------------|-------------------|----------------------|--------------------|----------------------------------|--|-----------------|
| | | | | | | | Surf Owner | Water Purveyor | Coal Mine Operator | Note the means and attach proof. | | Written Consent |
| | | | | | | | | Certified Mail Dates | Return Receipt | Address Affidavit | | |
| Name: Dale L & Ella E Teeple | Address: 13 Teeple Road Equinunk, Pa 18417-3514 | X | | | | | | | | | | X |
| Name: Roger D & Patricia A Hazen | Address: 3697 Hancock Hwy Equinunk, Pa 18417-3164 | | | | | | | | | | | X |
| Name: Granville W & Charlene Teeple | Address: 24 Sault River Road Equinunk, Pa 18417-3501 | | | | | | | | 3-25-10 | 3-29-10 | | |
| Name: Cynthia F Rowe | Address: 3743 Hancock Hwy Equinunk, Pa 18417-3166 | | | | | | | | 3-25-10 | 3-27-10 | | |
| Name: | Address: | | | | | | | | | | | |
| Name: | Address: | | | | | | | | | | | |
| Name: | Address: | | | | | | | | | | | |
| Optional: Signature below indicates the party's approval of the well location, and waives the 15-day objection period. Check applicable box. | | | | | | | | | | | | |
| <input type="checkbox"/> Water Purveyor or <input checked="" type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date | Signature below indicates written consent. Check applicable box. | | | | | | | | |
| <i>Handwritten Signature</i> | 03/30/2010 | | | Owner of: <input type="checkbox"/> water supply, or <input type="checkbox"/> building within 200 feet | | | | | | | | |
| <input type="checkbox"/> Water Purveyor or <input checked="" type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date | Address (of above) | | | | | | | | |
| <i>Handwritten Signature</i> | 3/30/2010 | | | Owner of: <input type="checkbox"/> water supply, or <input type="checkbox"/> building within 200 feet | | | | | | | | |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date | Address (of above) | | | | | | | | |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date | Date | | | | | | | | |
| Surface Landowner at proposed location | Date | Coal Operator within 1,000 feet of proposed location | Date | Date | | | | | | | | |
| Surface Landowner at proposed location | Date | Gas Storage Operator within 2,000 feet | Date | Date | | | | | | | | |

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NORTHWEST REGIONAL OFFICE
NORTHWEST REGIONAL OFFICE



COMMONWEALTH OF PENNSYLVANIA
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OIL & GAS MANAGEMENT PROGRAM

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL
Page 2 --- Record of Notification / Written Consent

| | |
|--------------------|----------------------------|
| Farm Name - Well # | D.L. Teeple 1-2H |
| Applicant Name | Newfield Appalachia PA LLC |
| DEP USE ONLY | APPS# |
| DEP ID#: | 277879 |

| Name | Address | Surface Landowner | Coal Owner | Coal Lessee | Coal Mine Operator | Gas Storage Operator | Within 1,000 feet | | | | Notification | | | | |
|--|---|-------------------|------------|-------------|--------------------|----------------------|-------------------|----------------|--------------------|----------------|----------------|-------------------|---|---|--|
| | | | | | | | Surf Owner | Water Purveyor | Coal Mine Operator | Water Purveyor | Return Receipt | Address Affidavit | Written Consent | | |
| Dale L & Ella E Teeple | Address: 13 Teeple Road Equinunk, Pa 18417-3514 | X | | | | | X | | | | | | | X | |
| Roger D & Patricia A Hazen | Address: 3697 Hancock Hwy Equinunk, Pa 18417-3164 | | | | | | X | | | | | | | X | |
| Granville W & Charlene Teeple | Address: 24 Sault River Road Equinunk, Pa 18417-3501 | | | | | | X | | | 3-25-10 | 3-29-10 | | | | |
| Cynthia F Rowe | Address: 3743 Hancock Hwy Equinunk, Pa 18417-3166 | | | | | | X | | | 3-25-10 | 3-27-10 | | | | |
| Name: | Address: | | | | | | | | | | | | | | |
| Name: | Address: | | | | | | | | | | | | | | |
| Name: | Address: | | | | | | | | | | | | | | |
| <p>Optional: Signature below indicates the party's approval of the well location, and waives the 15-day objection period. Check applicable box.</p> <p><input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. Date _____</p> <p><input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. Date _____</p> <p><input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. Date _____</p> <p><input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. Date _____</p> <p>Surface Landowner at proposed location Date _____</p> <p>Surface Landowner at proposed location Date _____</p> | | | | | | | | | | | | | <p>Signature below indicates written consent. Check applicable box.</p> <p>Owner of: <input type="checkbox"/> water supply, or <input type="checkbox"/> building within 200 feet Date _____</p> <p>Address (of above) _____</p> <p>Owner of: <input type="checkbox"/> water supply, or <input type="checkbox"/> building within 200 feet Date _____</p> <p>Address (of above) _____</p> | | |

127-20018

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| DEP USE ONLY | |
|-----------------------|---------------------|
| APS # 717984 | Site # 733332 |
| Permit # 107-20018 | Auth ID # 830995 |

Acct-676742

**Erosion, Sediment and Stormwater Control
MODULE**

ESM10-127-0001

Please complete this section if your earth disturbance activities will disturb 5 acres or greater.

| | |
|----|---|
| 1. | <p>Project Site Information.</p> <p>a. Attach topographic map of proposed location.</p> <p>b. Location of surface waters which may receive runoff and the waters classification, pursuant to Chapter 93 and the "statewide existing use listing":</p> <p>Receiving Waters/Watershed Name <u>Salt River Brook / Little Equinunk Creek</u></p> <p>Chapter 93 Designated Use or Existing Use Stream Classification <input checked="" type="radio"/> High Quality <input type="radio"/> Exceptional Value <input type="radio"/> Other _____</p> |
| | <p>RECEIVED APR 13 2010 ENVIRONMENTAL PROTECTION NORTHWEST REGIONAL OFFICE</p> |
| 2. | Erosion and Sediment Control authorization for Earth Disturbance Associated with Oil and Gas Activities filing fee of \$500 payable to: Commonwealth of Pennsylvania, Clean Water Fund. |
| 3. | <p>Compliance History</p> <p>Is the applicant in violation of any existing permit, regulation, order or schedule of compliance issued by the Department? If yes, provide the permit number or facility name, a brief description of the violation, the compliance schedule (including dates and steps to achieve compliance) and the current compliance status.</p> <p>Yes <input type="radio"/> No <input checked="" type="radio"/></p> <p>(Attach on a separate sheet, if needed)</p> |
| 4. | <p>Erosion & Sediment Control and Site Restoration Plan</p> <p>At least fourteen days before the commencement of earth disturbance activities, or earlier in accordance with applicable Chapter 105 permitting requirements, the applicant shall provide the appropriate DEP Regional Oil and Gas Program Office with the following:</p> <p>A. An Erosion and Sediment Control and Site Restoration Plan that meets the requirements of 25 Pa. Code Chapters 78 and 102, and in the Department's <i>Erosion and Sediment Pollution Control Manual</i>, No. 363-2134-008, as amended and updated and the Department's <i>Oil and Gas Operator's Manual</i>, No. 550-0300-001.</p> <p>B. The Site Restoration Plan shall include PCSM BMPs designed and implemented to meet the requirements of 25 Pa. Code Chapter 93, and consistent with the <i>Pennsylvania Stormwater Best Management Practices Manual</i>, No. 363-0300-002, as amended and updated.</p> <p>Both the E&S and Site Restoration Plan shall minimize the accelerated erosion and sedimentation and shall eliminate the net change in post construction stormwater runoff as compared to the amount of preconstruction stormwater runoff. This shall be accomplished first through the use of site design and nonstructural BMP approaches, and if necessary structural filtration, infiltration, and runoff control BMPs in accordance with <i>Erosion and Sediment Pollution Control Manual</i>, No. 363-2134-008, <i>Oil and Gas Operator's Manual</i>, No. 550-0300-001 and <i>Stormwater Best Management Practices Manual</i>, No. 363-0300-002, as amended and updated. Supporting calculations and measurements for PCSM BMPs are not required unless there will be permanent impervious paved surfaces or above-ground structures or facilities (excluding well-heads and brine storage tanks and other such ancillary equipment. See model plan for further guidance). Crushed rock or gravel roads are not considered impervious.</p> <p>Both the E&S and Site Restoration Plan shall be developed and sealed by a licensed professional engineer, surveyor or professional geologist, and shall contain the following certification:</p> <p><i>I do hereby certify to the best of my knowledge, information and belief, that the Erosion and Sediment Control and Site Restoration Plan are true and correct, represent actual field conditions and are in accordance with the 25 Pa. Code Chapters 78 and 102 of the Department's rules and regulations. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.</i></p> <p>Print Name: _____ Signature: _____</p> <p>Company: _____</p> <p>Address: _____</p> <p>Phone: _____</p> |
| 5. | <p>Area Wide or Phased E&S and Stormwater Management</p> <p>List the well permit numbers for any other well permit that is or will be included in the E&S and/or Site Reclamation Plan for this project:</p> |



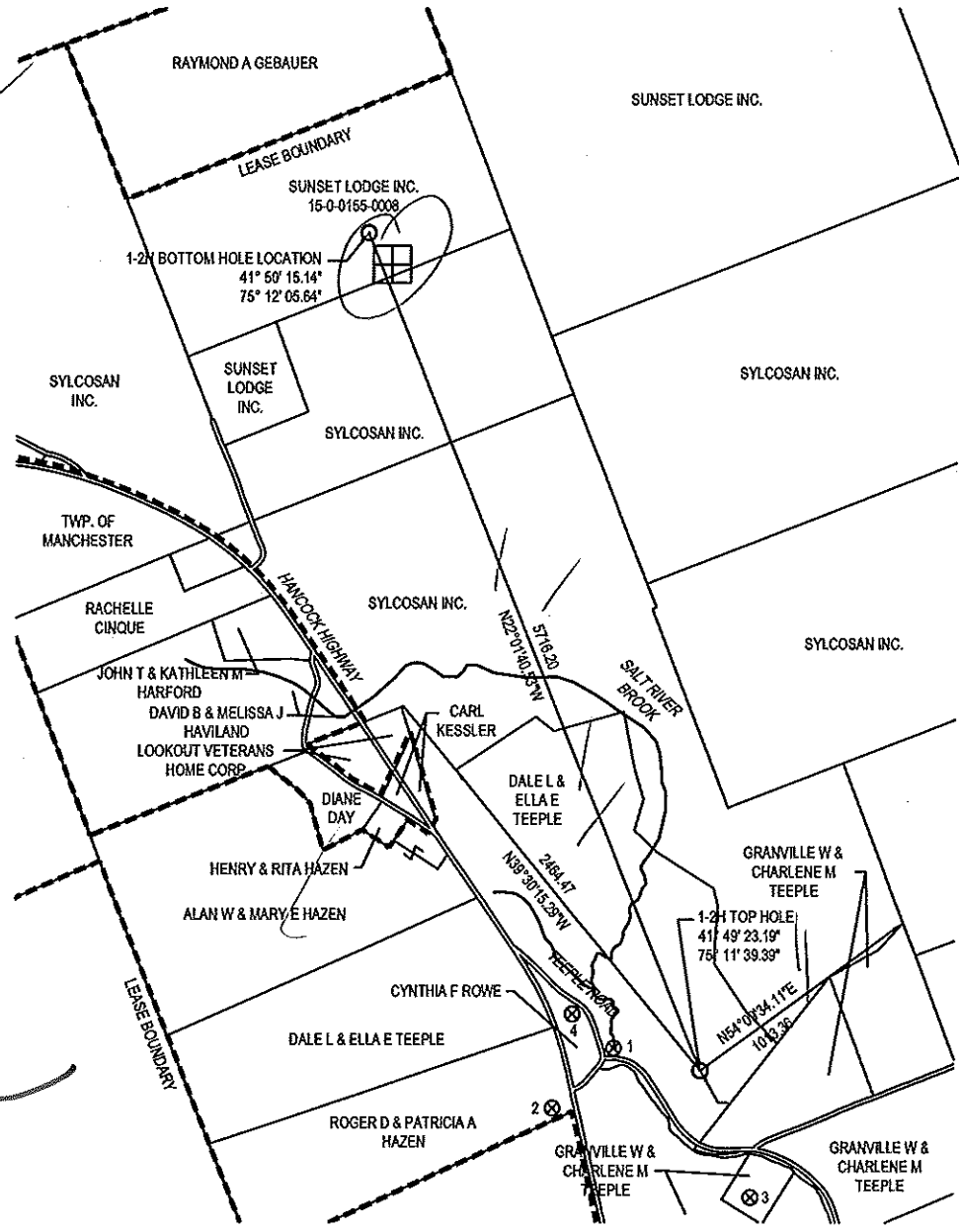
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Oil and Gas Management Program
WELL LOCATION PLAT

| | | |
|--------------------|----------------------------|--------------|
| DEP USE ONLY | DEP Application Tracking # | G: <i>JR</i> |
| | Permit # <i>127-2008</i> | 4/26/10 |
| | Project # | C: |

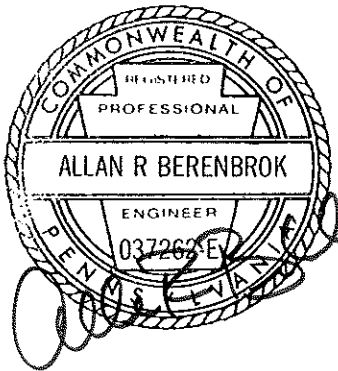
| | |
|--------------------------|---------------------------------------|
| <input type="checkbox"/> | Denotes location of well on topo map. |
| True Latitude: NORTH | |
| 41° 49' 23.19" | |
| True Longitude: WEST | |
| 75° 11' 39.39" | |
| WELL NORTHING - Y | |
| 613,811.1 | |
| WELL EASTING - X | |
| 2,665,002.7 | |

Well is located on topo map 3,725 feet south of latitude 41 ° 50 ' 00 "

Well is located on topo map 7,525 feet west of longitude 75 ° 10 ' 00 "



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Surveyor or Engineer **TETRA TECH** Phone # (412) 921-8873 Dwg. # 1-2H Date 4/7/2010 Scale 1" = 1200' Tract Acreage

| | | | | | |
|---|--|--|--|--|--|
| Lat. & Long Metadata Method GPS Accuracy +/- 1 ft. Datum NAD83 | | Elevation Metadata Method GPS Accuracy +/- 1 ft. Datum NAD83 | | Survey Date Jan. 2010 | |
| Applicant / Well Operator Name Newfield Appalachia PA LLC | | Well(Farm) Name D.L. Teeple | | Well # 1-2H | |
| Address 363 N. Sam Houston Parkway E., Suite 2020, Houston, TX 77060 | | County - Code Wayne | | Municipality Manchester | |
| Surface Landowner / Lessor Dale and Ella Teeple | | USGS 7 1/2 Quadrangle Map Name Long Eddy, NY | | Map Section 5 | |
| Target Formation(s) Marcellus Shale | | Angle & Course of Deviation (Drilling) N22D 01' 40.53"W 5,716.20' | | Anticipated Total Depth TVD 8,140 ft. TMD 13,548.80 ft. | |
| Surface Owner or Water Purveyor with a Water Supply within 1,000 ft. | | Approximate Course and Distance to Water Supply | | Owner, Lessee, or Operator of Workable Coal Seam | |
| Dale L. and Ella E. Teeple | | N75D 34' 24.47"W 568' | | N/A | |
| Roger D. and Patricia A. Hazen | | S75d 45' 16.93"W 967' | | N/A | |
| Granville W. and Charlene M. Teeple | | S21d 53' 56.41"E 864' | | N/A | |
| Cynthia F. Rowe | | N66d 11' 03.82"W 887' | | N/A | |
| | | | | Name of Coal Seam Owned, Leased, or Operated | |
| | | | | N/A | |
| | | | | N/A | |
| | | | | N/A | |

WATERSHED SALT RIVER BASIN

Reference 11



11/2007

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

WELL PERMIT

| | |
|---------------------------------|-------------------|
| DEP USE ONLY | |
| Permittee's eFACTS ID 261535 | Auth ID 715410 |
| Watershed Name | Quality |

| | | | | | |
|--|---|--|---|------------------------------------|----------------------------------|
| Permittee STONE ENERGY CORPORATION | | OGO.# OGO-66630 | Permit Number 37-127-20007-00 | | Date Issued 04/28/2008 |
| Address PO BOX 5280 | | Farm Name & Well Number GEUTHER 1 | | | Well Serial # |
| LAFAYETTE, LA 70506 | | Municipality Clinton | County Wayne | | |
| Phone (337) 237-0410 | Project # | 7 1/2' Quadrangle Name Forest City | | Map Section # 5 | |
| Surf Elev at Site 2210 feet | Anticipated Total Depth 8150 feet | Well Type GS | Latitude 41-41-3.7400 | Longitude -75-26-10.8600 | |
| | | | Offset distances referenced to NE corner of map section. South 8,703 feet West 5377 feet | | |

This permit covering the well operator and well location shown above is evidence of permission granted to conduct activities in accordance with the Oil and Gas Act and the Oil and Gas Conservation Law, if the well is subject to that act and any rules and regulations promulgated thereunder, subject to the conditions contained herein and in accordance with the application submitted for this permit. This permit does not convey any property rights.

This permit and the permittee's authority to conduct the activities authorized by this permit are conditioned upon operator's compliance with applicable law and regulations. Notification must be given to the district oil and gas inspector, the surface landowner and political subdivision of the date well drilling will begin at least 24 hours prior to commencement of drilling activities.

The permittee hereby authorizes and consents to allow, without delay, employees or agents of the Department to have access to and to inspect all areas upon presentation of appropriate credentials, without advance notice or a search warrant. This includes any property, facility, operation or activity governed by the Oil and Gas Act, the Oil and Gas Conservation Law, the Coal and Gas Resource Coordination Act and other statutes applicable to oil and gas activities administered by the Department. The authorization and consent shall include consent to the Department to collect samples of wastewaters or gases, to take photographs, to perform measurements, surveys, and other tests, to inspect any monitoring equipment, to inspect the methods of operation and disposal, and to inspect and copy documents required by the Department to be maintained. The authorization and consent includes consent to the Department to examine books, papers, and records pertinent to any matter under investigation pursuant to the Oil and Gas Act or pertinent to a determination of whether the operator is in compliance with the above referenced statutes. This condition in no way limits any other powers granted to the Department under the Oil and Gas Act and other statutes, rules and regulations applicable to these activities as administered by the Department.

This permit does not relieve the operator from the obligation to comply with the Clean Streams Law and all statutes, rules and regulations administered by the Department.

Special Permit Conditions:

This permit expires 04/28/2009 unless drilling is commenced on or before that date and prosecuted with due diligence.

S. Craig Loh
Regional Oil and Gas Program Manager

P O Box 673, Coudersport, PA 16915-0673
Address

814-274-3611
Telephone

RB KARLINSEY
and Gas Inspector



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL & GAS MANAGEMENT PROGRAM

| | |
|--------------|------------------|
| DEP USE ONLY | |
| AUTH# | CNE |
| Check # 1198 | Amount \$ 350.00 |

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL

| | | | |
|------------------------|-------|---------------------------------------|---------------------------|
| Notes | | DEP USE ONLY | |
| OGO # | 66630 | Objection Date - Do not issue before: | Well Permit # 127-20007 |
| Bond # | 11503 | 4-17-08 | Special Cond. A B C D E F |
| C: 3/10/08 del 4/18/08 | | Date Approved: 2 | Watershed Name: |
| INV: 4-28-08 | | | Designation: HQ EV |

Please read instructions before you begin filling in this form.

| | | | | | |
|---|-------------------------|----------------------|---|--|---|
| Applicant (Operator) Name STONE ENERGY CORPORATION | | DEP Client ID# | Phone 337-237-0410 | FAX 337-237-0426 | Check if new address. <input type="checkbox"/> |
| Mailing Address (Street or PO Box) P.O. Box 5280 | | City Lafayette | State LA | Zip +4 70506 | Country (if not USA) |
| (Well) Farm Name Geuther | Well # 1 | Serial # | PERMIT TYPE Check one. Application is to: <input checked="" type="checkbox"/> Drill a new well <input type="checkbox"/> Deepen a well <input type="checkbox"/> Redrill a well <input type="checkbox"/> Alter a well <input type="checkbox"/> Other (specify) | TYPE OF WELL Check one. <input checked="" type="checkbox"/> Gas <input type="checkbox"/> Oil <input type="checkbox"/> Comb. (gas & oil) <input type="checkbox"/> Injection, recovery <input type="checkbox"/> Disposal <input type="checkbox"/> Coalbed Methane <input type="checkbox"/> Gas Storage <input type="checkbox"/> Other (specify) | APPLICATION FEE Check one. <input checked="" type="checkbox"/> \$ 350 (Gas; Comb.; Coal Meth; Storage) <input type="checkbox"/> \$ 250 (Oil; Inj- Rec) <input type="checkbox"/> \$ 150 (Injection - Waste Disposal) <input type="checkbox"/> \$ 100 (Redrill, Drill Deeper, Alter a Well, or Change Use) <input type="checkbox"/> \$ 0 (Rehab orphan) |
| County WAYNE | Municipality CLINTON | Project # (from DEP) | | | |
| If you are applying for a permit to redrill, drill deeper, or alter a well that was previously permitted or registered, or for a well site that was previously permitted but not drilled, check this box <input type="checkbox"/> and enter the permit or registration number here: | | | | | |
| If applying for a permit to rework an existing well not registered or permitted, check this box <input type="checkbox"/> and enter date drilled, if known: (see instructions) | | | | | |
| PNDI Attached: <input checked="" type="checkbox"/> Any "hit" must include accepted mitigation plan from applicable agency. | | | | | |

| COORDINATION WITH REGULATIONS AND OTHER PERMITS | | Yes | No | DEP USE ONLY |
|---|--|-------------------------------------|-------------------------------------|-------------------|
| 1. | Will the well be subject to the Oil and Gas Conservation Law? If "No," go to 2). | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Date Stamps/Notes |
| a. | If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Auth 715410 |
| b. | Does the location fall within an area covered by a spacing order? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Site 702466 |
| 2. | Will the well penetrate a workable coal seam? If "No," include justification and supporting documentation. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Clnt 261535 |
| 3. | If the well will penetrate a workable coal seam, and the well is a "non-conservation" gas well, does the location comply with the distance requirements of Section 7 of the Coal and Gas Resource Coordination Act? (At least 1,000 feet from all existing wells). | <input type="checkbox"/> | <input type="checkbox"/> | APS 639350 |
| a. | If "No," is the required exception request attached? (Check here if re-working an existing well: <input type="checkbox"/> N/A) | <input type="checkbox"/> | <input type="checkbox"/> | Acct 614142 |
| 4. | Will the well be drilled at a location where the coal has been removed? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 5. | Will the well be drilled through an active (operating or projected) coalmine, or within 1,000 feet of the boundary? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. | If "Yes," print the names of: Mine: Operator: | | | |
| 6. | Will the well penetrate or be within 2,000 feet of an active gas storage reservoir boundary? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. | If Yes, print the names of: Storage Field: Operator: | | | |
| 7. | Is the proposed well location within the permitted area of a landfill? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 8. | Will the well site be within 100 feet (measured horizontally) of a stream, spring or body of water identified on the most current 7 1/2 topographic map? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. | If "Yes," is a request for a waiver (form 5500-FM-OG0057), and E&S control plan attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| 9. | Will the well site be within 100 feet of a wetland or in a wetland? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. | Is the well site within 100 feet of a wetland greater than one acre in size? If yes, is a waiver request (form 5500-FM-OG0057) and E&S control plan attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| 10. | Will the well be drilled within 200 feet (horizontally) from any existing building or an existing water supply? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. | If "Yes," is written consent from the owner attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| b. | If written consent is not attached, is a variance request (form 5500-FM-OG0058) attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| 11. | Will the well be located where it may impact a public resource as outlined in the "Coordination of a Well Location with Public Resources" form 5500-PM-OG0076? If yes, attach a completed copy of the form. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Yes No |
| 12. | Is the well site in a Special Protection High Quality (HQ) or Exceptional Value (EV) watershed? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 13. | Is this well part of a development where you need an Earth Disturbance Permit for Oil and Gas Activities disturbing more than 5 acres? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |

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| | | | |
|--|--|---|-------------------|
| Signature of Applicant | The person signing this form attests that they have the authority to submit this application on behalf of the applicant, and that the information, including all related submissions, is true and accurate to the best of their knowledge. | | |
| Signature of Person Authorized to Submit Application Eric W. Rankinen | (Print or Type) | Name of Signer: Eric W. Rankinen Title: Regional Landman | Date 2/13/2008 |
| Application Preparer/Contact: FOX AND FOX, INC. | | Phone: 814-745-2861 | |

Forest City



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Oil and Gas Management Program
WELL LOCATION PLAT

DEP Application Tracking # 205#1639350 4-18-08
Permit # 127-20007 c:
Project #

Denotes location of well on topo map.
True Latitude: NORTH
41° 41' 03.74"
True Longitude: WEST
75° 26' 10.86"

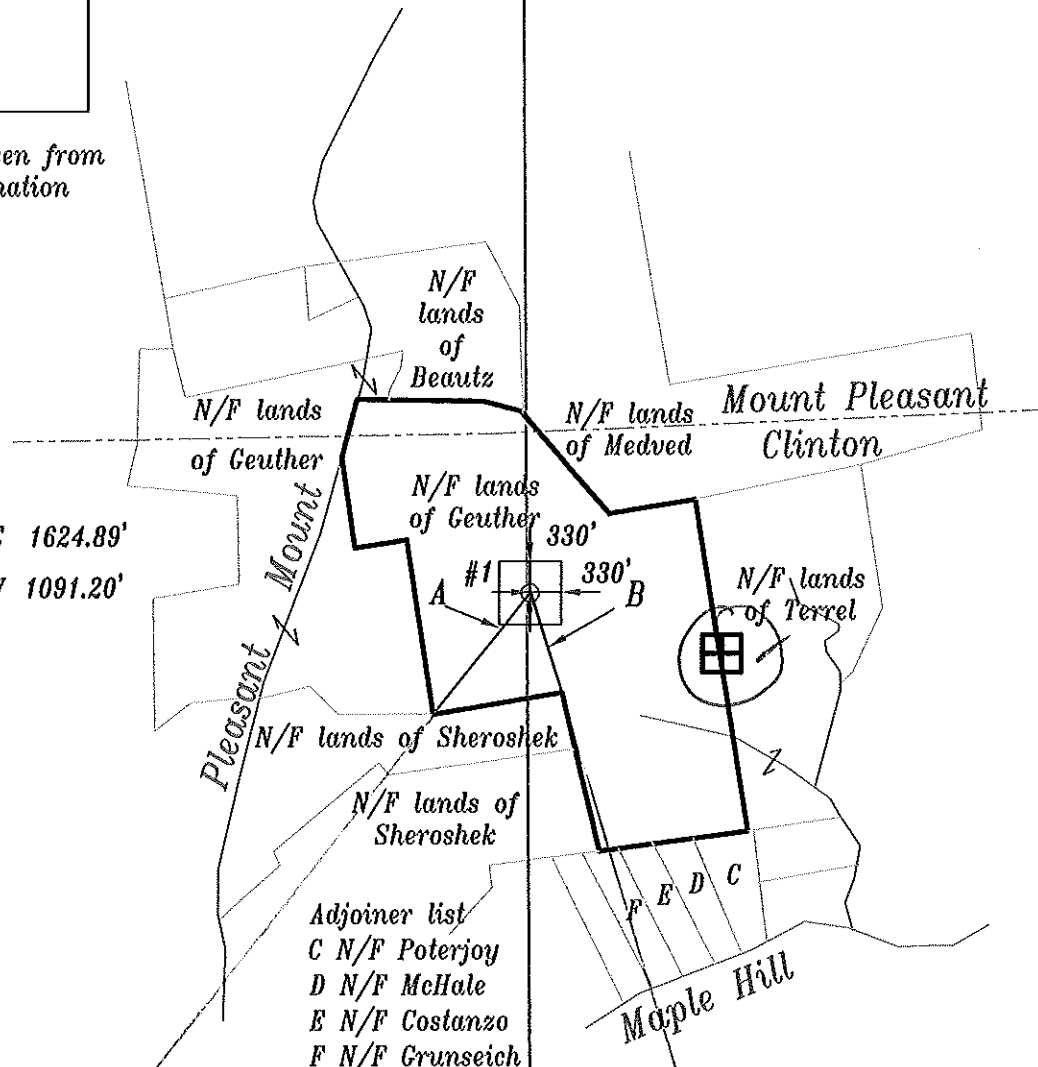
Well is located on topo map 8703 feet south of latitude 41 ° 42 ' 30 / "

Well is located on topo map
5377 feet west of longitude

parcel lines taken from tax map information

x 561411.86
y 2631916

A N 38°52'59" E 1624.89'
B N 17°59'20" W 1091.20'



- Adjoiner list
C N/F Poterjoy
D N/F McHale
E N/F Costanzo
F N/F Grunseich

75 ° 25 ' 00 "

D. Michael Canada

Surveyor or Engineer D. Michael Canada Pa. Lic. # 029272 E Phone # (716) 379-7918 Dwg. # 6669 Date Rev. Mar. 3, 2008 Scale 1" = 2000' Tract Acreage 261
January 30, 2008

| | | | | |
|--|---|---|--------------------------------------|---|
| Lat. & Long Metadata Method Static GPS Accuracy ± 10 ft. Datum NAD 27 | | Elevation Metadata Method Scaled Accuracy ± 10 ft. Datum USGS Quad | | Survey Date 1/30/2008 |
| Applicant / Well Operator Name Stone Energy Corporation | | Well (Farm) Name Geuther | | Well # #1 |
| Address PO Box 5280 Lafayette, LA 70506 | | County - Code Wayne | Municipality Clinton | |
| Surface Landowner Robert Geuther | | USGS 7 1/2 Quadrangle Map Name Forest City | | Map Section 5 |
| Surface Lessor | | Angle & Course of Deviation (Drilling) Vertical 0 | Surface Elevation 2210 ft. | Anticipated Total Depth 8150 ft. |
| Surface Owner or Water Purveyor with a Water Supply within 1,000 ft. | Approximate Course and Distance to Water Supply | Owner, Lessee, or Operator of Workable Coal Seam | | Name of Coal Seam Owned, Leased, or Operated |
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| APR 17 2008 | | | | |

ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

Reference 12



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

| DEP USE ONLY | |
|--|--------------------------|
| Permittee's eFACTS ID 277879 | Auth ID 825419 |
| Watershed Name N. Branch Culkins Creek | Quality HQ |

WELL PERMIT

| | | | |
|---|---|---|------------------------------------|
| Permittee NEWFIELD APPALACHIA PA LLC | OGO # OGO-67425 | Permit Number 37-127-20012- | Date Issued 04/29/2010 |
| Address 363 N SAM HOUSTON PKWY E STE 2020 | | Farm Name & Well Number HL RUTLEDGE 1 1 | Well Serial # |
| HOUSTON, TX 77060-2424 | | Municipality Damascus | County Wayne |
| Phone (281) 847-6031 | Project # | 7½' Quadrangle Name Galilee | Map Section # 2 |
| Surf Elev at Site 1440 feet | Anticipated Total Depth 8350 feet | Well Type GS | Latitude 41-43-43.2000 |
| | | | Longitude -75-11-32.1000 |
| Offset distances referenced to NE corner of map section. South 7820 feet West 6983 feet | | | |

This permit covering the well operator and well location shown above is evidence of permission granted to conduct activities in accordance with the Oil and Gas Act and the Oil and Gas Conservation Law, if the well is subject to that act and any rules and regulations promulgated thereunder, subject to the conditions contained herein and in accordance with the application submitted for this permit. This permit does not convey any property rights.

This permit and the permittee's authority to conduct the activities authorized by this permit are conditioned upon operator's compliance with applicable law and regulations.

Notification must be given to the district oil and gas inspector, the surface landowner and political subdivision of the date well drilling will begin at least 24 hours prior to commencement of drilling activities.

The permittee hereby authorizes and consents to allow, without delay, employees or agents of the Department to have access to and to inspect all areas upon presentation of appropriate credentials, without advance notice or a search warrant. This includes any property, facility, operation or activity governed by the Oil and Gas Act, the Oil and Gas Conservation Law, the Coal and Gas Resource Coordination Act and other statutes applicable to oil and gas activities administered by the Department. The authorization and consent shall include consent to the Department to collect samples of wastewaters or gases, to take photographs, to perform measurements, surveys, and other tests, to inspect any monitoring equipment, to inspect the methods of operation and disposal, and to inspect and copy documents required by the Department to be maintained. The authorization and consent includes consent to the Department to examine books, papers, and records pertinent to any matter under investigation pursuant to the Oil and Gas Act or pertinent to a determination of whether the operator is in compliance with the above referenced statutes. This condition in no way limits any other powers granted to the Department under the Oil and Gas Act and other statutes, rules and regulations applicable to these activities as administered by the Department.

This permit does not relieve the operator from the obligation to comply with the Clean Streams Law and all statutes, rules and regulations administered by the Department.

Special Permit Conditions:

This permit expires **04/29/2011** unless drilling is commenced on or before that date and prosecuted with due diligence.

Staci Gustafson, Co. Scraig Lobias
Regional Oil and Gas Program Manager

Stephen Watson
Oil & Gas Inspector

2 Public Square
Wilkes-Barre, PA 18711-0790

570-826-2320
Telephone



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

| | |
|----------------------------|---------------------------------|
| DEP USE ONLY | |
| Site ID | Primary Fac ID 728266 |
| Client Id 277879 | Subfacility Id |

Well Record and Completion Report

| | | | | | |
|--|--------------------|--|---|---------------------------------|-------|
| Well Operator NEWFIELD APPALACHIA PA LLC | | DEP ID# 277879 | Well API # (Permit / Reg) 37-127-20012- | Project Number | Acres |
| Address 363 N SAM HOUSTON PKWY E STE 2020, | | | Well Farm Name & Well # HL RUTLEDGE 1 1 | Serial # | |
| City HOUSTON | State TX | Zip Code 77060-2424 | County Wayne | Municipality Damascus | |
| Phone (281) 847-6031 | Fax | USGS 7.5 min. quadrangle map Galilee | | | |

Check all that apply: Original Well Record Original Completion Report Amended Well Record Amended Completion Report

WELL RECORD Also complete the Log of Formations on back (page 2)

| Well Type | <input type="checkbox"/> Gas | <input type="checkbox"/> Oil | <input type="checkbox"/> Combination Oil & Gas | <input type="checkbox"/> Injection | <input type="checkbox"/> Storage | <input type="checkbox"/> Disposal | |
|--------------------------|---------------------------------------|---------------------------------------|--|------------------------------------|--------------------------------------|--|----------|
| Drilling Method | <input type="checkbox"/> Rotary - Air | <input type="checkbox"/> Rotary - Mud | <input type="checkbox"/> Cable Tool | | | | |
| Date Drilling Started | Date Drilling Completed | Surface Elevation | ft. | Total Depth - Driller | ft. | Total Depth - Logger | ft. |
| Casing and Tubing | | | Cement returned on surface casing? <input type="checkbox"/> Yes <input type="checkbox"/> No | | | | |
| | | | Cement returned on coal protective casing? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A | | | | |
| Hole Size | Pipe Size | Wt. | Thread / Weld | Amount in Well (ft) | Material Behind Pipe Type and Amount | Packer / Hardware / Centralizers Type Size Depth | Date Run |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

COMPLETION REPORT

| Perforation Record | | | | Stimulation Record | | | | |
|---------------------------|--------------------------|----|-------------------------------|--------------------|------------------|-------------------|----------------------------|-------------------|
| Date | Interval Perforated From | To | | Date | Interval Treated | Fluid Type Amount | Propping Agent Type Amount | Average Injection |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| Natural Open Flow | | | Natural Rock Pressure | Hours | Days | | | |
| After Treatment Open Flow | | | After Treatment Rock Pressure | Hours | Days | | | |

Well Service Companies -- Provide the name, address, and phone number of all well service companies involved.

| | | |
|--------------------|--------------------|--------------------|
| Name | Name | Name |
| Address | Address | Address |
| City - State - Zip | City - State - Zip | City - State - Zip |
| Phone | Phone | Phone |

LOG OF FORMATIONS

Well API#: 37-127-20012--

(If you will need more space than this page, please photocopy the blank form before filling it in.)

| Formation Name or Type | Top (feet) | Bottom (feet) | Gas at (feet) | Oil at (feet) | Water at (fresh / brine: ft.) | Source of Data |
|------------------------|---------------|------------------|------------------|------------------|----------------------------------|----------------|
| | | | | | | |

I do hereby certify to the best of my knowledge, information and belief that the well identified on this Well Record and Completion Report has been properly cased and cemented in accordance with the requirements of 25 Pa. Code Chapter 78 and any conditions contained in the permit for this well. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Well Operator's Signature

Title:

Date:

DEP USE ONLY

Reviewed by:

Date:

Comments:



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

| | |
|---------------------|--------------------------|
| DEP USE ONLY | |
| Site ID | Primary Fac ID 728266 |
| Client Id 277879 | Subfacility Id |

Well Site Restoration Report

| | | | | | |
|---|---|--|--|---------------------------------|-------------------|
| A. Operator and Well Information | | | <i>Please read instructions on back before completing this form.</i> | | |
| Well Operator NEWFIELD APPALACHIA PA LLC | | DEP ID# 277879 | Well API # (Permit / Reg) 37-127-20012- | | |
| Address 363 N SAM HOUSTON PKWY E STE 2020, | | | Well Farm Name & Well # HL RUTLEDGE 1 1 | | Serial # |
| City HOUSTON | State TX | Zip Code 77060-2424 | County Wayne | Municipality Damascus | |
| Phone (281) 847-6031 | | Fax | | | |
| B. Land Application of Tophole Water | | | E. Pit Disposal | | |
| Date applied | pH | | Describe pit closure procedures. | | |
| Volume (bbls) | Spec. cond. (µmhos/cm) | | | | |
| C. Off-site Waste Disposal | | | | | |
| Type: <input type="checkbox"/> Drilling Fluid (803) | Amount: bbls | | | | |
| <input type="checkbox"/> Fracing Fluid (804) | bbls | | | | |
| <input type="checkbox"/> Other, specify: | Qty: bbls or tons | | | | |
| Method of disposal or reuse | | <input type="checkbox"/> Sewage Treatment Plant (10) | Subbase, material: | | Thickness: inches |
| <input type="checkbox"/> Disposal Well (04) | <input type="checkbox"/> Brine Treatment Plant (12) | | Pit liner, material: | | Thickness: mils |
| <input type="checkbox"/> Landfill (05) | <input type="checkbox"/> Other (08) | | Pit dimensions (feet) Length: | | Width: Depth: |
| Facility Information | | | F. Land Application | | |
| Name | Permit # | | Area: Length: feet | | Width: feet |
| Hauler Information | | | Waste-to-soil ratio (by volume): | | |
| Name | | | Chemical analysis of waste | | |
| Address | | | Cadmium (Cd) ppm Nickel (Ni) ppm | | |
| City | State | Zip Code | Copper (Cu) ppm Zinc (Zn) ppm | | |
| D. On-site Disposal – Drill Cuttings or Waste | | | Chromium (Cr) ppm Oil and Grease % | | |
| Location of center of disposal area in relation to the well: | | | Lead (Pb) ppm Spec. Cond. µmhos/cm | | |
| Course | Distance | feet | Mercury (Hg) ppm | | |
| Describe the material disposed, including additives. | | | Well Operator's Signature | | |
| | | | Title: Date: | | |
| | | | DEP USE ONLY | | |
| | | | Reviewed by: Date: | | |
| Specify disposal method | | | Comments: | | |
| <input type="checkbox"/> Unlined pit, complete Section E. | <input type="checkbox"/> Dusting | | | | |
| <input type="checkbox"/> Lined pit, complete Section E. | <input type="checkbox"/> Solidification | | | | |
| <input type="checkbox"/> Land application, complete Section F. | <input type="checkbox"/> Other | | | | |

Reference 13

COPY

5500-FM-OG0001A Rev. 11/2007



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

| DEP USE ONLY | |
|-----------------------------------|-------------------|
| Permittee's eFACTS ID 277879 | Auth ID 830957 |
| Watershed Name Hollister Creek | Quality HQ |

WELL PERMIT

| | | | |
|--|---|--|---|
| Permittee NEWFIELD APPALACHIA PA LLC | OGO.# OGO-67425 | Permit Number 37-127-20017-00 | Date Issued 05/27/2010 |
| Address 363 N SAN HOUSTON PKWY E | | Farm Name & Well Number WOODLAND MGMT PARTNERS 1 1 | Well Serial # |
| SUITE 2020 | | Municipality Damascus | County Wayne |
| HOUSTON, TX 77060-2424 | | 7 1/2' Quadrangle Name Callicoon | Map Section # 7 |
| Phone (281) 847-6031 | Project # | Latitude 41-45-57.2000 | Longitude -75-6-33.8000 |
| Surf Elev at Site 1193 feet | Anticipated Total Depth 8350 feet | Well Type GS | Offset distances referenced to NE corner of map section. South 9393 feet West 7108 feet |

This permit covering the well operator and well location shown above is evidence of permission granted to conduct activities in accordance with the Oil and Gas Act and the Oil and Gas Conservation Law, if the well is subject to that act and any rules and regulations promulgated thereunder, subject to the conditions contained herein and in accordance with the application submitted for this permit. This permit does not convey any property rights.

This permit and the permittee's authority to conduct the activities authorized by this permit are conditioned upon operator's compliance with applicable law and regulations.

Notification must be given to the district oil and gas inspector, the surface landowner and political subdivision of the date well drilling will begin at least 24 hours prior to commencement of drilling activities.

The permittee hereby authorizes and consents to allow, without delay, employees or agents of the Department to have access to and to inspect all areas upon presentation of appropriate credentials, without advance notice or a search warrant. This includes any property, facility, operation or activity governed by the Oil and Gas Act, the Oil and Gas Conservation Law, the Coal and Gas Resource Coordination Act and other statutes applicable to oil and gas activities administered by the Department. The authorization and consent shall include consent to the Department to collect samples of wastewaters or gases, to take photographs, to perform measurements, surveys, and other tests, to inspect any monitoring equipment, to inspect the methods of operation and disposal, and to inspect and copy documents required by the Department to be maintained. The authorization and consent includes consent to the Department to examine books, papers, and records pertinent to any matter under investigation pursuant to the Oil and Gas Act or pertinent to a determination of whether the operator is in compliance with the above referenced statutes. This condition in no way limits any other powers granted to the Department under the Oil and Gas Act and other statutes, rules and regulations applicable to these activities as administered by the Department.

This permit does not relieve the operator from the obligation to comply with the Clean Streams Law and all statutes, rules and regulations administered by the Department.

Special Permit Conditions:

This permit expires 05/27/2011 unless drilling is commenced on or before that date and prosecuted with due diligence.

Regional Oil and Gas Program Manager

Stephen Watson
Oil & Gas Inspector

2 Public Square
Wilkes-Barre, PA 18711-0790

570-826-2320
Telephone

DEP USE ONLY
 AUTH # CNC
 Check # 1064287 Amount \$ 1500 \$1500

1950
 200
 50

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL

| | | | |
|--|---|---|-----------------------------|
| Notes | | DEP USE ONLY | |
| OGO # <u>67425</u> | Objection Date - Do not issue before: <u>5/3/10</u> | Well Permit # <u>127-20017</u> | Special Cond. A B C D E F |
| Bond # <u>12382</u> | Date Approved: <u>5/11/10</u> | Watershed Name: <u>HOLLISTER CREEK</u> | Designation: <u>(AO) EV</u> |
| C: <u>4/13/10</u> n: <u>5/3/10</u> s: <u>5/11/10</u> | INV: <u>5-27-10</u> | Please read instructions before you begin filling in this form. | |

| | | | | |
|--|---------------------------------|------------------------------|-----------------------------|--|
| Applicant (Operator) Name Newfield Appalachia PA LLC | DEP Client ID# 277879 | Phone 281-847-6031 | FAX 281-847-6160 | Check if new address. <input type="checkbox"/> |
| Mailing Address (Street or PO Box) 363 N. Sam Houston Pkwy E. Suite 2020 | City Houston | State TX | Zip +4 77060-2424 | Country (if not USA) |

| | | | | | |
|---|---------------------------------|----------------------|---|--|---|
| (Well) Farm Name Woodland Management Partners | Well # 1-1 | Serial # | PERMIT TYPE Check applicable. | TYPE OF WELL Check one. | APPLICATION FEE Check applicable. |
| County WAYNE | Municipality DAMASCUS | Project # (from DEP) | Application is to: <input checked="" type="checkbox"/> Drill a new well <input type="checkbox"/> Deepen a well <input type="checkbox"/> Redrill a well <input type="checkbox"/> Alter a well <input type="checkbox"/> E&S Control Module <input type="checkbox"/> Other (specify) | <input type="checkbox"/> Gas <input type="checkbox"/> Oil <input type="checkbox"/> Comb. (gas & oil) <input type="checkbox"/> Injection, recovery <input type="checkbox"/> Injection, disposal <input type="checkbox"/> Coalbed Methane <input type="checkbox"/> Gas Storage <input checked="" type="checkbox"/> Other (specify) vertical test well | <input type="checkbox"/> Marcellus Well: Non-Vertical <input type="checkbox"/> Marcellus Well: Vertical <input type="checkbox"/> Non-Marcellus Well: Non-Vertical <input checked="" type="checkbox"/> Non-Marcellus Well: Vertical <input type="checkbox"/> \$200 (Home Use Well) <input type="checkbox"/> \$500 E&S Fee <input type="checkbox"/> \$0 (Rehab orphan) <input checked="" type="checkbox"/> Vertical: Length <u>8350</u> ft. <input type="checkbox"/> Marcellus: Length _____ ft. <input type="checkbox"/> Non-Vertical: Length _____ ft. Total Application Fee \$ <u>1500</u> |

COORDINATION WITH REGULATIONS AND OTHER PERMITS

| | Yes | No | DEP USE ONLY |
|---|-------------------------------------|-------------------------------------|--------------------|
| 1. Will the well be subject to the Oil and Gas Conservation Law? If "No," go to 2). | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Date Stamps/Notes |
| a. If "Yes" to #1, is the well at least 330 feet from outside lease or unit boundary? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Auth <u>830957</u> |
| b. Does the location fall within an area covered by a spacing order? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Site <u>733315</u> |
| 2. Will the well penetrate a workable coal seam? If "No," include justification and supporting documentation. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Cint <u>277879</u> |
| 3. If the well will penetrate a workable coal seam, and the well is a "non-conservation" gas well, does the location comply with the distance requirements of Section 7 of the Coal and Gas Resource Coordination Act? (At least 1,000 feet from all existing wells). | <input type="checkbox"/> | <input type="checkbox"/> | APS <u>717958</u> |
| a. If "No," is the required exception request attached? (Check here if re-working an existing well: <input type="checkbox"/> N/A) | <input type="checkbox"/> | <input type="checkbox"/> | Acct <u>676721</u> |
| 4. Will the well be drilled at a location where the coal has been removed? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | PF <u>729777</u> |
| 5. Will the well be drilled through an active (operating or projected) coalmine, or within 1,000 feet of the boundary? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | SF <u>101251</u> |
| a. If "Yes," print the names of: Mine: _____ Operator: _____ | | | |
| 6. Will the well penetrate or be within 2,000 feet of an active gas storage reservoir boundary? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. If Yes, print the names of: Storage Field: _____ Operator: _____ | | | |
| 7. Is the proposed well location within the permitted area of a landfill? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 8. Will the well site be within 100 feet (measured horizontally) of a stream, spring or body of water identified on the most current 7 1/2' topographic map? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. If "Yes," is a request for a waiver (form 5500-FM-OG0057), and E&S control plan attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| 9. Will the well site be within 100 feet of a wetland or in a wetland? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. Is the well site within 100 feet of a wetland greater than one acre in size? | <input type="checkbox"/> | <input type="checkbox"/> | |
| If yes, is a waiver request (form 5500-FM-OG0057) and E&S control plan attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| 10. Will the well be drilled within 200 feet (horizontally) from any existing building or an existing water supply? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| a. If "Yes," is written consent from the owner attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| b. If written consent is not attached, is a variance request (form 5500-FM-OG0058) attached? | <input type="checkbox"/> | <input type="checkbox"/> | |
| 11. Will the well be located where it may impact a public resource as outlined in the "Coordination of a Well Location with Public Resources" form 5500-PM-OG0076? If yes, attach a completed copy of the form. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 12. Is the well site in a Special Protection High Quality (HQ) or Exceptional Value (EV) watershed? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |
| 13. Is this well part of a development where you need an Earth Disturbance Permit for Oil and Gas Activities disturbing more than 5 acres? If yes, attach a completed Erosion Sediment and Stormwater Control Module or list the number and date of the ESCGP-1 Approval. | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |

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 NORTHWEST REGIONAL OFFICE

The person signing this form attests that they have the authority to submit this application on behalf of the applicant, and that the information, including all related submissions, is true and accurate to the best of their knowledge.

| | | |
|---|---|----------------------------|
| Signature of Person Authorized to Submit Application <u>Donald F. Sleeth</u> | (Print or Type) Name of Signer: DONALD F. SLEETH | Date 4-6-10 |
| Application Preparer/Contact: BETSY COLLINS | Title: Drilling Manager | Phone: 412-921-8250 |



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL & GAS MANAGEMENT PROGRAM

Farm Name - Well #
Woodland Management Partners-Well #1-1
Applicant Name
Newfield Appalachia PA LLC
DEP ID#
277879
APPS #

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL
Page 2 --- Record of Notification / Written Consent

List the following: surface landowner, all landowners or water purveyors whose water supplies are within 1,000 feet of this proposed well location; gas storage operator if within 2000 feet; all coal owners and lessees of all underlying workable coal seams; operators of underground coal mines at the proposed location; and coal operators with a deep mine within 1,000 feet. Mark the boxes, "X," which show the parties' interests. Use additional forms if you need more space. You are required to notify each of these parties.

| Name: | Address: | Surface Landowner | Coal Owner | Coal Lessee | Coal Mine Operator | Gas Storage Operator | Within 1,000 feet | | | Notification | | |
|------------------------------|--|-------------------|------------|-------------|--------------------|----------------------|-----------------------|----------------|--------------------|--------------|----------------|-------------------|
| | | | | | | | Surf Owner With Water | Water Purveyor | Coal Mine Operator | Surf Owner | Return Receipt | Address Affidavit |
| Donald and Marie Hartnett | 841A Calicoon Rd. Damascus, PA 18415-3514 | | | | | | X | | | 3/25/10 | 3/29/10 | |
| Woodland Management Partners | 308 Egypt Rd. Taffon, PA 18464 | X | | | | | | | | 3/25/10 | 4/1/10 | X |
| Alfred Cimino | 124 Monroe St, Apt. 1 Archibald, PA 18403-1818 | | | | | | X | | | | | X |
| Leon N Clause, Sr. | PO Box 241 Stanhope, NJ 07874-0241 | | | | | | X | | | | | X |
| Name: | Address: | | | | | | | | | | | |
| Name: | Address: | | | | | | | | | | | |
| Name: | Address: | | | | | | | | | | | |

Optional: Signature below indicates the party's approval of the well location, and waives the 15-day objection period. Check applicable box.

| | | | |
|--|------|--|------|
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| <input type="checkbox"/> Water Purveyor or <input type="checkbox"/> Landowner with water supply within 1,000 ft. | Date | Coal <input type="checkbox"/> Operator, <input type="checkbox"/> Owner, or <input type="checkbox"/> Lessee | Date |
| Surface Landowner at proposed location | Date | Coal Operator within 1,000 feet of proposed location | Date |
| Surface Landowner at proposed location | Date | Gas Storage Operator within 2,000 feet | Date |

Signature below indicates written consent. Check applicable box.

Owner of: water supply, or building within 200 feet Date: 3/16/10

Address (of above):
Leon N Clause

Owner of: water supply, or building within 200 feet Date:

Address (of above):

127-20017



Farm Name - Well #
Woodland Management Partners-Well #1-1

Applicant Name
Newfield Appalachia PA LLC

DEP ID#
277879

APS #

PERMIT APPLICATION FOR DRILLING OR ALTERING A WELL
Page 2 -- Record of Notification / Written Consent

| Name | Address | Surface Landowner | Coal Owner | Coal Lessee | Coal Mine Operator | Gas Storage Operator | Surt Owner | Within 1,000 feet | | | Notification | | |
|------------------------------|--|-------------------|------------|-------------|--------------------|----------------------|------------|-------------------|--------------------|----------|----------------------|----------------|-------------------|
| | | | | | | | | Water Purveyor | Coal Mine Operator | Operator | Certified Mail Dates | Return Receipt | Address Affidavit |
| Donald and Marie Harneit | 841A Calicoon Rd. Damascus, PA 18415-3514 | | | | | | X | | | 3/25/10 | 3/29/10 | | |
| Woodland Management Partners | 308 Egypt Rd. Taffton, PA 18464 | X | | | | | | | | | | | X |
| Alfred Cimino | 124 Monroe St, Apt. 1 Archibald, PA 18403-1818 | | | | | | X | | | 3/25/10 | 4/1/10 | | |
| Leon N Clouse, Sr. | PO Box 241 Starhope, NJ 07874-0241 | | | | | | X | | | | | | X |
| Name: | Address: | | | | | | | | | | | | |
| Name: | Address: | | | | | | | | | | | | |
| Name: | Address: | | | | | | | | | | | | |

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Optional: Signature below indicates the party's approval of the well location, and waives the 15-day objection period. Check applicable box.

Water Purveyor or Landowner with water supply within 1,000 ft. Date

Coal Operator, Owner, or Lessee Date

Water Purveyor or Landowner with water supply within 1,000 ft. Date

Coal Operator, Owner, or Lessee Date

Water Purveyor or Landowner with water supply within 1,000 ft. Date

Coal Operator, Owner, or Lessee Date

Water Purveyor or Landowner with water supply within 1,000 ft. Date

Coal Operator, Owner, or Lessee Date

Surface Landowner at proposed location
WOODLAND MANAGEMENT PARTNERS LP Date **3/14/2010**

Surface Landowner at proposed location
WOODLAND MGT SERVICES INC General Date

Todd M. ... PRESIDENT

Signature below indicates written consent. Check applicable box.

Owner of: water supply, or building within 200 feet Date

Address (of above)

Owner of: water supply, or building within 200 feet Date

Address (of above)

127-20017



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Oil and Gas Management Program
WELL LOCATION PLAT

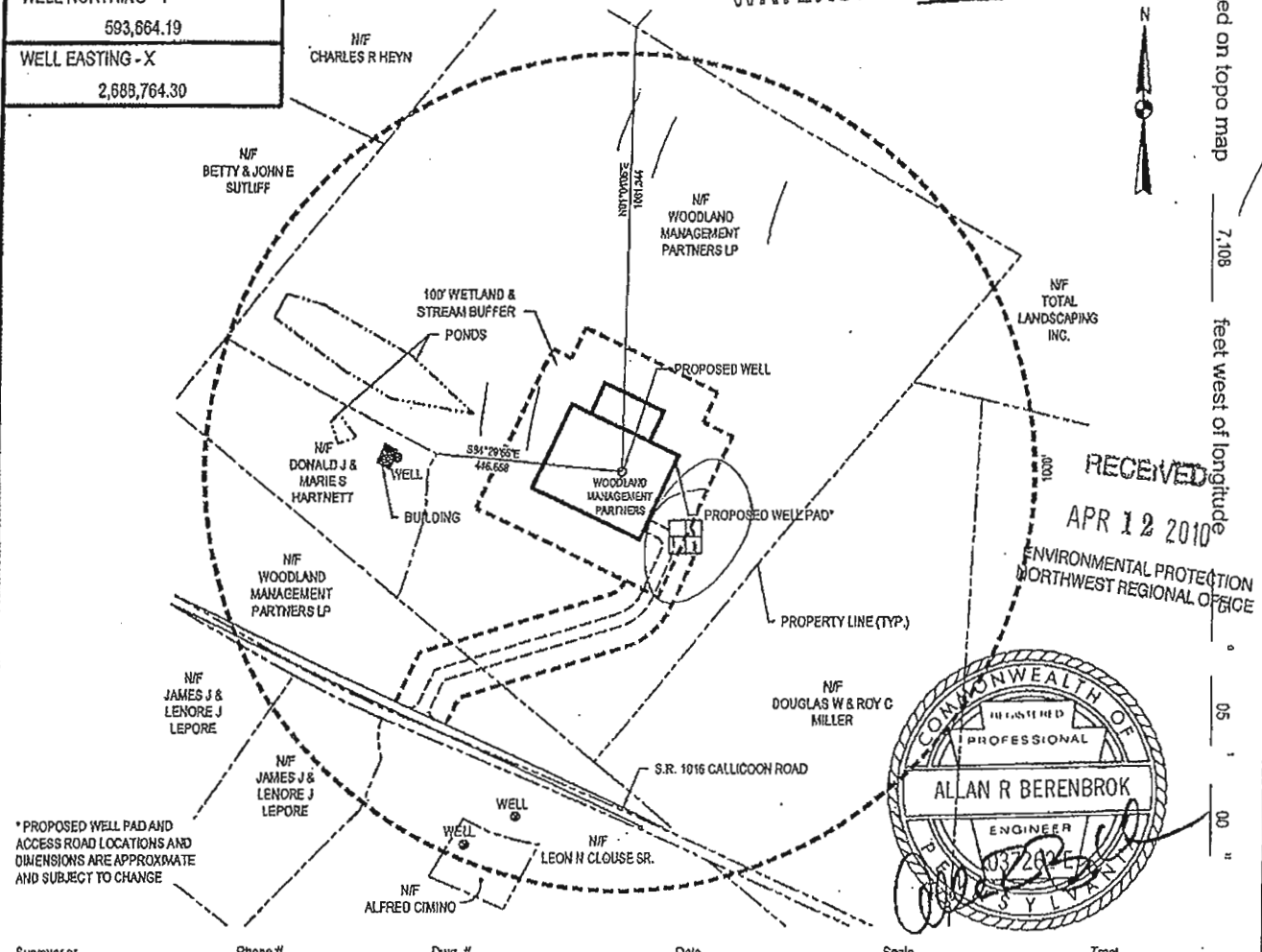
| | |
|----------------------------|------------------|
| DEP Application Tracking # | G: <i>ju</i> |
| Permit # | <i>5/3/10</i> |
| Project # | <i>127-20017</i> |
| | C: |

| |
|--|
| <input type="checkbox"/> Denotes location of well on topo map. |
| True Latitude: NORTH 41° 45' 57.2" |
| True Longitude: WEST 75° 06' 33.8" |
| WELL NORTHING - Y 593,664.19 |
| WELL EASTING - X 2,688,764.30 |

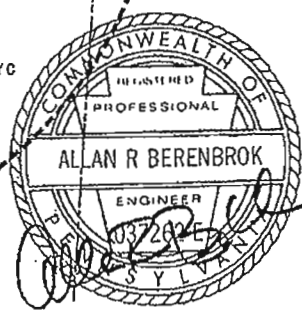
Well is located on topo map 9,393 feet south of latitude 41° 37' 30"

HQ

WATERSHED Hollister Creek



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NORTHWEST REGIONAL OFFICE



Surveyor or Engineer: **TETRA TECH** Phone #: (412) 921-8873 Dwg. #: 1 Date: 4/6/2010 Scale: 1" = 400' Tract Acreage: _____

| | | | | |
|---|--|---|--------------------------|-------------------------------|
| Lat. & Long Metadata Method: GPS Accuracy +/- 1 ft. Datum: NAD83 | | Elevation Metadata Method: GPS Accuracy +/- 1 ft. Datum: NAD83 | | Survey Date: Jan. 2010 |
| Applicant / Well Operator Name Newfield Appalachia PA LLC | | Well (Farm) Name Woodland Management Partners | | Well # 1-1 |
| Address 363 N. Sam Houston Parkway E., Suite 2020, Houston, TX 77080 | | County - Code Wayne | Municipality Damascus | Well Type Vertical Test |
| Surface Landowner / Lessor Woodland Management Partners | | USGS 7 1/2 Quadrangle Map Name Callicoon, PA | | Map Section 7 |
| Target Formation(s) Onondaga | | Angle & Course of Deviation (Drilling) N/A | | Surface Elevation 1193 ft. |
| | | Anticipated Total Depth TVD 8,350 ft. | | TD 8,350 ft. |
| Donald and Marie Hartnett | | N86d 22° 34' W 537' | | N/A |
| Leon N. Clouse Sr. | | S16d 46° 23' W 862' | | N/A |
| Alfred Cimino | | S22d 36° 51' W 965' | | N/A |
| | | N/A | | N/A |

PA_037262_0373 - Newfield Appalachia PA LLC Well Pad Plat Ectd 4.6.dwg PTT BEN.HOPPE 4/22/10 10:54:04 AM

Reference 14

**Erosion and Sediment Control
General Permit
For
Earth Disturbance
Associated With Oil & Gas Exploration,
Processing or Treatment Operations
or
Transmission Facilities**

(take a deep breath)

Otherwise known as...

ESCGP-1

HISTORY

- E&S Controls Required since 1972.
- E&S Control Manual published in 1981
 - E&S Control Manual incorporated into the Oil and Gas Operator's Manual.
- NPDES Phase I Stormwater Rule in 1990
- Oil and Gas Stormwater Policy was issued in 2001. Reissued in 2003

ENERGY POLICY ACT OF 2005

- Defined Oil and Gas Activities in the Clean Water Act
- Identified Oil and Gas Activities that do not require an NPDES Permit.
- Made certain Oil and Gas activities eligible for exemption from Stormwater NPDES permits associated with Construction Activities.

July 2006

EPA amended the NPDES regulations for stormwater discharges associated with oil and gas exploration, production, processing or treatment operations or transmission facilities **exempting them from the NPDES Stormwater Permit requirements.**

The EPA rulemaking does not affect the authority of the Department to regulate earthmoving activities under Chapter 102

The Department's Plan

- Continue Enforcement of Chapter 102
- Issue a General Permit for Erosion and Sediment Control.
- Revise Existing Oil & Gas Stormwater Policy.
- Revise Regulations.

Why Do We Need This Permit?

- **Restore disturbed areas promptly**
- **Minimize earth disturbance**
- **Ensure proper oversight by DEP**

ESCGP – 1

(the permit)

- Specific to Oil and Gas Activities
- disturb 5 acres or greater **at one time over the life of the project**
- Encourages prompt stabilization
- Ensure proper design and use of Erosion & Sediment BMPs and Post Construction Stormwater BMPs

- Encourages Operators to complete site restoration promptly



- Incentive for Operators to minimize disturbed areas

What Activities Might Need This Permit?



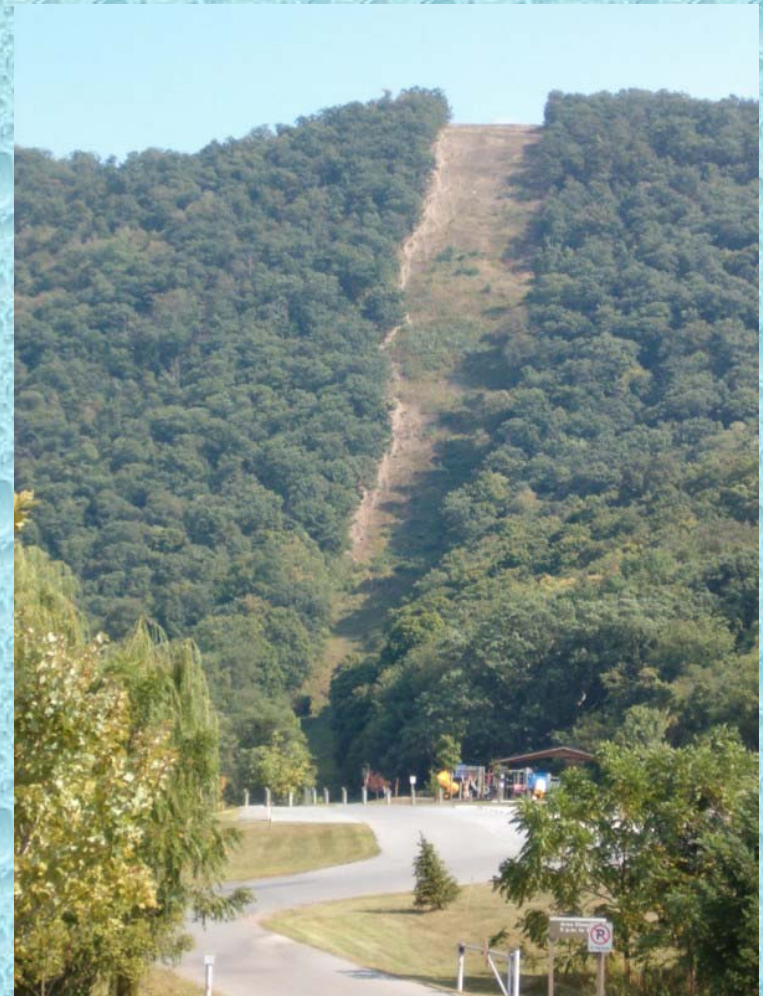
- **Deep well drilling**



- **Projects with multiple, closely spaced and interconnected wells**



**Multiple wells that are interconnected
by a common access road and pipeline**



•Transmission Pipelines

Who Issues What?

County Conservation Districts

- **Chapter 102 Delegated**
- **can issue the ESCGP-1**

Non-Delegated Counties

Bureau of Oil & Gas Management

Regional Office (SWRO or NWRO)

- **Projects that include well sites, access roads, flow lines and gathering lines**

Bureau of Watershed Management Regional Office

- **Transmission Line Projects**

Where Are We in the Process?

November 18, 2006 – The Dept. announced it's intent to develop an Erosion & Sediment Control Permit for Oil and Gas Activities in the PA Bulletin.

The intent to issue ESCGP-1 was published in the PA Bulletin on **May 5, 2007** and the public comment period ended on **June 4, 2007**.

Draft Permit, Application, Checklist and Instructions have been prepared.

Oil and Gas Earth Disturbance Examples

Example No. 1 – To construct the well sites and access roads for five oil wells on 660 ft. spacing. Pipelines and power lines will be buried along the access road.

Disturbed Area

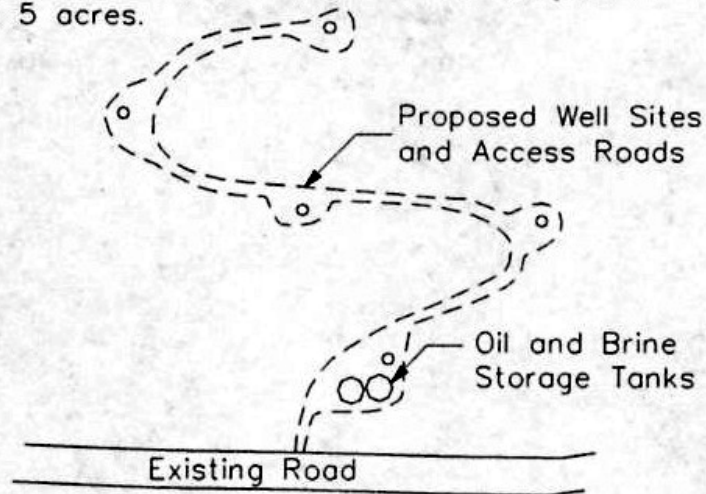
Access Road 3,400 ft. x 16 ft. = 54,400 Sq. Ft.

5 Well Sites 75 ft. x 60 ft. x 5 = 22,500 Sq. Ft.

Total = 76,900 Sq. Ft.

= 1.8 Acres

Comment – The disturbed area for the project will be less than 5 acres.

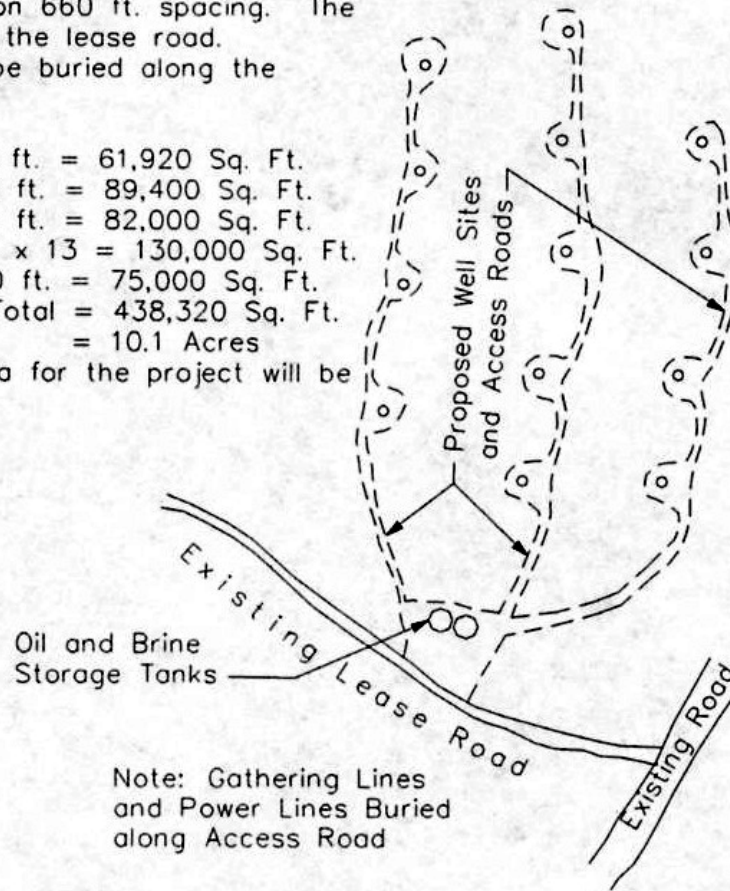


Example No. 2 – To construct the well sites and access roads for 13 oil wells on 660 ft. spacing. The tank battery will be set along the lease road. Pipelines and power lines will be buried along the access road.

Disturbed Area

| | |
|---------------|--|
| Access Road | 3,440 ft. x 18 ft. = 61,920 Sq. Ft. |
| | 2,980 ft. x 30 ft. = 89,400 Sq. Ft. |
| | 3,280 ft. x 25 ft. = 82,000 Sq. Ft. |
| 13 Well Sites | 100 ft. x 100 ft. x 13 = 130,000 Sq. Ft. |
| Tank Battery | 300 ft. x 250 ft. = 75,000 Sq. Ft. |
| Total | = 438,320 Sq. Ft. = 10.1 Acres |

Comment – The disturbed area for the project will be greater than 5 acres.



Example No. 3 – To construct the well sites and access roads for four new oil wells at an existing operation. Wells are placed on 660 ft. spacing. Pipelines and power lines will be buried in the access road.

Disturbed Area

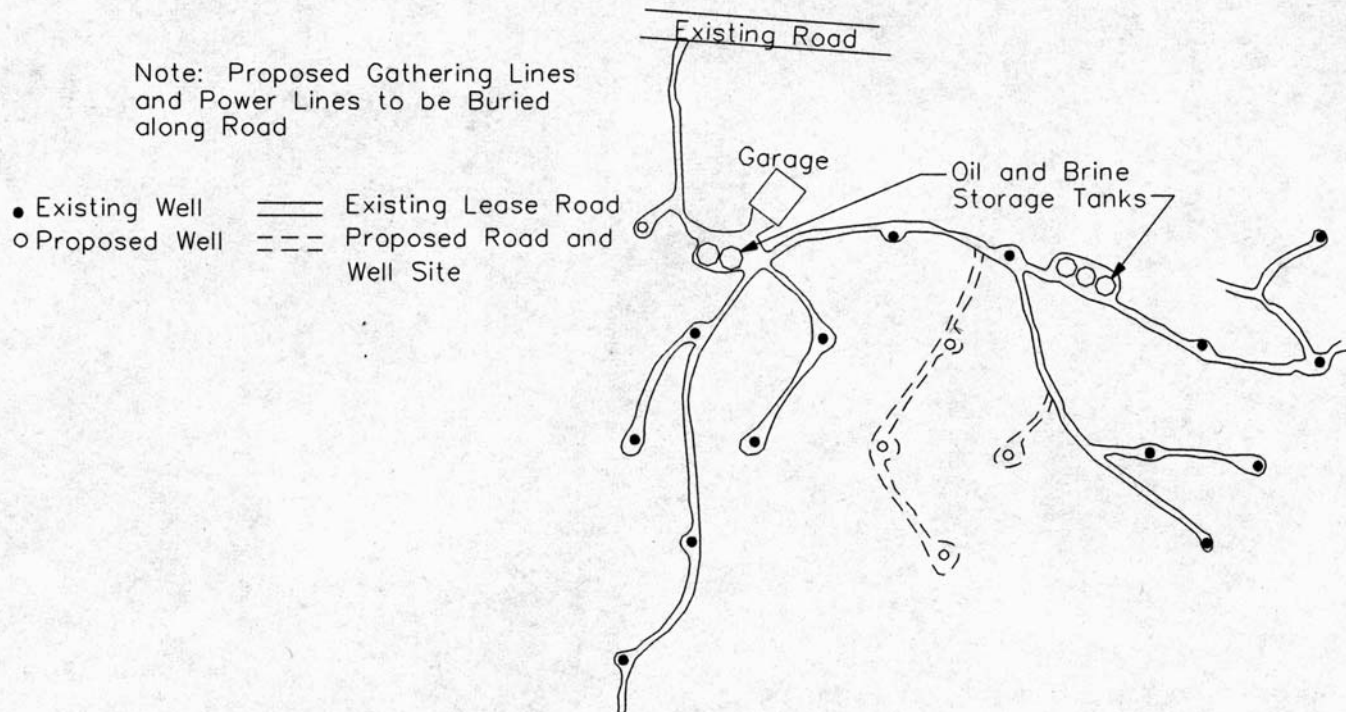
Access Road 2,700 ft. x 16 ft. = 43,200 Sq. Ft.

4 Well Sites 50 ft. x 60 ft. x 4 = 12,000 Sq. Ft.

Total = 55,200 Sq. Ft.

= 1.3 Acres

Comment – The disturbed area for the project will be less than 5 acres.



Example No. 4 – To construct the well site and access road and install the gathering line for a gas well on 1,000 ft. or 1,320 ft. spacing.

Disturbed Area

Access Road 900 ft. x 20 ft. = 18,000 Sq. Ft.

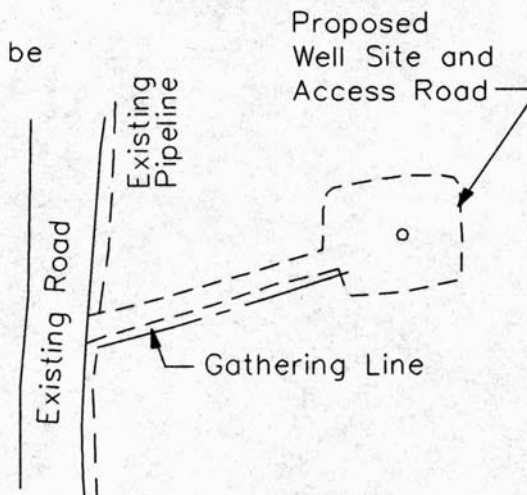
1 Well Site 220 ft. x 220 ft. = 48,400 Sq. Ft.

Gathering Line 900 ft. x 10 ft. = 9,000 Sq. Ft.

Total = 75,400 Sq. Ft.

= 1.7 Acres

Comment – The disturbed area for the project will be less than 5 acres



Example No. 5 – To construct well sites and access roads and install the gathering line for five gas wells on 1,200 ft. spacing.

Disturbed Area

Access Road 4,900 ft. x 20 ft. = 98,000 Sq. Ft.

5 Well Sites 175 ft. x 175 ft. x 5 = 153,125 Sq. Ft.

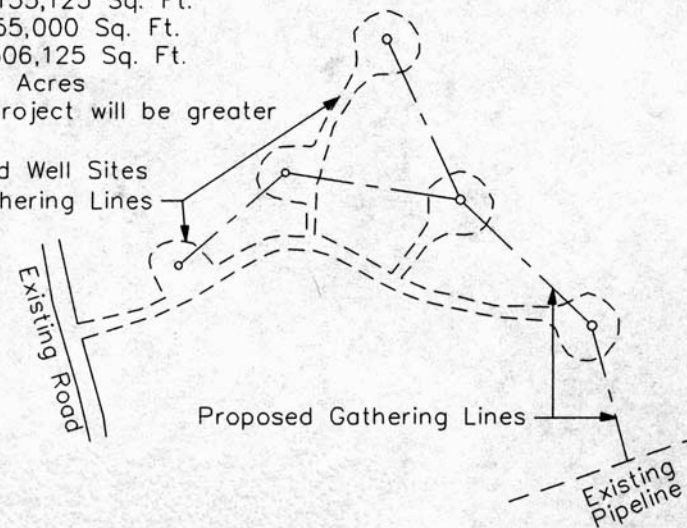
Gathering Line 5,500 ft. x 10 ft. = 55,000 Sq. Ft.

Total = 306,125 Sq. Ft.

= 7 Acres

Comment – The disturbed area for the project will be greater than 5 acres.

Proposed Well Sites
and Gathering Lines



Example No. 6 – To construct well sites and access roads and install the gathering line for six gas wells (1000 ft. well spacing). Access for three wells is from the existing road on the west and access for the other 3 wells is from the existing road on the east. The installation of the gathering line connects the two areas.

Disturbed Area

Access Road 3,850 ft. x 22 ft. = 84,700 Sq. Ft.

Well Site 190 ft. x 190 ft. x 6 = 216,600 Sq. Ft.

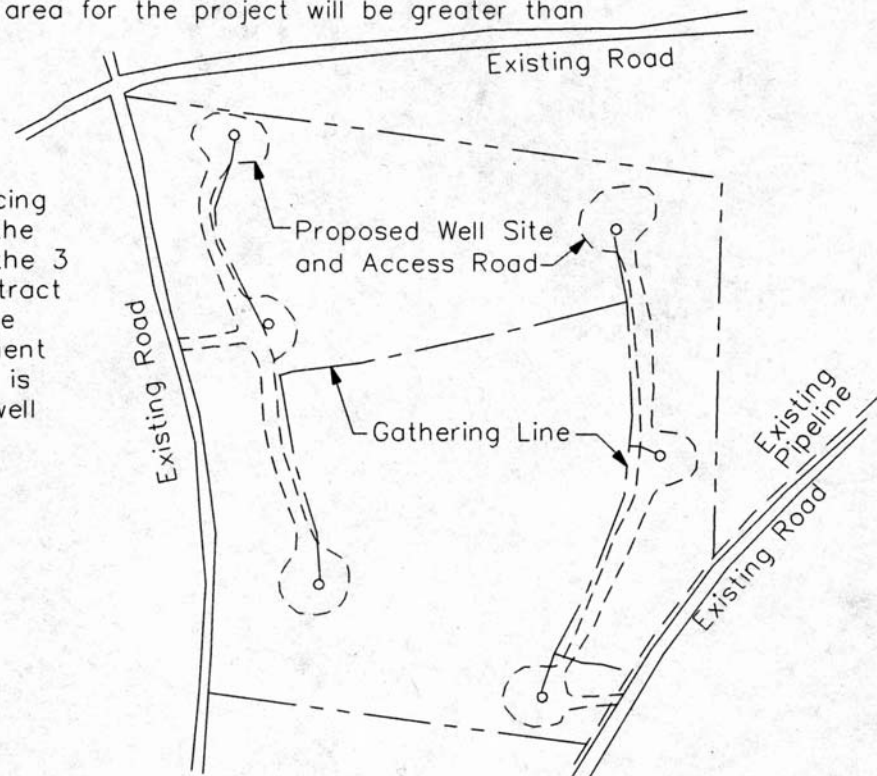
Gathering Line 2100 ft. x 10 ft. = 21,000 Sq. Ft.

Total = 322,300 Sq. Ft.

= 7.4 Acres

Comment – The disturbed area for the project will be greater than 5 acres.

Note – Since the well spacing is greater than 900 feet, the construction activities for the 3 wells on each side of the tract may be treated as separate common plans of development provided the gathering line is not constructed until the well site and access roads are permanently stabilized.



In Summary

- **Conservation District with 102 delegation can process the ESCGP-1 permit for O & G well sites, access roads, flow lines and gathering lines as well as transmission lines**
- **Non Delegated counties, in the case of O & G covered activities, the ESCGP-1 permit would go to the appropriate O & G REGIONAL OFFICE. (NWRO or the SWRO)**
- **For Transmission lines in non-delegated counties the permit would be reviewed by the appropriate Regional Watershed Management program for that county.**

- **Transmission lines are exempt from the NPDES Stormwater Permit process.**
- **They are not exempt from the state permit ESCGP-1**
- **O & G doesn't do transmission lines. They will be covered, as always, by Watershed Management**
- **O & G covers well sites, access roads, flow lines and gathering lines**
- **Distribution lines are not exempt from the federal NPDES permit process. These are also the responsibility of Watershed Management.**

The Permit Application and Checklist





COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATERSHED MANAGEMENT
BUREAU OF OIL AND GAS MANAGEMENT

OFFICIAL USE ONLY

ID # _____

Date Received _____

**NOTICE OF INTENT FOR COVERAGE
UNDER THE EROSION AND SEDIMENT CONTROL GENERAL PERMIT (ESCGP-1)
FOR EARTH DISTURBANCE ASSOCIATED WITH OIL AND GAS EXPLORATION,
PRODUCTION, PROCESSING OR TREATMENT OPERATIONS OR TRANSMISSION FACILITIES
(ESCGP-1)**

READ THE STEP-BY-STEP INSTRUCTIONS PROVIDED IN THIS PERMIT APPLICATION PACKAGE BEFORE COMPLETING THIS FORM.

PLEASE PRINT OR TYPE INFORMATION IN BLACK OR BLUE INK.

| | | | |
|--|-------------------------------------|--|----------------------------------|
| APPLICATION TYPE | NEW <input type="checkbox"/> | RENEWAL <input type="checkbox"/> | REVISED <input type="checkbox"/> |
| SECTION A. E&S PLANNING REQUIREMENTS | | | |
| 1. Total Project Area (Acres): _____ | Total Disturbed Area (Acres): _____ | | |
| 2. Project Name _____ | | | |
| 3. Project Description | | | |
| <input type="checkbox"/> Oil/Gas Well <input type="checkbox"/> Pipeline/Transmission Facility <input type="checkbox"/> Processing Facility <input type="checkbox"/> Treatment Facility | | | |
| <input type="checkbox"/> Number of wells to be drilled <input type="checkbox"/> Installation of injection lines <input type="checkbox"/> Construction of access road <input type="checkbox"/> Construction and restoration of well site <input type="checkbox"/> Installation of pipeline <input type="checkbox"/> Installation of tank battery <input type="checkbox"/> Installation of gathering/production line <input type="checkbox"/> Other (list) _____ | | | |
| 4. Please provide the latitude and longitude coordinates for the center of the project. The coordinates should be in degrees, minutes and seconds (dd mm ss.ss) | | | |
| Latitude _____ degrees _____ minutes _____ seconds Longitude _____ degrees _____ minutes _____ seconds | | | |
| Reference Datum: <input type="checkbox"/> North American Datum 1983 <input type="checkbox"/> North American Datum 1927 <input type="checkbox"/> World Geodetic System 1984 | | | |
| Horizontal Collection Method: <input type="checkbox"/> GPS <input type="checkbox"/> Interpolated from U.S.G.S. topo map <input type="checkbox"/> DEP's eMAP | | | |
| 5. U.S.G.S. 7.5 min. Quad Map Name _____ | | | |
| 6. Estimated Timetable for Phased Projects | | | |
| Phase No. or Name | Description | Total Area | Disturbed Area |
| | | | |
| | | | |
| | | | |
| | | | |
| 7. Existing and previous land use _____ | | | |
| 8. Other Pollutants: Will the stormwater discharge contain pollutional substances other than sediment? Yes <input type="checkbox"/> No <input type="checkbox"/> If yes, explain and provide any available quantitative data. | | | |
| 9. Receiving Water/Watershed Name _____ | | Name of Municipal or Private Separate Storm Sewer Operator _____ | |
| Chapter 93 Designated Use or Existing Use Stream Classification | | | |
| <input type="checkbox"/> High Quality <input type="checkbox"/> Exceptional Value <input type="checkbox"/> Other | | | |
| Secondary Water | | | |

| SECTION B. PERMIT COORDINATION | | | | | |
|--|--------------|--------------------------|--|--------------------------|--|
| In addition to well permits, are other DEP environmental permits required for this project (check the type of permit needed)? | | | | | |
| <input type="checkbox"/> Encroachment permit | | | <input type="checkbox"/> √ if the application has been submitted | | |
| <input type="checkbox"/> Air Quality permit for compressor station | | | <input type="checkbox"/> √ if the application has been submitted | | |
| <input type="checkbox"/> Other (list) | | | <input type="checkbox"/> √ if the application has been submitted | | |
| SECTION C. APPLICANT INFORMATION | | | | | |
| Applicant's Last Name | First Name | MI | Phone | FAX | |
| Organization Name or Registered Fictitious Name | | | Phone | FAX | |
| Mailing Address | City | State | ZIP + 4 | | |
| Co-Applicant's Last Name | First Name | MI | Phone | FAX | |
| Organization Name or Registered Fictitious Name | | | Phone | FAX | |
| Mailing Address | City | State | ZIP + 4 | | |
| SECTION D. SITE INFORMATION | | | | | |
| Site Name | | | | | |
| Site Location | | | | | |
| Site Location -- City | | State | ZIP+4 | | |
| Detailed Written Directions to Site | | | | | |
| County | Municipality | City | Boro | Twp | |
| | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| SECTION E. POST CONSTRUCTION STORMWATER MANAGEMENT (PCSM) PLAN See the Attached Instructions on how to Complete This Section | | | | | |
| All PCSM plans should be designed to maximize infiltration technology, eliminate or minimize point source discharges to surface waters, preserve the integrity of stream channels, and protect the physical, chemical and biological qualities of the receiving water. In addition to these water quality design features, all PCSM plans must comply with local water quantity or flood control requirements. | | | | | |
| Check those that apply: | | | | | |
| <input type="checkbox"/> The attached PCSM plan was developed to be consistent with an Act 167 Stormwater Management Plan approved by the Department after July 2001. | | | | | |
| <input type="checkbox"/> The attached PCSM plan was developed to be consistent with existing local ordinances | | | | | |
| <input type="checkbox"/> The attached PCSM plan was developed to employ water quality design features and BMPs that will manage any net increase in stormwater runoff volume resulting from the DEP recommended 2-year/24-hour frequency storm. | | | | | |

- a. Written narrative Yes No
- b. Plan drawings Yes No
- c. Identification and location of post construction stormwater management BMPs. Such BMPs should address: (1) infiltration; (2) volume and rate control; and (3) water quality treatment Yes No
- d. Operation and maintenance procedures Yes No
- e. Supporting calculations and measurements: Yes No

Supporting calculations and measurements are required only if the answers to both questions 1 and 2 below are NO.

- 1) The approximate original contours of the project site will be maintained or replicated and the disturbed areas will be revegetated or otherwise stabilized with pervious material. Yes No
- 2) PCSM BMPs which: use natural measures to eliminate pollution, do not require extensive construction efforts, promote pollutant reduction, and are capable of controlling the net increase in the volume and rate of stormwater runoff from a 2-year/24-hour storm event will be employed, and the net increase in the volume of post construction runoff is infiltrated and/or dissipated away from surface waters of the Commonwealth. Yes No

If the responses to both questions 1 and 2, above are NO, please provide the requested post construction stormwater information in the Data Table for Supporting Calculations and Measurements below:

- 2. Explain how post construction stormwater runoff volume will be managed if BMPs will not infiltrate the total net increase in stormwater runoff volume. (Net increase volume = Post construction runoff volume minus Pre-construction runoff volume):

Supporting calculations and measurements are required only if the answers to both questions 1 and 2 below are NO.

- 1) The approximate original contours of the project site will be maintained or replicated and the disturbed areas will be revegetated or otherwise stabilized with pervious material. Yes No
- 2) PCSM BMPs which: use natural measures to eliminate pollution, do not require extensive construction efforts, promote pollutant reduction, and are capable of controlling the net increase in the volume and rate of stormwater runoff from a 2-year/24-hour storm event will be employed, and the net increase in the volume of post construction runoff is infiltrated and/or dissipated away from surface waters of the Commonwealth. Yes No

Check this box if supporting calculations and measurements are NOT required in accordance with Section E.1.e on the preceding page.

| | | | |
|------------------------------|------------------|-------------------|------------|
| Design storm frequency _____ | Pre-construction | Post Construction | Net Change |
|------------------------------|------------------|-------------------|------------|

If the responses to both questions 1 and 2, above are NO, please provide the requested post construction stormwater information in the Data Table for Supporting Calculations and Measurements below:

- 2. Explain how post construction stormwater runoff volume will be managed if BMPs will not infiltrate the total net increase in stormwater runoff volume. (Net increase volume = Post construction runoff volume minus Pre-construction runoff volume):

N/A (check N/A only if BMPs will infiltrate all of the Net Change in Runoff)

| SECTION H. CERTIFICATION BY PERSON PREPARING APPLICATION | |
|--|---|
| <p>I do hereby certify to the best of my knowledge, information and belief, that the Erosion and Sediment Control Plan and Post Construction Stormwater Management Plan are true and correct, represent actual field conditions and are in accordance with the 25 Pa. Code Chapters 78 and 102 of the Department's rules and regulations. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.</p> | |
| Print Name | Signature |
| Company | |
| Address | |
| Phone | |
| SECTION I. APPLICANT CERTIFICATION | |
| <p>Applicant Certification. I certify under penalty of law that this document and all attachments were prepared by me or under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. The responsible official's signature also verifies that the activity is eligible to participate in the permit, and that the applicant agrees to abide by the terms and conditions of the permit. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.</p> | |
| _____ Print Name and Title of Applicant | _____ Print Name and Title of Co-Applicant (if applicable) |
| _____ Signature of Applicant | _____ Signature of Co-Applicant |
| _____ Date Application Signed | _____ Date Application Signed |
| Notarization | |
| Sworn to and subscribed to before me this _____ day of _____, 20____ | Commonwealth of Pennsylvania County of _____ |
| _____ Notary Public | My Commission expires _____ |
| NAME, ADDRESS AND PHONE NUMBER OF INDIVIDUAL TO BE CONTACTED IF ADDITIONAL INFORMATION IS REQUIRED | |
| Name | |
| Address | Phone |



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATERSHED MANAGEMENT
BUREAU OF OIL AND GAS MANAGEMENT

**NOTICE OF INTENT (NOI) CHECKLIST
EROSION AND SEDIMENT CONTROL GENERAL PERMIT FOR EARTH
DISTURBANCE ASSOCIATED WITH OIL AND GAS EXPLORATION,
PRODUCTION, PROCESSING, OR TREATMENT OPERATIONS
OR TRANSMISSION FACILITIES
(ESCGP-1)**

Please check the following list to make sure that you have included all the required information. Place a check mark in the column provided for all items completed and/or provided. Failure to provide all of the requested information will delay the processing of the application and may result in the application being placed ON HOLD with NO ACTION, or being considered withdrawn and the application file closed.

THIS CHECKLIST MUST BE COMPLETED AND ENCLOSED WITH YOUR GENERAL PERMIT NOI

| ✓CHECKLIST FOR EROSION AND SEDIMENT CONTROL GENERAL PERMIT NOI | | Applicant Check ✓ If Included | Official Use Only |
|--|--|-------------------------------------|--------------------------|
| 1. | Fully completed, properly signed and notarized Notice of Intent form (1 original and 2 copies). | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. | Complete Erosion and Sediment Control Plans. (3 copies) | <input type="checkbox"/> | <input type="checkbox"/> |
| | a. Topographic features | Location: _____ Page: _____ | <input type="checkbox"/> |
| | b. Soils information | Location: _____ Page: _____ | <input type="checkbox"/> |
| | c. Proposed alteration | Location: _____ Page: _____ | <input type="checkbox"/> |
| | d. Amount of runoff | Location: _____ Page: _____ | <input type="checkbox"/> |
| | e. Location of water which may receive runoff and receiving water classification, pursuant to Chapter 93 and the "statewide existing use listing". | Location: _____ Page: _____ | <input type="checkbox"/> |
| | f. Supporting calculations | Location: _____ Page: _____ | <input type="checkbox"/> |
| | g. BMPs used before, during, and after earth disturbance, including special protection BMPs. | Location: _____ Page: _____ | <input type="checkbox"/> |
| | h. Maintenance program | Location: _____ Page: _____ | <input type="checkbox"/> |
| | i. Plan drawings and narratives | Location: _____ Page: _____ | <input type="checkbox"/> |
| | j. Sequence of BMP installation and removal | Location: _____ Page: _____ | <input type="checkbox"/> |
| | k. Recycling and disposal methods | Location: _____ Page: _____ | <input type="checkbox"/> |
| 3. | Permit filing fee of \$500 payable to the appropriate Clean Water Fund. | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. | Location map: USGS of scale 1:24,000 indicating project location and boundaries. (3 copies) | <input type="checkbox"/> | <input type="checkbox"/> |

| ✓CHECKLIST FOR ESCGP-1 | | | Applicant Check ✓ If Included | Official Use Only |
|------------------------|---|---------------------------|-------------------------------------|--------------------------|
| 5. | Notifications to the local municipality and county governments that specify Acts 67 and 68 Coordination, and that the application is for a Erosion and Sediment Control General permit for Earth Disturbance Associated with Oil and Gas Activities. (3 copies) A "sample" notification letter is provided as Appendix A of the instructions. | | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. | Proof of receipt of municipal notifications; copies of certified mail receipts or acknowledgment letters from the local municipality and county government. (3 copies) | | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. | The PNDI Review receipt for the project area. Include impact clearance letters if proof of agency coordination is required. (3 copies) | | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. | PPC Plan: Include a current Preparedness, Prevention and Contingency Plan (3 copies) | | <input type="checkbox"/> | <input type="checkbox"/> |
| 9. | Complete Post Construction Stormwater Management Plan. (3 copies) Location: Drawings (D), Narrative (N). | | <input type="checkbox"/> | <input type="checkbox"/> |
| | a. Written Narrative | Location _____ Page _____ | <input type="checkbox"/> | <input type="checkbox"/> |
| | b. Location of BMPs showing final contours | Location _____ Page _____ | <input type="checkbox"/> | <input type="checkbox"/> |
| | c. Plan drawings of permanent stabilization | Location _____ Page _____ | <input type="checkbox"/> | <input type="checkbox"/> |
| | d. Plan drawings of BMPs | Location _____ Page _____ | <input type="checkbox"/> | <input type="checkbox"/> |
| | e. Operation and maintenance procedure | Location _____ Page _____ | <input type="checkbox"/> | <input type="checkbox"/> |
| | f. Supporting calculations or measurements | Location _____ Page _____ | <input type="checkbox"/> | <input type="checkbox"/> |
| | g. Design frequency storm rainfall amount | Location _____ Page _____ | <input type="checkbox"/> | <input type="checkbox"/> |
| | h. Area of impervious surface | Location _____ Page _____ | <input type="checkbox"/> | <input type="checkbox"/> |
| | i. Curve Number or Runoff Coefficient | Location _____ Page _____ | <input type="checkbox"/> | <input type="checkbox"/> |
| | j. Runoff from the design frequency storm | Location _____ Page _____ | <input type="checkbox"/> | <input type="checkbox"/> |
| | k. Volume of water infiltrated through BMPs | Location _____ Page _____ | <input type="checkbox"/> | <input type="checkbox"/> |
| | l. Peak discharge rate from the design frequency storm | Location _____ Page _____ | <input type="checkbox"/> | <input type="checkbox"/> |

Umholtz's Corollaries to Murphy's Law of BMP Entrophy

- 1. All BMPs work if it's not raining.**
- 2. BMPs and PMS sound alike for a reason.**
- 3. All BMPs will eventually fail.**
The question is, will they last until you retire?
- 4. You can get grass to grow on the side of a tree.**
The question is, for how long? (See 3 above.)
- 5. Water flows downhill, unless you're looking at the
Erosion and Sedimentation Plan upside down..**
- 6.. All filter fence and hay bales are installed correctly, and yes, Virginia, there is a
Santa Claus.**
- 7. Snow is not an effective sediment filter BMP.**
- 8. Erosion is a natural process, but then again, so is death.**
It is not in your best interest to accelerate either.



Questions?

Reference 15

Last update 8/26/2010 12:58:04 PM

Site Details

[North Central Regional Office](#)

[Site Search](#)

[Sites by County/Muni Search](#)

| | |
|------------|------------------------|
| Site ID: | 721137 |
| Site Name: | PRESTON 38 LLC OG WELL |
| Address: | ORSON, |
| Status: | Active |

Clients

| Client List |
|--|
| PENNSWOOD OIL & GAS LLC (272597) |

Programs

| DEP Programs |
|--------------|
| Oil & Gas |

PA Municipalities

| Municipalities/Counties |
|---------------------------|
| Preston Twp, Wayne County |

Site Permits

No records matched the criteria.

Facility Permits

| Authorization Id | Authorization Type | Date Received | Status/Date |
|------------------------|-----------------------------|---------------|-------------------|
| 792478 | Drill & Operate Well Permit | 05/15/2009 | Issued 07/29/2009 |
| 841478 | Drill & Operate Well Permit | 07/06/2010 | Issued 07/20/2010 |

Site-Level and Primary Facility-Level Inspections

No records matched the criteria.

[Licensing, Permits, and Certification](#)

http://www.ahs2.dep.state.pa.us/eFACTSWeb/searchResults_singleClient.aspx?ClientID=272597

Reference 16

[EPA Envirofacts](#)

[The PA Code](#)

Last update 8/26/2010 12:58:04 PM

Site [North Central Regional](#) [Site](#) [Sites by County/Muni](#) [no
Details [Office](#) [Search](#) [Search](#) paging]

| | |
|------------|------------------|
| Site ID: | 722440 |
| Site Name: | STOCKPORT ASSN 1 |
| Address: | HANCOCK, |
| Status: | Active |

Clients

| Client List |
|--|
| PENNSWOOD OIL & GAS LLC (272597) |

Programs

| DEP Programs |
|--------------|
| Oil & Gas |

PA Municipalities

| Municipalities/Counties |
|------------------------------|
| Buckingham Twp, Wayne County |

Site Permits

No records matched the criteria.

Facility Permits

| Authorization Id | Authorization Type | Date Received | Status/Date |
|------------------------|-----------------------------|---------------|-------------------|
| 796670 | Drill & Operate Well Permit | 06/15/2009 | Issued 07/22/2009 |
| 841481 | Drill & Operate Well Permit | 07/06/2010 | Issued 07/20/2010 |

Site-Level and Primary Facility-Level Inspections

No records matched the criteria.

[Licensing, Permits, and Certification](#)

Reference 17
(Excerpt)

Environmentally Sensitive Maintenance Practices for Unpaved Roads: Sediment Reduction Study

Prepared for

Chesapeake Bay Commission

c/o Senate of Pennsylvania
G-05 North Office Building
Harrisburg, PA 17120

By

Dr. Barry E. Scheetz
Steven M. Bloser

Center for Dirt and Gravel Road Studies

The Pennsylvania State University
University Park, PA 16802

FINAL REPORT

June 30, 2008

Revised August 29, 2008

Research Overview:

Pennsylvania's Dirt and Gravel Road Maintenance Program has long advocated Environmentally Sensitive Maintenance (ESM) Practices to reduce stream pollution from unpaved roads. Penn State's Center for Dirt and Gravel Road Studies (Center) has recently completed a research project with funding from the Chesapeake Bay Commission that begins to quantify sediment reductions from several commonly used ESM practices.

This document is a summary only, full report is available at www.dirtandgravelroads.org under "research".

research funded by...



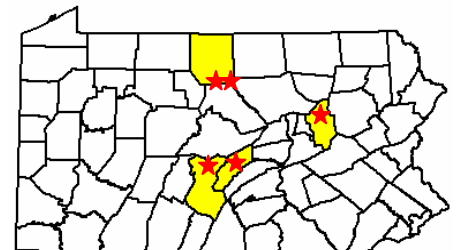
ESM Practices Tested:

Five Environmentally Sensitive Maintenance Practices were tested in this study:

- **Driving Surface Aggregate:** a specific aggregate mixture designed as a wearing course for unpaved roads;
- **Raising the Road Profile:** raising road elevation to eliminate lower ditch & restore sheet flow;
- **Grade Breaks:** elongated humps in the road surface designed to shed water to each side of the road;
- **Additional Drainage Outlets:** creating new outlets in ditchline to reduce channelized flow; and
- **Berm Removal:** removing unnecessary berm and ditch on down slope side of road to encourage sheet flow.

Methods:

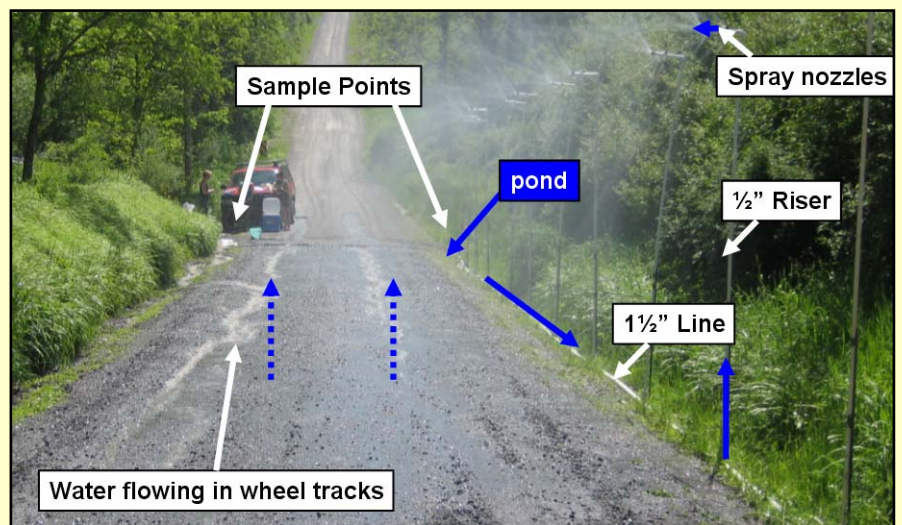
In order to determine sediment reductions of the five practices, it was necessary to collect sediment data both before and after each practice was implemented. The Rainmaker (see description below) was used to create a controlled and repeatable rainfall event on a 100' section of road. Each test consisted of three 30-minute runs of the rainmaker, both before and after ESM practice implementation. Flow and sediment samples were taken at regular intervals to determine the total sediment loss for each section of road. The three test runs were combined for each section of road to determine the average sediment loss for one 30 minute event. By comparing the flow and sediment differences from before and after ESM practice implementation, the sediment reduction from each practice can be determined.



These projects were completed on roads in Potter, Columbia, Huntingdon, and Mifflin Counties as illustrated by the stars above.

Meet the Rainmaker, a Rainfall Simulator for Roadways...

The "rainmaker" is a rainfall simulator developed by the Center that creates a 0.55" rainfall event in 30 minutes over a 100' length of road. This is equivalent to a 1-month return interval for a 30 minute storm for most of Pennsylvania. The rainmaker creates a controlled, repeatable rainfall event that is run both before and after ESM practices are installed on the road. By comparing runoff and sediment concentrations, sediment reductions can be calculated for the various ESM practices. Rainmaker layout and components are illustrated to the right.



The publishers of this publication gratefully acknowledge the financial support of the Pennsylvania State Conservation Commission and the Chesapeake Bay Commission. For additional information, contact: Center for Dirt & Gravel Roads Studies, Penn State University, 207 Research Unit D, University Park, PA 16802 (Toll-Free Phone: 1-866-668-6683, Fax: 814-863-6787, Email: dirtandgravel@psu.edu). Additional copies available on our website at: www.dirtandgravelroads.org



Results

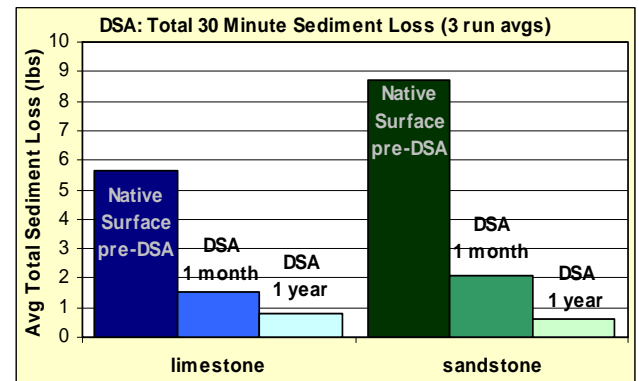
Special Note: This study provides a valuable initial look at sediment reductions from ESM practices. However, due to the limited number of sample points, and the infinite variability of road conditions in the field, sediment reductions for specific practices found in this study should NOT be considered blanket or universal reductions for each practice.

Runoff Rates from Existing Roads:

The five “existing condition” tests done for this study found sediment production rates ranging from 0.7-12.2 pounds of sediment runoff in a single 30 minute, 0.55 inches simulated rainfall. The 0.7 pound event was generated from a flat narrow farm lane with grass growing between the wheel tracks. The 12.2 pound event was generated from a wider, mixed limestone/clay road at a 4-5% slope. This highlights the great variability in erosion rates based on specific site conditions. Using the average sediment runoff rate of 5.6 pounds per event, a single 30 minute 0.55 inch rain event moving across Pennsylvania can be conservatively expected to generate over 3,000 tons* of sediment from the State’s 20,000+ miles of public unpaved roads. *For illustrative purposes only, more testing on varied roads is needed to substantiate this extrapolation.

Driving Surface Aggregate:

Two separate DSA placements were tested on Lebo Road in Potter County. The aggregates, one limestone and one sandstone, were placed according to Dirt and Gravel Road Program standards (one 8” lift, placed using a paver, compacted to 6”). Rainfall simulations were run before placement, and at intervals of 1 month and one year after placement. The graph to the right summarizes the results in total sediment loss per 30 minute rainfall simulation. Compared to their respective native surfaces, Limestone DSA reduce sediment by 73% after one month and 86% after one year, while Sandstone DSA reduced sediment by 76% after one month and 93% after one year. Parent material did not significantly affect sediment generation rates.



Drainage Control Practices:

Unlike DSA which reduces sediment generation from the road surface, the four remaining practices reduce sediment by reducing and controlling the volume of road runoff.

Raising the Road Profile:

Diehl Road in Columbia County was filled approximately 5 feet in order to completely eliminate the ditch on the down slope side of the road. Sheet flow into a vegetative filter was achieved off the down slope side of the road after it was filled. This practice reduced the amount of sediment entering the stream by 82% after one month, and 87% after one year. Some infiltration of runoff into the new road fill may have accounted for the higher than expected sediment reductions on Diehl Road.

Grade Break:

Two grade breaks were tested in this study, one in Huntingdon County, and one in Mifflin County. The grade breaks showed sediment reductions of 57% and 43% respectively. Note that the grade breaks were placed in the middle of the 100’ test section, therefore sediment reductions of 50% indicate the gradebreak was 100% effective in eliminating upslope sediment.

Additional Drainage Outlets:

The effect of adding a turnout was tested on Pine Swamp Road in Huntingdon County. The new turnout discharged into a vegetative filter and did not affect the stream. A turnout was used instead of a culvert for cost effectiveness and simplicity. The turnout showed sediment reductions of 48% for the down slope ditch alone, or 31% when factoring in the up slope ditch that was unaffected by the turnout. Note that, as with the “grade-break”, the turnout was placed in the middle of the 100’ test section, so a 50% sediment reduction indicates a 100% efficiency.

Berm Removal:

The effect of berm removal was tested on Pine Swamp Road in Huntingdon County. Removing the berm effectively eliminated the down slope ditch and allowed water to sheet flow into a vegetative filter area. Berm removal showed sediment reductions of 94% for the down slope ditch alone, or 59% when factoring in the up slope ditch that was unaffected by the practice.

This is a summary only, full report available at www.dirtandgravelroads.org under “research”.

Reference 18
(Excerpt)

**PREPAREDNESS, PREVENTION,
AND CONTINGENCY PLAN
WAYNE COUNTY FIELD
WAYNE COUNTY, PENNSYLVANIA**

Prepared for:

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May 2010

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1.0 DESCRIPTION OF FACILITY

1.1 DESCRIPTION OF THE INDUSTRIAL OR COMMERCIAL ACTIVITY

Newfield Appalachia PA LLC (Newfield) is a natural gas exploration company with operations planned for Wayne County, Pennsylvania. Operations will involve natural gas exploration of the Marcellus Shale formation, which will include site preparation, drilling, and well development and production activities. Wastes generated during these activities will be typical for gas drilling operations and will include drill cuttings, produced water, drilling and frac fluids, waste oil, municipal waste and trash. No hazardous waste is expected to be generated at the Newfield sites.

Newfield is currently in the exploratory phase of operations, which will require construction activities for new natural gas well pads and access roads.

This Prevention, Preparedness and Control (PPC) Plan applies to all well sites in Wayne County, Pa.

The attached map (Figure 1) in Appendix B shows the area covered under this PPC Plan. Figure 2 is the required 7.5 topographic map of the specific well site. The proposed Site Plan (Figure 3) shows the site layout, the well site boundaries, material storage areas, waste storage areas, dike drains and drainage that leads away from the well site, and the entrances and exits to the well site.

During the different stages of site preparation, construction, drilling, well development and production, the site will store various fuels, oils and chemicals on-site. A chemical and container inventory for the specific well site is located in Table 1 of Appendix C.

1.2 DESCRIPTION OF EXISTING EMERGENCY RESPONSE PLANS

This is a new facility and this plan has been prepared prior to construction of the well pad. There are no previous emergency response plans.

A separate Spill Prevention Control and Countermeasure (SPCC) Plan will be prepared for each facility meeting the requirements defined in 40 CFR§112.

1.3 MATERIAL AND WASTE INVENTORY

Information in this section is used to evaluate the prevention, containment, mitigation, cleanup, and disposal measures which would be used in the event of a spill, discharge, explosion, or fire. Oils, chemicals and other hazardous materials anticipated to be used and stored at the facility during site preparation and construction, drilling, well development and production are listed in Table 1.

MSDS's will be maintained onsite for chemicals and compounds used at the facility in accordance with the Occupational Safety and Health Administration (OSHA) worker right-to-know requirements, as appropriate.

1.4 POLLUTION INCIDENT HISTORY

Newfield has not had any reportable incidents for this facility.

1.5 IMPLEMENTATION SCHEDULE FOR PLAN ELEMENTS NOT CURRENTLY IN PLACE

All plan elements are in place.

1.6 PURPOSE AND IMPLEMENTATION OF PPC PLAN

Newfield has developed and will implement this PPC Plan for effective action to minimize and abate hazards to human health and the environment from fire, explosion, and emission or discharge of pollutants to air, soil, surface water or groundwater. This plan was prepared to satisfy the requirements set forth in 25 PA Code Section 78.

The Drilling Manager serves as the Primary Emergency Coordinator and is responsible for the preparation and implementation of the PPC Plan. The PPC Plan has been prepared and implemented in general accordance with Pennsylvania Department of Environmental Protection (PADEP) guidelines, and will be submitted to PADEP for approval at such time as the PADEP may prescribe.

This PPC Plan identifies and describes any arrangements with police departments, fire departments, hospitals, contractors, and state, county, and local emergency response teams to coordinate emergency services.

The PPC Plan lists names, addresses and phone numbers of all persons identified to act as Emergency Coordinator. One person is named as the Primary Emergency Coordinator and others are listed in the order in which they will assume responsibility as alternates. The PPC Plan also includes a list of emergency equipment at the facility, the location and a physical description of emergency equipment, and a brief outline of emergency equipment capabilities.

1.7 PLAN REVISIONS

This PPC Plan will be reviewed and amended, annually, or whenever:

- Applicable PADEP regulations are revised;
- The plan fails in an emergency;
- The list of Emergency Coordinators changes;
- The list of emergency equipment changes; and
- Construction, operation, maintenance, or other circumstances change in a manner that materially increases the potential for fires, explosions, or releases of toxic or hazardous constituents; or which changes the response necessary in an emergency.

Reference 19



Polluted Runoff

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Erosion, Sediment and Runoff Control for Roads and Highways

United States
Environmental Protection
Agency

Office of Water
(4503F)

EPA-841-F-95-008d
December 1995



The Coastal Zone Management Act of 1972 established a program for states to voluntarily develop comprehensive programs to protect and manage coastal water resources. There are now 29 coastal states and territories with federally approved coastal management programs.

The Coastal Zone Act Reauthorization Amendments (CZARA) of 1990 specifically charged coastal states and territories with upgrading their runoff pollution control programs to protect coastal waters. The Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) jointly oversee the development and implementation of these *Coastal Nonpoint Pollution Control Programs*, or CNPCPs.

EPA published *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters* to be used by states to implement management measures - economically achievable measures that reflect the greatest degree of runoff pollution control - to control the addition of runoff pollutants to coastal waters.

The *Guidance* also includes best management practices, technologies, processes, siting criteria, and operating methods for roads, highways, and bridges that states can use to implement the management measures. States can use alternative management measures if they provide the same or a greater degree of pollutant control as the management measures in the *Guidance*. States will begin implementing their CNPCPs in 1996 and achieve full implementation by 2004.

CZARA applies to site development and land disturbing activities in the coastal management area of each State with an approved coastal management program. Certain road, highway and bridge related activities are excluded from this program due to coverage under the National Pollutant Discharge Elimination System (NPDES) permitting program. These activities include construction activities where 5 or more acres (2.02 ha) are disturbed, and activities within municipalities with municipal separate storm sewer systems that have populations of 100,000 or more.

Why Runoff Control is Needed

Runoff controls are essential to preventing polluted runoff from roads, highways, and bridges from reaching surface waters. Erosion during and after construction of roads, highways, and bridges can contribute large amounts of sediment and silt to runoff waters, which can deteriorate water quality and lead to fish kills and other ecological problems.

Heavy metals, oils, other toxic substances, and debris from construction traffic and spillage can be absorbed by soil at construction sites and carried with runoff water to lakes, rivers, and bays. Runoff control measures can be installed at the time of road, highway, and bridge construction to reduce runoff pollution both during and after construction. Such measures can effectively limit the entry of pollutants into surface waters and ground waters and protect their quality, fish habitats, and public health.

Pesticides and fertilizers used along roadway rights-of-way and adjoining land can pollute surface waters and ground water when they filter into the soil or are blown by wind from the area where they are applied. Table 1 shows typical pollutants in runoff waters that can be traced to the operation of roads and highways.

Principles of Runoff Control for Roads, Highways, and Bridges

Preventing runoff pollution from road, highway, and bridge construction in coastal areas requires planning, education, inspection,

and maintenance. An erosion and sediment control (ESC) plan that incorporates the most appropriate and cost-effective best management practices (BMPs) is essential to effective pollution control. Affected highway personnel must be educated about the requirements of the ESC plan. Inspection and enforcement authority are necessary to ensure awareness of and compliance with the adopted practices. Finally, BMPs require regular maintenance to ensure that they perform optimally. The following principles apply to an effective erosion and runoff control program.

- **Develop a comprehensive erosion and sediment control (ESC) plan prior to earth-moving activities.** Write ESC requirements into plans, specifications, and cost estimates for highway and bridge projects. Four key factors affect the potential for soil erosion from a site: soil characteristics, vegetative cover, topography, and climate. Take all of these factors into consideration to develop an ESC plan that will minimize soil loss, limit the area exposed to construction, maximize the vegetative cover, use natural topographic features to the best advantage, and include BMPs suitable to the regional climate.

The Federal Highway Administration Local Transportation Assistance Program, the Association of American State Highway and Transportation Officials, and many state highway departments can provide ESC guidelines.

- **Apply ESC practices to prevent excessive onsite damage.** Use ESC BMPs to control the flow of runoff water and thereby prevent or lessen soil erosion. Limiting land disturbance and preserving natural vegetation are excellent ESC practices.
- **Apply perimeter control practices to protect the disturbed area from offsite runoff and to prevent sedimentation damage to areas below the construction site.** A sediment and runoff barrier surrounding the disturbed area prevents construction site runoff from moving offsite and fouling surface waters downstream.
- **Keep runoff velocities low and retain runoff on the site.** The erosive power of runoff increases dramatically as distance and slope increase. BMPs can be used to effectively control runoff velocity and detain it to remove 80 to 90 percent of the sediment from runoff.
- **Stabilize disturbed areas immediately after final grade has been attained.** Any exposed soil is subject to erosion from rainfall, wind, and vehicles. BMPs to stabilize soil should be applied as quickly as possible after the land is disturbed. Temporary stabilization practices include seeding, mulching, and erosion control blankets or mats.
- **Develop a schedule and implement a comprehensive inspection and maintenance program.** This principle is vital to the success of erosion control. BMPs must receive regular inspection and maintenance to ensure that they are operating effectively and optimally, both during and after construction.

Best Management Practices

CZARA defines management measures as economically achievable measures to control the addition of pollutants to our coastal waters. Management measures are achieved by the application of one or more BMPs. The BMPs described below are especially useful for erosion and runoff control for roads, highways, and bridges.

Best management practices can be organized by the function they perform. General maintenance BMPs (listed below) are usually vegetative practices used to contain polluted runoff from the operation of highways or from erosion and sedimentation generated at small construction sites. A variety of practices are used at construction sites to control both erosion and polluted runoff. These are identified as Construction Site BMPs. Practices developed as permanent erosion and sediment control devices are both structural and nonstructural. Several of these BMPs are listed below as long-term or Permanent Control BMPs.

Construction Site BMPs

- **Straw bale barriers** should be bound, entrenched, and securely anchored to prevent deterioration. A row of straw bales slows runoff flow and creates a pond behind the barrier where sediment can settle out. Straw bale barriers are most effective for filtering low to moderate storm flows, where structural strength is not required.
- **Filter fabrics** are engineering fabrics designed to retain sediment particles larger than a certain size and allow water to pass through. Filter fabrics can be used in silt fences (see below) or erosion control mats. Erosion control mats protect soil and seed from erosion and can be designed to allow vegetation to grow through the material.
- **Silt fences** are vertical fences of filter fabric that are stretched across and attached to support poles. The fabric retains sediment on the construction site and allows relatively sediment-free water to pass through. Silt fences are placed to protect streams and surrounding property from sediment-laden runoff.
- **Sediment basins** are ponds created by excavation or the construction of a dam or barrier. Sediment basins primarily serve to retain or detain runoff to allow excessive sediment to settle out during construction. Sediment basins can be converted into permanent detention ponds or wetlands after construction.
- **Stabilized entrances** reduce the amount of sediment carried off a construction site by vehicles when pressure-washed on-site. These entrances are designed to include stabilized pads of aggregate underlain with a filter fabric. Stabilized construction site entrances should be located at any point in the construction zone where vehicles enter and leave. Wheels and undercarriages of vehicles should be washed before leaving the site.

Operation and Maintenance

Inspection and maintenance of erosion and sediment control BMPs after construction has been completed is important to ensure that the BMPs are operating properly and effectively. Some key operation and maintenance procedures include:

- **Prepare and adhere to a schedule of regular maintenance for temporary erosion and runoff control BMPs.** Two critical maintenance operations that must be performed regularly are cleaning out accumulated sediment and replacing worn-out or deteriorated materials, such as silt fence fabrics, so that the effectiveness of the controls is maintained. Maintenance can include dredging and reshaping sediment basins and revegetating the slopes of grassed swales.
- **Remove temporary BMPs from construction areas when they are no longer needed and replace them, where appropriate, with permanent BMPs.**
- **Schedule and periodically inspect and maintain permanent erosion and runoff controls.** This should include a periodic visual inspection of permanent BMPs during runoff conditions to ensure that the controls are operating properly. Clean, repair, and replace permanent erosion and runoff control BMPs when necessary.

General Maintenance BMPs

- **Seeding with grass and fertilizing** to promote strong growth provide long-term stabilization of exposed surfaces. Disturbed areas can be seeded and fertilized during construction and after it is completed. Sufficient watering and refertilizing 30 to 40 days after the seeds germinate help establish dense growth.
- **Seeding with grass and overlaying with mulch or mats** is done to stabilize cleared or freshly seeded areas. Types of mulches include organic materials, straw, wood chips, bark or other wood fibers, or decomposed granite and gravel. Mats are made of natural or synthetic material and are used to temporarily or permanently stabilize soil.
- **Wildflower cover** has been successfully used by many state and county highway departments to provide attractive vegetation along roadways and erosion control. Careful consideration must be given to visibility, access, soil condition, climate, and maintenance when choosing sites for wildflower cover.
- **Sodding** with established grass blankets on prepared soil provides a quick vegetative cover to lessen erosion. Proper watering and fertilizing are important to ensure the vitality of newly placed sod.

Permanent Control BMPs

- **Grassed swales** are shallow, channeled grassed depressions through which runoff is conveyed. The grass in swales slows the flow of runoff water, which allows sediment to settle out and water to infiltrate into the soil. Grassed swales can remove small amounts of pollutants such as nutrients and heavy metals. Check dams (see below) can be added to grassed swales to further reduce flow velocity and promote infiltration and pollutant removal.
- **Filter strips** are wide strips of vegetation located to intercept overland sheet flows of runoff. They can remove organic material, sediment, and heavy metals from runoff. Filter strips can consist of any type of dense vegetation from woods to grass but they cannot effectively treat high-velocity flows. They are therefore best suited to low-density developments.
- **Terracing** breaks a long slope into many flat surfaces where vegetation can become established. Small furrows are often placed at the edge of each terraced step to prevent runoff from eroding the edge. Terracing reduces runoff velocity and increases infiltration.
- **Check dams** are small temporary dams made of rock, logs, brush, limbs, or another durable material, placed across a swale or drainage ditch. By reducing the velocity of storm flows, sediment in runoff can settle out and erosion in the swale or ditch is reduced.
- **Detention ponds or basins** temporarily store runoff from a site and release it at a controlled rate to minimize downstream flooding. Pollutant removal effectiveness is quite good for well-designed basins. Effectiveness is greatest for suspended sediments (80 percent or more removal) and related pollutants such as heavy metals.
- **Infiltration trenches** are shallow, three to eight feet deep (.91 to 2.44 m), excavated trenches that are backfilled with stone to create underground reservoirs. Runoff is diverted into the trenches, from which it percolates into the subsoil. Properly designed infiltration trenches effectively remove sediment from runoff and can remove some other runoff pollutants.
- **Infiltration basins** are relatively large, open depressions produced by either natural site topography or excavation. When runoff enters an infiltration basin, the water percolates through the bottom or the sides and the sediment is trapped in the basin. The soil where an infiltration basin is built must be permeable enough to provide adequate infiltration. Some pollutants other than sediment are also removed in infiltration basins.
- **Constructed wetlands** are areas inundated by water for a sufficient time to support vegetation adapted for life in saturated soil conditions. Wetlands effectively filter sediment, nutrients, and some heavy metals from runoff waters.

Table 1. Typical pollutants found in runoff from roads and highways.

Sources of Pollution in Highway Runoff

| | Pollutant | Source |
|----------------------|----------------------------|--|
| Sedimentation | Particulates | Pavement wear, vehicles, the atmosphere and maintenance activities |
| Nutrients | Nitrogen & phosphorus | Atmosphere and fertilizer application |
| Heavy Metals | Lead | Leaded gasoline from auto exhausts and tire wear |
| | Zinc | Tire wear, motor oil and grease |
| | Iron | Auto body rust, steel highway structures such as bridges and guardrails, and moving engine parts |
| | Copper | Metal plating, bearing and brushing wear, moving engine parts, brake lining wear, fungicides & insecticides |
| | Cadmium | Tire wear and insecticide application |
| | Chromium | Metal plating, moving engine parts and brake lining wear |
| | Nickel | Diesel fuel and gasoline, lubricating oil, metal plating, bushing wear, brake lining wear and asphalt paving |
| | Manganese | Moving engine parts |
| | Cyanide | Anti-caking compounds used to keep deicing salt granular |
| | Sodium, calcium & chloride | Deicing salts |
| Hydrocarbons | Sulphates | Roadway beds, fuel and deicing salts |
| | Petroleum | Spills, leaks, antifreeze and hydraulic fluids and asphalt surface leachate |

Adapted from Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters

Last updated on Wednesday, April 21, 2010.

Reference 20
(Excerpt)

**United States Environmental Protection Agency
Final Report for Catalog of Federal Domestic Assistance Grant
Assistance Number 66.463 Water Quality Cooperative
Agreement for Project Entitled “Demonstrating the Impacts of
Oil and Gas Exploration on Water Quality and How to Minimize
these Impacts Through Targeted Monitoring Activities and Local
Ordinances”**

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Summary of the Results of the Investigation Regarding Gas Well Site Surface Water Impacts

In 2005, the Environmental Protection Agency awarded a grant to the City of Denton, Texas, to monitor and assess the impact of gas well drilling on stormwater runoff, and to provide, if necessary, regulatory and management strategies for these activities. This unique study focused on three nearby gas well sites where pad construction and drilling were occurring. Runoff, primarily from the sites' well pad areas, was monitored and analyzed, as were the contents of on-site drilling mud pits.

There is presently no regulatory oversight of oil and gas-related construction or operations under the National Pollutant Discharge Elimination System (NPDES) permit program, except in very limited circumstances. While NPDES stormwater regulations cover a large amount of the construction and industrial activity in the US, Congress mandated that oil and gas construction is specifically exempt from stormwater regulations in the Energy Policy Act of 2005 (the act encourages oil and gas operators to voluntarily implement best management practices to minimize erosion and control sediment). To help local governments decide whether drilling activities do, in fact, have impacts on their water resources, and how to minimize those impacts, the Agency awarded this research grant.

Findings

Gas well sites have the potential to produce sediment loads comparable to traditional construction sites.

- Total suspended solids (TSS) and turbidity event mean concentrations (EMC = pollutant mass / runoff volume) at gas sites were significantly greater than at reference sites (the median TSS EMC at gas sites was 136 times greater than reference sites).
- Compared to the median EMCs of storms sampled by Denton near one of their outfalls, the gas well site median EMC was 36 times greater.
- Gas site TSS EMCs ranged from 394 to 9898 mg/l and annual sediment loadings ranged from 21.4 to 40.0 tonnes/hectare/year (tonne = 1000 Kg; hectare = 10,000 square meters), and were comparable to previous studies of construction site sedimentation.

Other pollutants in gas well runoff were found in high concentrations.

- EMCs of total dissolved solids, conductivity, calcium, chlorides, hardness, alkalinity and pH were higher at gas well sites compared to reference sites, and differences were statistically significant for all parameters except conductivity.
- Generally, the presence of metals was higher at gas well sites compared to reference sites and EMCs were statistically significantly greater for Fe, Mn and Ni.
- Overall, the concentrations of metals tend to be higher at gas well sites compared to both nearby reference sites and as measured in runoff from local mixed-use watersheds (EMCs were statistically significantly greater for Fe, Mn and Ni).
- Total petroleum hydrocarbons (TPH) were not detected in any of the samples collected at gas well sites or reference sites.

Conclusions based on runoff sampling results.

- Gas well sites have the potential to negatively impact surface waters due to increased sedimentation rates and an increase in the presence of metals in stormwater runoff.
- Pad sites also have the potential to produce other contaminants associated with equipment and general site operations.
- Gas wells do not appear to result in high concentrations of petroleum hydrocarbons in runoff, but accidental spills and leaks are still a potential source of impact.

Runoff monitoring from gas well sites can be difficult.

- Requires complex equipment to do the volume-based sampling needed.
- Municipal inspections by trained individuals are important.
- In most cases, sediment impacts are visually apparent.

States or local governments should consider regulating sediment and associated pollutants in stormwater runoff.

- Recommended approach: develop regulations similar to current NDPES requirements for construction sites.
- Requirement options: stormwater pollution prevention plans, erosion and sediment control BMPs, provisions for containing spills and leaks, procedures for site inspections and enforcement of control measures, sanctions to ensure compliance.
- Require installation of berms around the down slope portion of gas well pad sites (regular compost can be used but newer, better technologies such as compost “socks” offer more stability, durability and ease of installation).

Models and other predictive tools can help with gas site management decisions.

- The Water Erosion Prediction Project (WEPP) and the Revised Universal Soil Loss Equation (RUSLE 2.0) can be used to model runoff and sediment yields from gas well sites, and to evaluate sediment impacts and control options
- Modeling indicated that using both erosion and sediment controls at sites tended to give the best combination of protection and cost, but the optimum combination is dependent on soil type and slope.
- Modeling showed that using BMPs reduced sediment from 52% to 93%.
- Generally, mulching and erosion control blankets produced the best results; however, in most cases, silt fences or filter strips were shown to be less expensive and still effective.
- The approach used can be applied to complex or simple slopes, can evaluate a wide variety of BMPs, and can be easily customized for specific site characteristics or geographical regions.

Regulating gas well drilling and production operations is needed, but can be complex.

- In addition to erosion and sediment control requirements, institute regulations for site locations and tree preservation.
- Requirements are needed for proper site management, equipment maintenance, and hazardous materials management and containment.
- Subchapter 22 of the Denton Development Code (www.cityofdenton.com) has information municipalities can use to establish gas well regulations.
- Regular monitoring of receiving waters using specific conductance (conductivity) can, under the right circumstances, offer a relatively inexpensive and rapid method for detecting contaminant discharges and tracing these discharges back to the well site source.

Regulating site activities (i.e., site management).

- Place drip pans or oil absorbing materials underneath all tanks, containers and other equipment with a potential to leak.
- Store chemical materials on pallets or other devices to raise containers off the ground, and shelter the materials from stormwater and wind.
- Depending on the type and quantity of materials, use secondary containment and other similar strategies.
- Institute a hazardous materials management plan, including adequate labeling and containment, and having material safety data sheets on hand.
- Remediate as quickly and safely as possible any accidental spills, leaks or discharges of materials.

Regulating well drilling locations.

- Typically, consists of site “setback” requirements from residential structures and places of assemblage (e.g., schools, churches).
- The proximity to surface water conveyances is an important consideration for minimizing water impacts, i.e., flat, heavily vegetated areas distant from surface waters are usually less of a concern than those areas close to waters that have highly erodible soils, steeper slopes and little vegetation.
- In floodplains or other environmentally sensitive areas, Denton requires a Watershed Protection Permit (WPP), which contains extra environmental regulations plus a fee to cover site assessments, additional regulatory oversight, and water quality testing.
- Denton’s WPP requirements highlights:
 - Must take a tree survey of the site and effect a 1:1 replacement for trees removed from the site.
 - Storage tanks and separation facilities allowed only if they are at least 18 in above the established base flood elevation, plus an extra depth for encroachment to the limits of the floodway

- Must show via an engineering study that the proposed activity will have no adverse impact on the carrying capacity of the adjacent waterway, and will not cause any increase in the elevations established for the floodplain.

Regulating tree preservation (Denton's program).

- All construction activities associated with gas wells, roads, pipelines, etc., must be considered.
- In non-WDD areas, must mitigate at a rate of 25% for all trees removed from the property in the form of payments to Denton's tree fund (not on-site planting).
- Removal of trees in WDD areas may cause a loss of critical habitat and harm waters, thus the 1:1 replanting requirement (or a very high payment into tree fund).

Well drilling mud pits merit attention and management.

- Mud pits exceeded the regulatory standard for total petroleum hydrocarbons (TPH) of 15 mg/L in approximately 46% of samples (there were also a few instances of very high concentrations, with a max of 25,590 mg/l).
- Based on the diesel and hydraulic equipment used at gas well sites, and the type of hydrocarbons found, contamination was likely due at least in part to such things as maintenance activities, fuel / hydraulic fluid leaks and spills, or similar sources.
- To a lesser extent, this also applies to fracture water pits.
- Municipalities may want to consider sampling and setting standards for pits, but mud pit contents are complex and appeared not amenable to analyses via rapid field-based methods or rapid laboratory methods.
- Although a regular monitoring program coupled with associated regulatory standards may be the best way to minimize the pollution potential for these pits, municipalities may not have the staff, resources or expertise to implement such a program.

Regulating mud pits.

- Enforceable standards for pit contents are not generally viable; instead, consider pit design standards that minimize the chances of releases.
- Restrict pits to areas with relatively flat slopes and design them to not capture much stormwater so the pits do not overflow.
- Use pit liners.
- Use freshwater-based muds only.
- Maintain a minimum freeboard distance between the elevation of the pit contents and the elevation of the top of the mud pit dam.
- Remove mud pits as soon as possible after drilling.
- Eliminate open mud pits altogether (e.g., use closed loop drilling).

Placement of drip pans or oil absorbing materials underneath all tanks, containers and other equipment with a potential to leak.

Safely store chemical materials on pallets or other devices to raise containers off the ground and, and sheltering them from stormwater and weather elements.

Depending on the type and quantity of materials, secondary containment and other similar strategies may be appropriate.

Institute a hazardous materials management plan including adequate labeling and containment, and have material safety data sheets available.

Remediate as quickly and safely as possible any accidental spills, leaks or discharges of materials.

Reference 21
(Excerpt)

EROSION AND SEDIMENT CONTROL PLAN

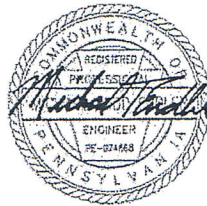
FOR THE PROPOSED DAVIDSON 1V WELL SITE SCOTT TOWNSHIP WAYNE COUNTY, PENNSYLVANIA

APRIL 2010

Submitted for:
Hess Corporation
500 Dallas Street
Houston, TX 77002

Statement of Limitations: This report is intended for the sole use of Hess Corporation. The scope of services performed may not be appropriate to satisfy the need of other users, and an use or re-use of this document or of the findings, conclusions, or recommendations presented herein is at the sole risk of said user. Background information, design bases, and other data have been furnished to URS by Hess Corporation and/or third parties, which URS has used in preparing this report. URS has relied on this information as furnished, and is neither responsible for nor has confirmed the accuracy of this information.

I do hereby certify to the best of my knowledge, information and belief, that the Erosion and Sediment Control and Site Restoration Plan are true and correct, represent actual field conditions and are in accordance with 25 P.A. Code Chapters 78 and 102 of the Department's rules and regulations. I am aware that there are significant penalties for submitting false information, including the possibility of imprisonment.



Prepared By:

URS

335 COMMERCE DRIVE, SUITE 300
FORT WASHINGTON, PA 19034
Job # 19998479.00010

IMPORTANT
A COPY OF THIS EROSION AND SEDIMENT CONTROL PLAN NARRATIVE AND
COMPANION DRAWINGS MUST BE PRESENT ON SITE AT ALL TIMES DURING
CONSTRUCTION.

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| 3.0.0 Types, Depth, Slope and Areal Extent Of The Soils | 2 |
| 4.0.0 Proposed Alteration to the Area..... | 2 |
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ATTACHMENTS

| | |
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| Attachment A. | PNDI Search |
| Attachment B. | Design Calculations |
| Attachment C. | Soil Survey Report |
| Attachment D. | Form 5500-FM-OG0111 |
| Attachment E. | Act 14 Notification Letters and Proof of Receipt |
| Attachment F. | Erosion and Sediment Control Plan Drawings |



INTRODUCTION

The Erosion and Sediment Control (E&SC) Plan for well pad installation associated natural gas exploration (Project) includes this narrative, appended supporting information and drawings. The E&SC Plan described in this narrative was developed to comply with the requirements of Chapter 102, Title 25 of the Pennsylvania Administrative Code created under the Clean Streams Law. The Pennsylvania Department of Environmental Protection (PADEP) Erosion and Sediment Pollution Control Program Manual, dated April 2000, was used as a primary reference for the design and selection of erosion and sediment control Best Management Practices (BMPs).

1.0.0 Project Description

This project is located on an unused, forested area accessed from Harris Road in Scott Township, Wayne County, Pennsylvania. The proposed work includes grading and construction of approximately 2,600 feet (ft) of access road and a one (1) 300 ft x 300 ft gravel drilling pad. Once drilling has been completed, the gravel pad will be reduced in size to 200 ft x 200 ft. The resulting disturbed area will be stabilized with grass seed.

1.1.0 Stormwater Handling

1.1.1 Existing Site Drainage Characteristics

The site currently does not have a drainage system in place. The project is located on a gently sloping hillside. Stormwater from the existing project area generally drains in sheet-flow and/or concentrated overland flow conditions from north to south. Runoff from the site drains to an unnamed tributary to Sherman Creek which is classified as high quality – cold water fishes (HQ-CWF).

1.1.2 Proposed Site Drainage Characteristics

The proposed drainage will closely match that of the existing drainage characteristics. Due to the location of the well pad, stormwater runoff will generally flow from north to south following the same general pattern as under existing conditions. Diversion channels will be constructed at the base of the well pad cut slope which will divert up-gradient stormwater runoff around the pad to stabilized outlets (i.e., riprap aprons). Roadside ditches will be constructed on the upslope side of the access road. Cross drain culverts will be placed along the access road to convey stormwater under the roads to stabilized outlets (i.e., riprap aprons). Stormwater flowing across the well pad will drain to a sump located in a topographical low corner. The sump will be drained during rain events and discharged through a stabilized outlet (riprap apron) to areas with stable ground cover.

1.2.0 Project Schedule

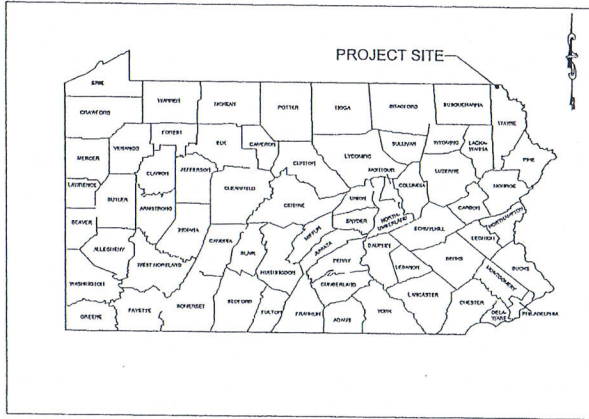
The project construction is anticipated to begin in May of 2010 and be concluded in February 2011.

Reference 22
(Excerpt)

POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN

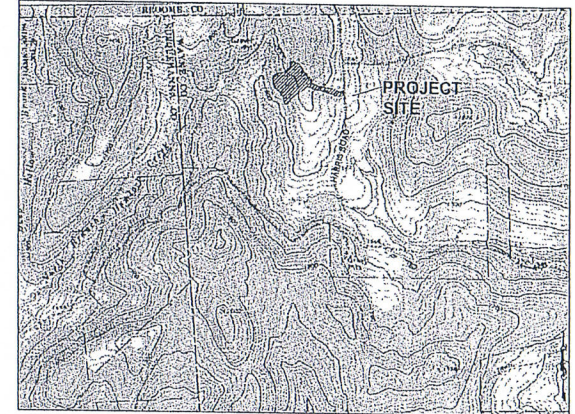
HESS MARCELLUS SHALE SITE - DAVIDSON 1V

149 HARRIS ROAD
SCOTT TOWNSHIP, WAYNE COUNTY
PENNSYLVANIA
Prepared for:
HESS CORPORATION



REGIONAL LOCATION MAP
PENNSYLVANIA STATE
N.T.S.

| DRAWING SCHEDULE | | |
|------------------|--|---------------|
| DRAWING NUMBER | DRAWING TITLE | DRAWING SCALE |
| PCSM-01 | COVER SHEET | AS SHOWN |
| PCSM-02 | EXISTING CONDITIONS PLAN | 1"=100' |
| PCSM-03 | POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN | 1"=100' |
| PCSM-04 | DETAILS (SHEET 1 OF 2) | NTS |
| PCSM-05 | DETAILS (SHEET 2 OF 2) | NTS |



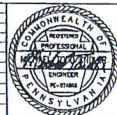
VICINITY MAP
N.T.S.

OWNER:
HESS CORPORATION
500 DALLAS STREET
HOUSTON, TX 77002
(570) 253-7801

SITE LOCATION:
149 HARRIS ROAD
SUSQUEHANNA, PA 18847

ENGINEER:
URS CORPORATION
335 COMMERCE DRIVE, STE. 300
FORT WASHINGTON, PA 19034
PH: (215) 367-2500 FAX: (215) 367-1000

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- NOTES:**
- SCALE NOTED APPLIES TO 22" x 34" SHEET SIZE. FOR SHEET SIZES OTHER THAN 22"x34", REFER TO GRAPHIC SCALE.
 - EXISTING CONTOURS SHOWN ARE BASED ON NAVD88 DATUM.
 - HORIZONTAL DATUM IS TIED TO THE NORTH AMERICAN DATUM (NAD) OF 1983.

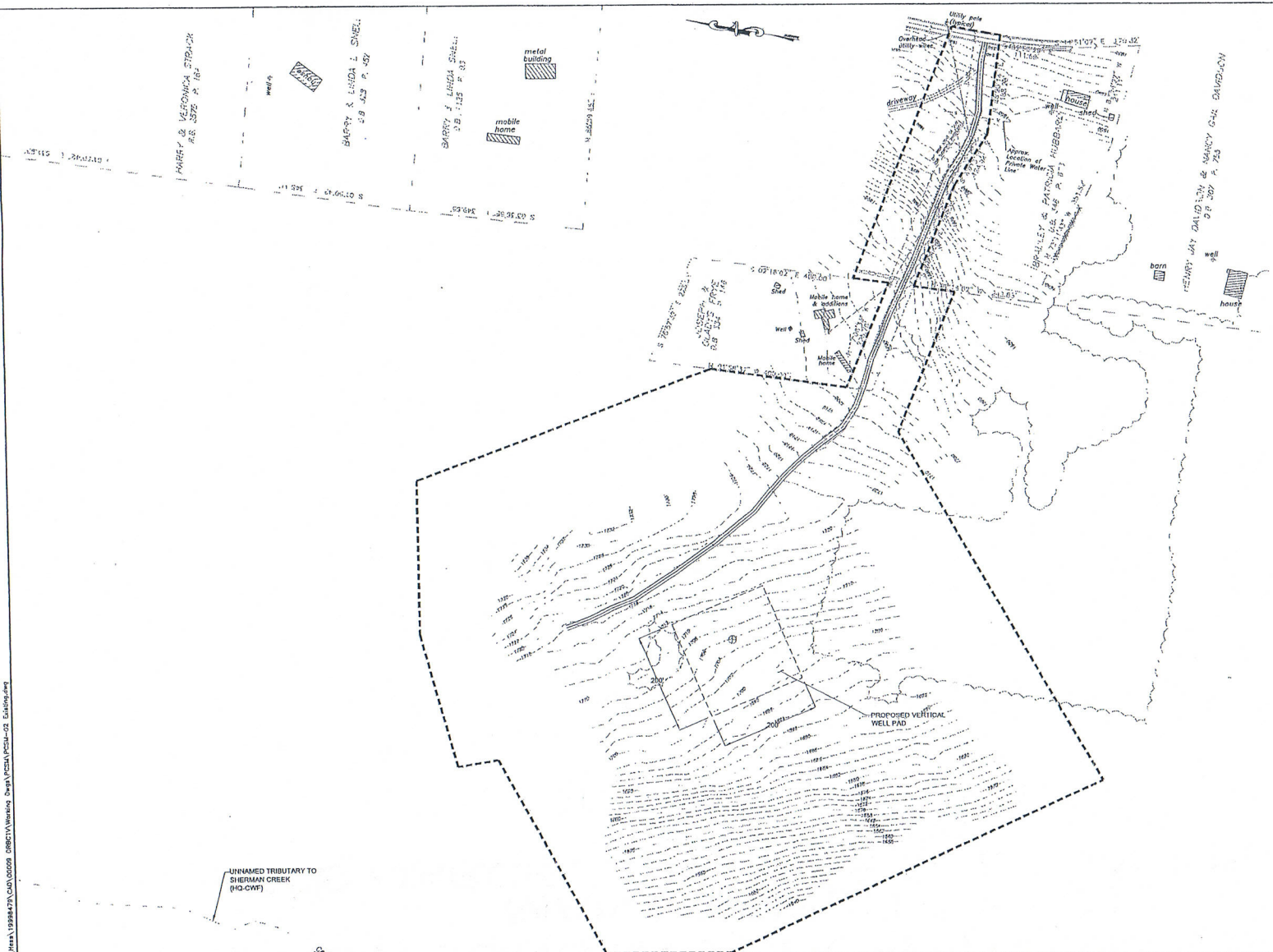
URS
335 COMMERCE DRIVE, STE. 300
FORT WASHINGTON, PA 19034
TEL: (215) 367-2500
FAX: (215) 367-1000

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HESS MARCELLUS SHALE WELL SITES
DAVIDSON 1V
SCOTT TOWNSHIP, WAYNE COUNTY, PENNSYLVANIA
POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN
COVER SHEET

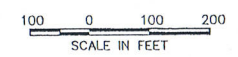
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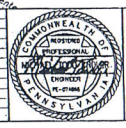


- LEGEND:**
- 1640— MAJOR CONTOUR (10' INTERVAL)
 - - - - - MINOR CONTOUR (2' INTERVAL)
 - EXISTING SPOT ELEVATION
 - LdC2** SOIL CLASSIFICATION
 - SOIL BOUNDARY
 - - - - - PROPERTY LINE
 - ~ ~ ~ ~ ~ EDGE OF TREES
 - - - - - PROPERTY LINE
 - ⊕ VERTICAL GAS WELL
 - - - - - PROJECT BOUNDARY
 - ○ ○ ○ ○ EXISTING STONE WALL

- NOTES:**
1. EXISTING FEATURES, 2-FOOT CONTOURS, AND PROPERTY LINES SHOWN HEREON ARE FROM A FIELD SURVEY PERFORMED BY FACHER ASSOCIATES, INC., 148 HIGHLAND ROAD, HONESDALE, PA 15431, (570) 224-4300 DURING MARCH 2010.
 2. THIS TOPOGRAPHIC MAP DOES NOT REPRESENT A PROPERTY BOUNDARY SURVEY.
 3. HORIZONTAL DATUM IS TIED TO THE NORTH AMERICAN DATUM (NAD) OF 1983.
 4. VERTICAL DATUM IS TIED TO THE NATIONAL GEODEIC VERTICAL DATUM (NGVD) OF 1988.
 5. THE RECEIVING WATERCOURSE, LOCATED WEST OF THE PROJECT AREA, IS AN UNNAMED TRIBUTARY TO SHERMAN CREEK. THE CHAPTER 83 CLASSIFICATION IS HIGH QUALITY-COLDWATER FISHES (HQ-CWF).



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NOTES:

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3. HORIZONTAL DATUM IS TIED TO THE NORTH AMERICAN DATUM (NAD) OF 1983.

URS

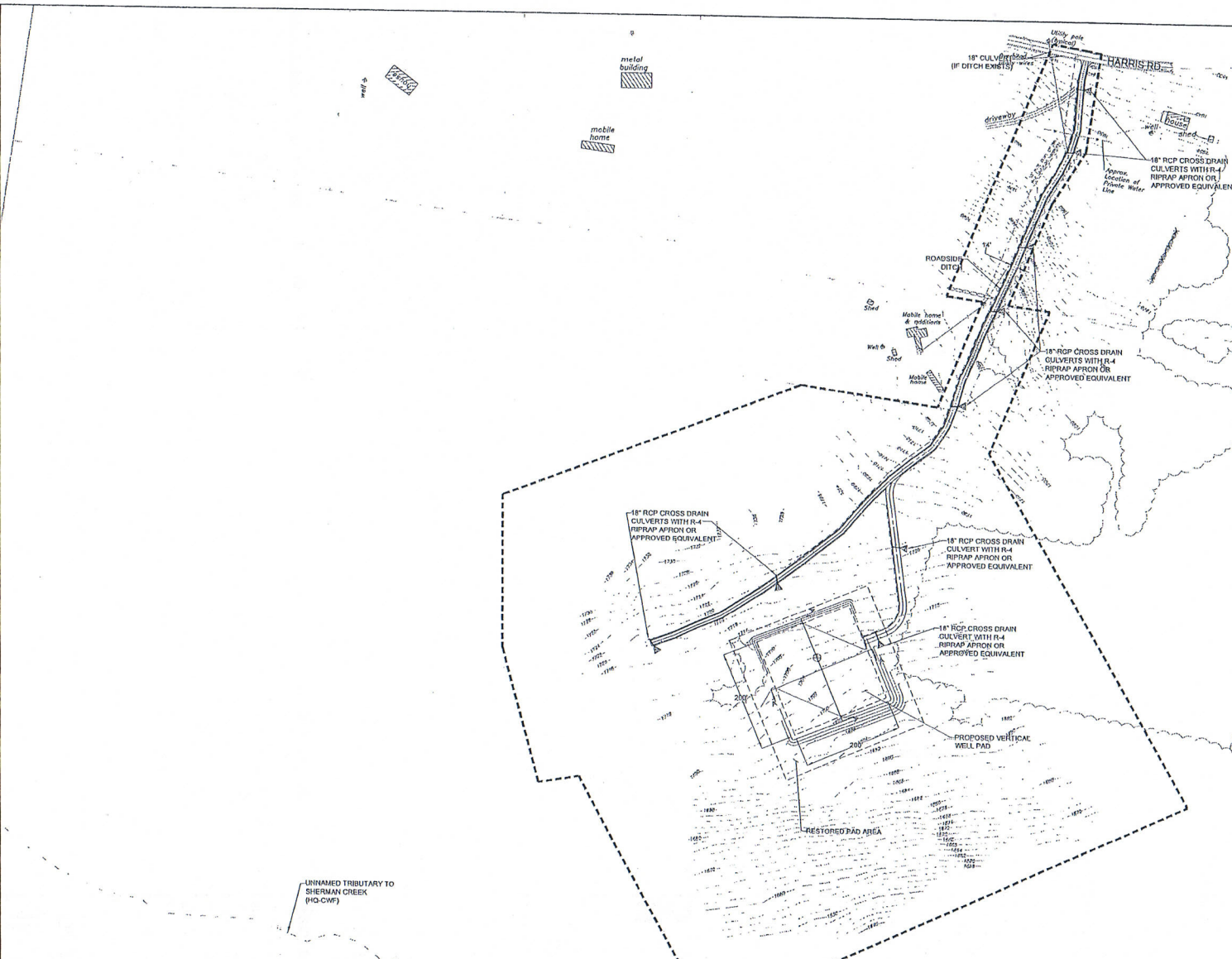
335 COMMERCE DRIVE STE 300
 FORT WASHINGTON, PA 19034
 TEL: (215) 367-3500
 FAX: (215) 367-1000

| DESIGNED BY | DATE |
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| BY: BJA | 04/23/10 |
| CHECKED BY: BJA | 04/23/10 |
| APPROVED BY: | |
| CADD APPROVED BY: | |

HESS MARCELLUS SHALE WELL SITES
 DAVIDSON 1V
 SCOTT TOWNSHIP, WAYNE COUNTY, PENNSYLVANIA

POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN
 EXISTING CONDITIONS PLAN

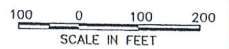
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| CHECKED BY: | | DATE: | |
| APPROVED BY: | | PROJECT: | PCSM-02 |



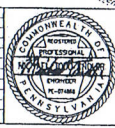
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| | |
|---------------|--------------------------------------|
| --- 1640 --- | MAJOR CONTOUR (10' INTERVAL) |
| --- 243.2 --- | MINOR CONTOUR (2' INTERVAL) |
| - - - - | EXISTING SPOT ELEVATION |
| --- | SOL CLASSIFICATION |
| --- | SOL BOUNDARY |
| --- | PROPERTY LINE |
| --- | EDGE OF TREES |
| ⊕ | VERTICAL GAS WELL |
| --- | PROPOSED MAJOR CONTOUR (5' INTERVAL) |
| --- | PROPOSED MINOR CONTOUR (1' INTERVAL) |
| --- | PROPOSED DRIVE |
| --- | ROADSIDE DITCH |
| --- | CROSS DRAIN |
| ⊕ | RIPRAP APRON |
| --- | PROJECT BOUNDARY |

- NOTES:**
- EXISTING FEATURES SHOWN HEREON ARE FROM A FIELD SURVEY PERFORMED BY PACKER ASSOCIATES, INC., 148 HOLGATE ROAD, HONESDALE, PA 16431, (570) 224-4300 DURING MARCH 2016.
 - HORIZONTAL DATUM IS TIED TO THE NORTH AMERICAN DATUM (NAD) OF 1983.
 - VERTICAL DATUM IS TIED TO THE NATIONAL GEODETIC VERTICAL DATUM (NGVD) OF 1988.
 - THE RECEIVING WATERCOURSE, LOCATED WEST OF THE PROJECT AREA, IS AN UNNAMED TRIBUTARY TO SHERMAN CREEK. THE CHAPTER 93 CLASSIFICATION IS HIGH QUALITY-COLDWATER FISHES (HQ-CWF).



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- HORIZONTAL DATUM IS TIED TO THE NORTH AMERICAN DATUM (NAD) OF 1983.

URS

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 FORT WASHINGTON, PA 19034
 TEL: (215) 367-2500
 FAX: (215) 367-1000

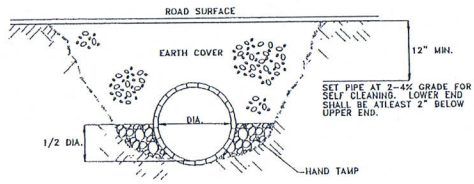
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| DRAWN BY: | JMS | DATE: | 03/25/16 |
| CHECKED BY: | RSC | DATE: | 04/23/16 |
| APPROVED BY: | | DATE: | |
| CLIENT APPROVED BY: | | DATE: | |

HESS MARCELLUS SHALE WELL SITES
 DAVIDSON 1V
 SCOTT TOWNSHIP, WAYNE COUNTY, PENNSYLVANIA

POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN

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| DRAWING DATE | 04/23/16 | DATE OF ISSUE | 04/23/16 |
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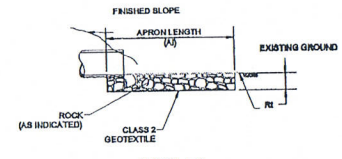
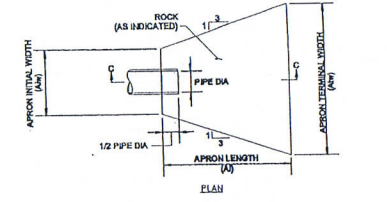
TYPICAL CROSS DRAIN CULVERT
N.T.S.



NOTES:
1. SEE MANUFACTURER'S INSTALLATION DETAIL FOR STAPLE PATTERNS, AND VEGETATION STABILIZATION SPECIFICATIONS FOR SOIL AMENDMENTS, SEED MIXTURES, AND MULCHING INFORMATION.

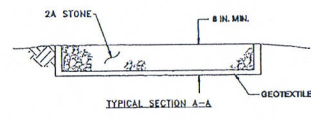
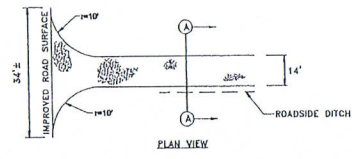
| SLOPE (%) | LINING |
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| 1 - 3 | NO L. STONE |
| 3 - 10 | NO. 10-20 |

TYPICAL ROADSIDE DITCH SECTION
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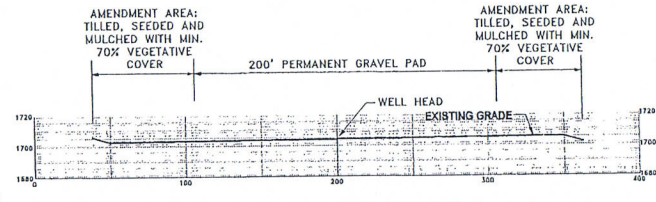


| OUTLET NO. | PIPE DIA. (IN) | RIPRAP | | APRON | |
|------------|----------------|--------|-------------|-------------|---------------------|
| | | SIZE | THICK. (IN) | LENGTH (FT) | TERMINAL WIDTH (FT) |
| TYPICAL | 18 | R-4 | 18 | 10 | 13 |

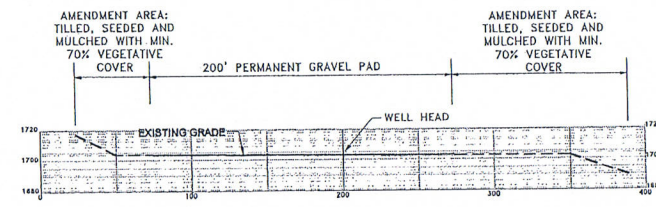
RIPRAP APRON
N.T.S.



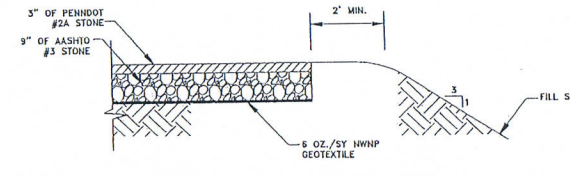
PERMANENT ACCESS ROAD
N.T.S.



PERMANENT WELL PAD CROSS-SECTION B-B
SCALE: 1" = 40'



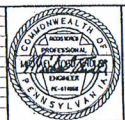
PERMANENT WELL PAD CROSS-SECTION A-A
SCALE: 1" = 40'



PERMANENT WELL PAD - SURFACING DETAIL
N.T.S.

Drawing Location & Name: \\hess\198847\1\0\0005 DIRECT\Working Drawings\PCSM-01_05_PCSM_Details

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NOTES:
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3. HORIZONTAL DATUM IS TIED TO THE NORTH AMERICAN DATUM (NAD) OF 1983.

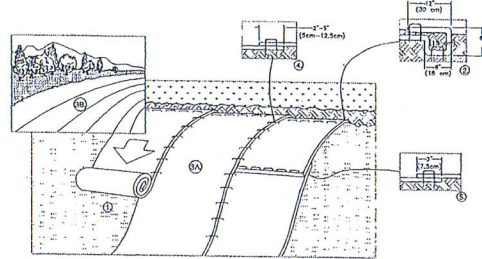
URS
335 COMMERCE DRIVE STE 300
FORT WASHINGTON, PA 19074
TEL: (215) 367-2500
FAX: (215) 367-1000

| DESIGNED BY | DATE | CHKD BY | DATE |
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HESS MARCELLUS SHALE WELL SITES
DAVIDSON 1V
SCOTT TOWNSHIP, WAYNE COUNTY, PENNSYLVANIA
POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN
DETAILS (SHEET 1 OF 2)

| PROJECT NO. | SCALE |
|------------------------|------------------------|
| 10004179 | N |
| DATE PLOTTED: 04/23/10 | DATE PRINTED: 04/23/10 |
| PROJECT FILE: | |

PCSM-0



NOTES:

1. PLACE EROSION CONTROL MATTING (NAG P-300 OR APPROVED EQUAL) ON SLOPES AT OR STEEPER THAN 3:1.
2. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED.
3. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE BLANKET IN A 6" (15cm) DEEP X 6" (15cm) WIDE TRENCH WITH APPROXIMATELY 12" (30cm) OF BLANKET EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE BLANKET WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30cm) APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" (30cm) PORTION OF BLANKET BACK OVER SEED AND COMPACTED SOIL. SECURE BLANKET OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" (30cm) APART ACROSS THE WIDTH OF THE BLANKET.
4. ROLL THE BLANKETS (A) DOWN OR (B) HORIZONTALLY ACROSS THE SLOPE. BLANKETS WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL BLANKETS MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE. WHEN USING OPTIONAL DOT SYSTEM, STAPLES/STAKES SHOULD BE PLACED THROUGH EACH OF THE COLORED DOTS CORRESPONDING TO THE APPROPRIATE STAPLE PATTERN.
5. THE EDGES OF PARALLEL BLANKETS MUST BE STAPLED WITH APPROXIMATELY 2"-5" (5cm-12.5cm) OVERLAP DEPENDING ON BLANKET TYPE. TO ENSURE PROPER SEAM ALIGNMENT, PLACE THE EDGE OF THE OVERLAPPING BLANKET (BLANKET BEING INSTALLED ON TOP) EVEN WITH THE COLORED SEAM STITCH ON THE PREVIOUSLY INSTALLED BLANKET.
6. CONSECUTIVE BLANKETS SPICED DOWN THE SLOPE MUST BE PLACED END OVER END (SHINGLE STYLE) WITH AN APPROXIMATE 3" (7.5cm) OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12" (30cm) APART ACROSS ENTIRE BLANKET WIDTH.

SUPPLEMENTAL NOTES:

- * IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" (15cm) MAY BE NECESSARY TO PROPERLY SECURE THE BLANKETS.
- ** STAPLE PATTERNS AND APPLICATIONS VARY BETWEEN MANUFACTURERS AND MATTING TYPES. THE CONTRACTOR IS ENCOURAGED TO CONSULT SPECIFIC MANUFACTURER INSTALLATION PROCEDURES FOR STAPLE SPACING AND CONSTRUCTION.

INSTALLATION OF EROSION CONTROL MATS FOR SLOPE STABILIZATION
N.T.S.

SEEDING PROCEDURES:

SEEDING PREPARATION WILL BE ACCOMPLISHED BY TRACKING THE AREAS TO BE SEEDDED WITH A SMALL BULLDOZER OR OTHER COMPARABLE DEVICE IN AN UP AND DOWN PATTERN TO CREATE TINY CONTOURS ALONG THE SLOPE. THESE TINY DEPRESSIONS HELP REDUCE EROSION AND PROVIDE A POCKET FOR PROPER GERMINATION OF THE SEEDS. THESE TINY DEPRESSIONS HELP "SITE STABILIZATION CHART" WILL BE REQUIRED TO PREPARE THE AREA TO BE SEEDDED.

MULCHING AS LISTED BELOW WILL BE PERFORMED IMMEDIATELY AFTER THE ADMINISTRATION OF THE LIME, FERTILIZER AND SEEDING MATERIALS.

THE MOST EFFECTIVE PERIODS FOR VEGETATION ESTABLISHMENT ARE EARLY SPRING TO EARLY SUMMER AND LATE SUMMER TO MID FALL. SEEDING AND MULCHING CAN BE PERFORMED DURING OTHER PERIODS AS WEATHER CONDITIONS PERMIT. MAJOR ACTIVITIES OF DEVELOPMENT SHALL BE PLANNED TO COINCIDE WITH THESE PRIME GROWING SEASONS.

IF OUT-OF-SEASON SEEDING IS NECESSARY, APPLY EITHER THE FULL-SPECIFIED QUANTITIES FOR SUPPLEMENTS, SEED AND MULCH OR APPLY FULL SUPPLEMENTS AND 50% OF THE SEED APPLICATION RATE TO BE FOLLOWED BY THE REMAINING 50% WITHIN THE NEXT SEEDING DATES. FULL MULCH RATE APPLICATIONS WILL BE REQUIRED FOR EACH SEEDING APPLICATION TO PREVENT SOIL EROSION UNTIL SEED GERMINATES.

TEMPORARY STABILIZATION:

ANNUAL RYE OR OATS SHALL BE USED AT A RATE OF 40 LBS. PER ACRE. STRAW AT A RATE OF 3 TONS PER ACRE SHALL BE USED AS MULCH. STRAW SHALL BE APPLIED IN LONG STRANDS, NOT CHOPPED OR FINELY BROKEN.

IN WETLAND AREAS, ANNUAL RYE SHALL BE USED AT A RATE OF 48 LBS. PER ACRE, CLEAN STRAW WITHOUT BINDERS AT A RATE OF 3 TONS PER ACRE SHALL BE USED.

SEEDING PROCEDURES:

| BRUSH SEED MIXTURE | | | |
|-----------------------|-------------------|-----------------------|------------------|
| BOTANICAL NAME | COMMON NAME | PERCENTAGE OF MIXTURE | APPLICATION RATE |
| LOLIUM MULTIFLORUM | ANNUAL RYEGRASS | 35 | 20 LBS / ACRE |
| PHEIUM PRATENSE | TIMOTHY | 25 | |
| ANDROPOGON GERARDI | BIG BLUESTEM | 10 | |
| ELYMUS VIRGINICUS | VIRGINIA WILD RYE | 10 | |
| LESPEDEZA BICOLOR | BICOLOR LESPEDEZA | 5 | |
| HELIANTHUS ANNUUS | COMMON SUNFLOWER | 5 | |
| LATHYRUS SYLVESTRIS | LATHCO FLAT PEA | 5 | |
| VIBURNUM DENTATUM | ARROW WOOD | 3 | |
| SAMBUBICUS CANADENSIS | ELDERBERRY | 2 | |

* SEEDING DATES: APRIL 1-JUNE 15 & AUGUST 16-SEPTEMBER 15

SOIL SUPPLEMENT RATES:

| SUPPLEMENTS | RATES |
|--|--|
| PULVERIZED AGRICULTURAL LIMESTONE | 435 KG PER 1000 M ³ (800 LBS PER 1,000 SY) |
| 10-20-20 ANALYSIS COMMERCIAL FERTILIZER | 80 KG PER 1000 M ³ (140 LBS PER 1,000 SY) |
| 38-0-0 UREAFORM FERTILIZER | 30 KG PER 1000 M ³ (50 LBS PER 1,000 SY) |
| 32-0-0 TO 38-0-0 SULFUR COATED UREA FERTILIZER | 35 KG TO 30 KG PER 1000 M ³ (50 TO 50 LBS PER 1,000 SY) |
| 31-0-0 IBDU FERTILIZER | 35 KG PER 1000 M ³ (61 LBS PER 1,000 SY) |

MULCHING:

| SUPPLEMENTS | RATES |
|-------------|-----------------|
| CLEAN STRAW | 3 TONS PER ACRE |

NOTES:

WITHIN SEVEN DAYS OF AN EARTH DISTURBANCE ACTIVITY OR ANY STAGE OR PHASE OF AN ACTIVITY, THE SITE SHALL BE SEEDDED, MULCHED, OR OTHERWISE PROTECTED FROM ACCELERATED EROSION AND SEDIMENTATION. (SECTION 102.22 (A)).

CLEAN STRAW MULCHING MAY BE USED AT A RATE OF 3 TONS PER ACRE AS TEMPORARY STABILIZATION DURING TIMES OF NON-GERMINATING.

EROSION CONTROL MATTING MUST BE USED ON ANY SLOPE STEEPER THAN 3:1. PLEASE SEE DETAIL ON SHEET ES-007.

THE SITE RESTORATION WILL BE IMPLEMENTED AND COMPLETED WITHIN 9 MONTHS AFTER THE LAST DRILLING AND FRACING ACTIVITIES.

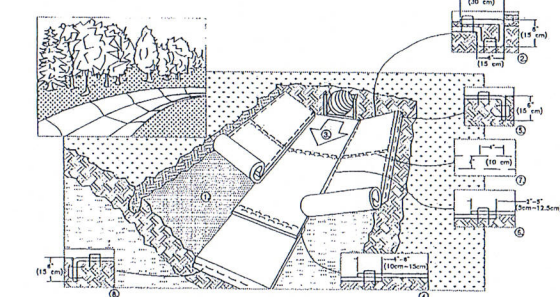
EROSION CONTROL MATTING FOR STEEP SLOPES:

STEEP SLOPES THAT ARE DISTURBED FOR CONSTRUCTION SUCH AS ROADWAY CUT OR EMBANKMENT SLOPES 3 HORIZONTAL TO 1 VERTICAL OR STEEPER SHALL BE PROTECTED AGAINST EROSION WITH EROSION CONTROL MATTING (NAG P-300 OR APPROVED EQUAL) OR MATS SUITABLE FOR THE ESTABLISHMENT OF VEGETATION. THE EROSION CONTROL MATTING SHOULD BE INSTALLED IMMEDIATELY AFTER THE SOIL AMENDMENTS AND THE SEED ARE APPLIED. EROSION CONTROL MATTING SHOULD ALSO BE INSTALLED ON OTHER STEEP SLOPES WHERE EROSION WILL BE A PROBLEM UNTIL VEGETATION IS ESTABLISHED. THE INSTALLATION PROCEDURE SHOULD COMPLY WITH THE RECOMMENDATIONS OF THE MANUFACTURER, INCLUDING SLOPE PREPARATION, ORIENTATION, TRENCHING, OVERLAP AND SPACING OF STAPLES.

STABILIZATION DURING NON-GROWING SEASONS:

ALL CONSTRUCTION SHOULD BE PLANNED FOR COMPLETION WITHIN THE RECOMMENDED DATES FOR THE APPLICATION OF PERMANENT SEEDING AND ESTABLISHMENT OF A PERMANENT VEGETATIVE COVER, HOWEVER, WHEN CONSTRUCTION MUST BE DONE AND IS COMPLETED DURING A NON-GROWING SEASON (WINTER, ETC.), INTERIM STABILIZATION BMP'S MUST BE IMPLEMENTED AND MAINTAINED. THE APPLICATION OF STRAW MULCH AT THE RATE OF THREE TONS PER ACRE IS RECOMMENDED. THE BMP'S SHOULD BE CHECKED WEEKLY (UNLESS SNOW COVERED) TO IDENTIFY AREAS THAT BECOME BARE. THESE BARE AREAS SHOULD BE COVERED WITH A PROPERLY INSTALLED EROSION CONTROL MATTING.

ALL TEMPORARY EROSION AND SEDIMENT POLLUTION CONTROLS MUST BE MAINTAINED UNTIL PERENNIAL VEGETATION IS ESTABLISHED.



NOTES:

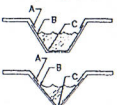
1. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED. NOTE: WHEN USING CELL-O-SEED DO NOT SEED PREPARED AREA. CELL-O-SEED MUST BE INSTALLED WITH PAPER SIDE DOWN.
2. BEGIN AT THE TOP OF THE CHANNEL BY ANCHORING THE BLANKET IN A 6" (15cm) DEEP X 6" (15cm) WIDE TRENCH WITH APPROXIMATELY 12" (30cm) OF BLANKET EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE BLANKET WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30cm) APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" (30cm) PORTION OF BLANKET BACK OVER SEED AND COMPACTED SOIL. SECURE BLANKET OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" (30cm) APART ACROSS THE WIDTH OF THE BLANKET.
3. ROLL CENTER BLANKET IN DIRECTION OF WATER FLOW IN BOTTOM OF CHANNEL. BLANKETS WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL BLANKETS MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE MANUFACTURER'S STAPLE PATTERN GUIDE. WHEN USING OPTIONAL DOT SYSTEM, STAPLES/STAKES SHOULD BE PLACED THROUGH EACH OF THE COLORED DOTS CORRESPONDING TO THE APPROPRIATE STAPLE PATTERN.
4. PLACE CONSECUTIVE BLANKETS END OVER END (SHINGLE STYLE) WITH A 4"-6" (10cm-15cm) OVERLAP. USE A DOUBLE ROW OF STAPLES STAGGERED 4" (10cm) APART AND 4" (10cm) ON CENTER TO SECURE BLANKETS.
5. FULL LENGTH EDGE OF BLANKETS AT TOP OF SIDE SLOPES MUST BE ANCHORED WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30cm) APART IN A 6" (15cm) DEEP X 6" (15cm) WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
6. ADJACENT BLANKETS MUST BE OVERLAPPED APPROXIMATELY 2"-5" (5cm-12.5cm) (DEPENDENT ON BLANKET TYPE) AND STAPLED, TO ENSURE PROPER SEAM ALIGNMENT, PLACE THE EDGE OF THE OVERLAPPING BLANKET (BLANKET BEING INSTALLED ON TOP) EVEN WITH THE COLORED SEAM STITCH ON THE BLANKET BEING OVERLAPPED.
7. IN HIGH FLOW CHANNEL APPLICATIONS, A STAPLE CHECK SLOT IS RECOMMENDED AT 30 TO 40 FOOT (9m-12m) INTERVALS. USE A DOUBLE ROW OF STAPLES STAGGERED 4" (10cm) APART AND 4" (10cm) ON CENTER OVER ENTIRE WIDTH OF THE CHANNEL.
8. THE TERMINAL END OF THE BLANKETS MUST BE ANCHORED WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30cm) APART IN A 6" (15cm) DEEP X 6" (15cm) WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.

SUPPLEMENTAL NOTES:

- * HORIZONTAL STAPLE SPACING SHOULD BE ALTERED IF NECESSARY TO ALLOW STAPLES TO SECURE THE CRITICAL POINTS ALONG THE CHANNEL SURFACE.
- ** IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" (15 cm) MAY BE NECESSARY TO PROPERLY ANCHOR THE BLANKETS.
- *** STAPLE PATTERNS AND APPLICATIONS VARY BETWEEN MANUFACTURERS AND MATTING TYPES. THE CONTRACTOR IS ENCOURAGED TO CONSULT SPECIFIC MANUFACTURER INSTALLATION PROCEDURES FOR STAPLE SPACING AND CONSTRUCTION.

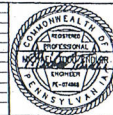
CRITICAL POINTS

- A. OVERLAPS AND SEAMS
- B. PROJECTED WATER LINE
- C. CHANNEL BOTTOM/SIDE SLOPE VERTICES



INSTALLATION OF EROSION CONTROL MATS IN CHANNELS
N.T.S.

| REVISIONS | |
|-----------|-------------|
| NO. | DESCRIPTION |
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NOTES:

1. SCALE NOTED APPLIES TO 22" X 34" SHEET SIZE. FOR SHEET SIZES OTHER THAN 22" X 34", REFER TO GRAPHIC SCALE.
2. EXISTING CONTOURS SHOWN ARE BASED ON NOV0888 DATUM.
3. HORIZONTAL DATUM IS TIED TO THE NORTH AMERICAN DATUM (NAD) OF 1983.

URS

335 COMMERCE DRIVE STE 300
FOUNTAIN VALLEY, CA 92708
TEL: (714) 357-9920
FAX: (714) 357-1000

| DESIGN NO. | DATE |
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| | |

HESS MARCELLUS SHALE WELL SITES
DAVIDSON 1V
SCOTT TOWNSHIP, WAYNE COUNTY, PENNSYLVANIA

POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN
DETAILS (SHEET 2 OF 2)

| NO. | DATE | SCALE |
|----------|----------|----------|
| 19980479 | | N.T.S. |
| 042210 | 04/22/10 | 1" = 10' |
| 042211 | 04/22/10 | 1" = 10' |