MINNESOTA POLLUTION CONTROL AGENCY
520 Lafayette Road North
St. Paul, MN 55155-4194

Notice of Availability of an Environmental Assessment Worksheet (EAW)

Epitome Energy Soybean Processing Facility

Doc Type: Public Notice

Public comment information

EAW public comment period begins: July 19, 2022

EAW public comment period ends: August 18, 2022

Notice published in the EQB Monitor: July 19, 2022

Facility specific information

Epitome Energy Soybean Processing Facility
2100 Main Street
Crookston, MN 56716

Denis Egan
1651 Old Highway 19
Red Wing, MN 55066
(952) 229-8673

MPCA contact information

MPCA EAW contact person:

Charles Peterson
Resource Management and Assistance Division
Minnesota Pollution Control Agency
520 Lafayette Road North
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General information

The Minnesota Pollution Control Agency (MPCA) is distributing this Environmental Assessment Worksheet (EAW) for a 30-day review and comment period pursuant to the Environmental Quality Board (EQB) rules. The MPCA uses the EAW, and any comments received to evaluate the potential for significant environmental effects from the project and decide on the need for an Environmental Impact Statement (EIS).

An electronic version of the EAW is available on the MPCA Environmental Review webpage at http://www.pca.state.mn.us/oxpg691. If you would like a copy of the EAW or have any questions on the EAW, contact the appropriate person(s) listed above.

Description of proposed project

Epitome Energy, LLC proposes to construct a rail served soybean crush and extraction facility in Crookston, MN (Project). At full production capacity, the Project will process up to 42 million bushels of soybeans per year procured from soybean growers in the Crookston region. The Project will produce up to 450 million pounds of crude oil, just under one million tons of soybean meal, and 65,000 tons of soybean hulls. The Project includes 21 aboveground storage tanks for over 3.6 million gallons of storage.

Note: All comment letters are public documents and will be part of the official public record for this project.

Written comments on the EAW must be received by the MPCA EAW contact person within the comment period listed above.

Comments may be submitted by:

1) US Mail to the following address:

   Minnesota Pollution Control Agency
   c/o Charles Peterson
   520 Lafayette Road
   St. Paul, MN 55155

2) Online at: www.pca.state.mn.us/epitome

Public comments must state the following:

1) Your name
2) Mailing address

Need for an EIS

The MPCA Commissioner will make a final decision on the need for an EIS after the end of the comment period.

July 2013 version

ENVIRONMENTAL ASSESSMENT WORKSHEET

This Environmental Assessment Worksheet (EAW) form and EAW Guidelines are available at the Environmental Quality Board's website at:
http://www.eqb.state.mn.us/EnvRevGuidanceDocuments.htm. The EAW form provides information about a project that may have the potential for significant environmental effects. The EAW Guidelines provide additional detail and resources for completing the EAW form.
Cumulative potential effects can either be addressed under each applicable EAW Item or can be addresses collectively under EAW Item 19.
Note to reviewers: Comments must be submitted to the RGU during the 30-day comment period following notice of the EAW in the *EQB Monitor*. Comments should address the accuracy and completeness of information, potential impacts that warrant further investigation and the need for an EIS.

1. **Project title:** Epitome Energy Soybean Processing Facility

2. **Proposer:**
   Epitome Energy, LLC
   Contact person: Dennis Egan
   Title: CEO
   Address:1651 Old Highway 19 City,
   State, ZIP: Red Wing, MN 55066
   Phone: (952) 229-8673
   Email: Dennis@EpitomeEnergy.com

3. **RGU:**
   MN Pollution Control Agency
   Contact person: Charles Peterson
   Title: Project Manager
   Address: 520 Lafayette Road
   City, State, ZIP: St. Paul, MN 55155
   Phone: 651-272-5937
   Email: charles.peterson@state.mn.us

4. **Reason for EAW Preparation:** (check one)

Required:	Discretionary:
☐ EIS Scoping	☐Citizen petition
☑ Mandatory EAW	☐RGU discretion
	☐Proposer initiated

   If EAW or EIS is mandatory, give EQB rule category subpart number(s) and name(s):
   Subpart 15.A. For construction of a stationary source facility that generates 250 tons or more per year or modification of a stationary source facility that increases generation by 250 tons or more per year of any single air pollutant, other than those air pollutants described in item B, after installation of air pollution control equipment, the PCA shall be the RGU.

5. **Project Location:**
   County: Polk
   City/Township: City of Crookston
   PLS Location (¼, ¼, Section, Township, Range): Part of the NW1/4 of Section 1, T. 149 N R. 047 W
   Watershed (81 major watershed scale): Red Lake River (63)
   GPS Coordinates: 47.757048, -96.627360
   Tax Parcel Number: Part of 82.00163.01

   At a minimum, attach each of the following to the EAW:
   - County map showing the general location of the project

- U.S. Geological Survey 7.5 minute, 1:24,000 scale map indicating project boundaries (photocopy acceptable)
- Site plans showing all significant project and natural features. Pre-construction site plan and post-construction site plan

Figures:
Figure 1: County Location Map
Figure 2: USGS Quad Map Excerpt
Figure 3: Concept Site Plan
Figure 4: Aerial Photograph
Figure 5: Existing Land Use
Figure 6: Zoning
Figure 7: Wetlands
Figure 8: NWI Map
Figure 9: Well Location

Attachments:
Attachment 1: Public Outreach
Attachment 2: NRCS Soil Report
Attachment 3: Wetland Delineation Report
Attachment 4: Area Well Logs
Attachment 5: DNR Natural Heritage Database Review
Attachment 6: SHPO Database Search Results
Attachment 7: Air Dispersion Model Technical Summary
Attachment 8: Air Emissions Risk Analysis Technical Summary
Attachment 9: GHG Calculation Summary

6. Project Description:

a. Provide the brief project summary to be published in the *EQB Monitor*, (approximately 50 words).

Epitome Energy, LLC proposes to construct a rail served soybean crush and extraction facility in Crookston, MN (Project). At full production capacity, the Project will process up to 42 million bushels of soybeans per year procured from soybean growers in the Crookston region. The Project will produce up to 450 million pounds of crude oil, just under one million tons of soybean meal, and 65,000 tons of soybean hulls. The Project includes 21 aboveground storage tanks for over 3.6 million gallons of storage.

b. Give a complete description of the proposed project and related new construction, including infrastructure needs. If the project is an expansion include a description of the existing facility. Emphasize: 1) construction, operation methods and features that will cause physical manipulation of the environment or will produce wastes, 2) modifications to existing equipment or industrial processes, 3) significant demolition, removal or remodeling of existing structures, and 4) timing and duration of construction activities.

Epitome Energy, LLC (Epitome) proposes to construct and operate a soybean oil extraction and refining project. The Project is in the southwestern portion of the City of Crookston (City) in Polk County, MN. Figure 1, County Location Map, illustrates the general location of the Project. Figure 2, USGS Quad Map Excerpt, illustrates the site with respect to the surrounding area and

Figure 3, Concept Site Plan, illustrates the layout of significant site features within the Project area.

The Project will produce soybean oil, hulls, and meal from soybeans. The crushing process consists of cracking a soybean to remove the hull; rolling the de-hulled soybean into flakes; extracting oil from the flakes; and drying and grinding these de-oiled flakes into meal using solvent extraction. Epitome will sell a portion of the soybean oil for biodiesel production and a portion of the soybean oil will be processed further into refined, bleached, and deodorized (RBD) oil. Typically, the RBD soybean oil becomes an edible oil that is sold to food processors, food service, and retail industries.

The Project involves the construction of rail and truck receiving terminals, processing buildings, unprocessed and processed product storage, rail and truck loadouts, railyard, maintenance, storage, and office buildings. Epitome will construct the Project on a 60-acre parcel of property zoned I-1 Heavy Industrial. Current land use is agricultural. Construction will require site grading and construction of infrastructure to serve the Project including utilities, rail, internal access roads, storage, and buildings.

The operation will consist of raw seed storage, seed preparation and hull storage, oil extraction, and meal and crude oil storage. Epitome will use solvent extraction to extract the oil. The extraction process will use a commercial grade hexane solvent to extract oil from the conditioned oilseeds. The extraction process consists of "washing" the oil from the soybean flakes with hexane solvent in a countercurrent extractor. The process uses steam to evaporate the solvent from both the solvent/oil mixture and the flakes. The process recovers the evaporated solvent for reuse in the process. The process also uses a mineral oil absorber to recover and reuse hexane from the extractor.

The Project will utilize 21 above ground storage tanks to store liquids used in the extraction process and final product. Larger tanks will be field erected and smaller tanks will be shop fabricated. The tanks will be subject to Minnesota's above ground storage tank rules and will be designed with either concrete secondary containment or a compacted clay liner depending upon the type of substance stored in accordance with Minnesota's above ground storage tank requirements.

At full production capacity, the Project will process up to 42 million bushels of soybeans per year procured from soybean growers in the Crookston region. Epitome will produce up to 450 million pounds of crude oil, just under one million tons of soybean meal, and 65,000 tons of soybean hulls. Epitome will sell the soybean oil as edible oil, feedstock to biodiesel production, and renewable industrial applications such as highway sealant. Additionally, Epitome will sell the soybean meal and soybean hulls as animal feed to local markets.

The Project will receive soybeans by truck and rail. The Project will include a railyard for deliveries and load out on the eastern portion of the Project. This is immediately adjacent to Crookston Junction where the Minnesota Northern Railroad's connection to the Burlington Northern Santa Fe Railroad's (BNSF) mainline is situated. The railyard will be constructed on the Epitome property. The main switch will be on land owned by Minnesota Northern Railroad. The rail line will cross the Front Street right of way. Epitome has requested that the section of Front Street right-of-way adjacent to the railyard be vacated, but whether that occurs will be

determined by local approvals and the final development agreement with the City of Crookston. The total length of track in the railyard will be approximately 12,000-15,000 linear feet.

Truck deliveries of soybeans will access the Project from the south and exit to the west on to Agriculture Road, which the City will extend from the Ag Innovation Campus south along the Project's western property line. Primary employee, vendor, and final product access will be to and from Agricultural Road north to County Road 9 (Ingersoll Avenue). Construction of a truck access and scales will be on property south of the Project pending a lease agreement or ownership acquisition.

Construction will produce normal construction wastes. Epitome anticipates that site work and construction will take 12 months.

c. Project magnitude:

Table 1: Summary of project magnitude

Total Project Acreage	**60 acres**
Linear project length	NA
Number and type of residential units	NA
Commercial building area (in square feet)	NA
Industrial building area (in square feet)	130,000 sf
Institutional building area (in square feet)	NA
Other uses – specify (in square feet)	350,650 sf - Rail Yard
Structure height(s)	Tanks up to 40 feet Storage bins up to 135 feet Processing buildings up to 90 feet Stacks up to 170 feet

d. Explain the project purpose; if the project will be carried out by a governmental unit, explain the need for the project and identify its beneficiaries.

The purpose of the Project is to establish a processing plant to serve the regional soybean growers. Soybeans have rapidly become a predominant agricultural crop in northwestern Minnesota. The Project would serve an 11-county region in northwestern Minnesota and potentially 12 counties in northeastern North Dakota. With no other existing soybean processing facilities within 100 miles, the Project will strengthen the local soybean market and create certainty for soybean growers in the expanding northwestern Minnesota market area.

e. Are future stages of this development including development on any other property planned or likely to happen? ☐ Yes ☑No
If yes, briefly describe future stages, relationship to present project, timeline and plans for environmental review.

f. Is this project a subsequent stage of an earlier project? ☐ Yes ☑ No
If yes, briefly describe the past development, timeline and any past environmental review.

7. Cover types: Estimate the acreage of the site with each of the following cover types before and after development:

Table 2: Summary of land cover

Cover Type	Before (acres)	After (acres)	Cover Type	Before (acres)	After (acres)
Wetlands	0.45	0	Lawn/landscaping	0	6
Deep water/streams	0	0	Impervious surface	0	20
Wooded/forest	0	0	Stormwater Ponds	0	4
Brush/Grassland			Other (describe) gravel yard and rail yard		
Cropland	59.5	0		0	30
			TOTAL	60	60

8. **Permits and approvals required: List all known local, state and federal permits, approvals, certifications and financial assistance for the project. Include modifications of any existing permits, governmental review of plans and all direct and indirect forms of public financial assistance including bond guarantees, Tax Increment Financing and infrastructure.** ***All of these final decisions are prohibited until all appropriate environmental review has been completed. See Minnesota Rules, Chapter 4410.3100.***

Table 3: Required permits and approvals

Unit of government	Type of application	Status
U.S. EPA	Federal Spill Prevention Control and Countermeasure Plan (SPCC)	To be submitted
US Army Corps of Engineers	Section 404 Wetland Permit	To be submitted if required
MPCA	401 Water Quality Certification	To be submitted if required
MPCA	Air Emissions Permit	To be submitted
MPCA	National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Permit	To be submitted
MPCA	National Pollutant Discharge Elimination System (NPDES) Industrial Stormwater Permit	To be submitted
MPCA	Aboveground Storage Tank Major Facility Permit	Submitted on February 4, 2022
MPCA	Minnesota State Spill Response Plan	To be submitted
MN Dept. of Natural Resources	Temporary Projects General Permit	To be applied for if required
Mn/DOT	Driveway/Access Permit	To be Submitted
State Fire Marshall	Plan Review for Aboveground Storage Tanks	To be submitted
Board of Soil and Water	Wetland Replacement Plan	To be submitted
City	Conditional Use Permit	To be submitted
City	Building Permit	To be submitted

City	Permit for Discharge of Industrial Wastewater	To be submitted
City	Connection Permit to Sanitary Sewer	To be submitted

Notes:

A. A Federal Spill Prevention Response and Counter Measure Plan (SPCC Plan) is required, and Epitome will prepare one for this site. The purpose of the SPCC Plan is to help prevent the discharge of oil from non-transportation related facilities. Development of the Plan is in accordance with Title 40 Code of Federal Regulations (CFR) Part 112 Oil Pollution Prevention. Petroleum based oils, vegetable oils, and biofuels are subject to the regulation and Epitome will address them in the SPCC Plan. The SPCC Plan is not subject to a permit.

B. A State Spill Response Plan is required, and Epitome will prepare one for this site. The State Spill Response Plan requires preparedness to effectively and reliably respond to worst-case discharges. Epitome will develop the requirements of the State Spill Response Plan in accordance with Minn. Statute 115. Handlers of oil and hazardous substances are required to prepare for potential spills. Epitome will incorporate the Prevention and Response Plans into the SPCC Plan described above as allowed in Minn. Statute 115E.04, subd. 1. Epitome must notify the Commissioner of Public Safety upon completion, but the State Spill Response Plan is not subject to a permit.

C. Discharge of the water used for hydrostatic testing does not require a MPCA Industrial Wastewater Discharge Permit. Epitome will discharge water used for the hydrostatic testing of tanks to the City's municipal sanitary sewer system.

D. A Temporary Water Appropriations Permit for water used to fill the tanks for the hydrostatic testing is not required because Epitome will obtain water from currently permitted sources including either the City's municipal system or recycled and reused greywater generated by American Crystal Sugar - Crookston.

Cumulative potential effects may be considered and addressed in response to individual EAW Item Nos. 9-18, or the RGU can address all cumulative potential effects in response to EAW Item No. 19. If addressing cumulative effect under individual items, make sure to include information requested in EAW Item No. 19

The EAW will address cumulative potential effects in response to individual EAW items.

9. Land use:

a. Describe:

i. Existing land use of the site as well as areas adjacent to and near the site, including parks, trails, prime or unique farmlands.

Current land use of the Project site is for agricultural production. Land use in the area adjacent to and near the Project is predominantly commercial, agricultural, and industrial to the east, southwest, and north. There is an area of single-family residential land use immediately northeast of the Project. Nearby commercial and industrial uses include the American Crystal Sugar processing plant to the northwest, Calumet asphalt terminal to the south, and recycling facilities, including the Polk County Environmental Services facility, across Ingersoll Avenue just to the north of the Project. The Great Plains Natural Gas substation is just north of the Project. The Minnesota Northern Railroad, a short line railroad operates railroad tracks coming up to the Project from the south and southwest that run

along the eastern boundary of the Project where they join the BNSF railroad's mainline at Crookston Junction. There are a number of industry siding tracks near the junction just to the east of the Project. The Ag Innovation Campus, currently under construction, will be just to the northwest of the Project. The Ag Innovative campus is a small mechanical crush research facility for locally grown oilseeds.

There are no parks or trails on or near the Project. The closest park is a neighborhood park (Carmen Park) approximately 2,000 feet to the northeast of the property boundary. The park includes platy structures, volleyball courts, soccer fields, green space and a rentable shelter.

The Project site is classified as *Prime Farmland if Drained* by the US Department of Agriculture's Natural Resources Conservation Service (NRCS). The majority of the surrounding farmland, which is west of the Project and extends beyond the City limits, is considered Prime Farmland or Prime Farmland if Drained, by the NRCS. The main agricultural crops in the area are small grain, sugar beets, and soybeans.

Figure 4, Aerial Photograph, illustrates existing land use of the Project and surrounding area. Figure 5, Existing Land Use, is an excerpt of the City's Existing Land Use Map.

ii. Plans. Describe planned land use as identified in comprehensive plan (if available) and any other applicable plan for land use, water, or resources management by a local, regional, state, or federal agency.

The City adopted the Crookston Tomorrow Comprehensive Plan 2035 (2035 Plan) on March 14, 2016. The 2035 Plan articulates a vision of how the City will develop over the next 20 years. The 2035 Plan includes strategies that accommodate growth and development to optimize benefits to the City and provides a framework for zoning and subdivision regulations. The 2035 Plan includes a Future Land Use Map intended to provide a logical framework to guide the City's land use policies and development decisions.

The 2035 Plan designates future land use of the Project and surrounding area as Industrial, served by rail and major transportation corridors, as well as an area of Single Family Residential to the northeast of the Project. According to the 2035 Plan, the Industrial land use designation allows for a wide range of industrial uses including manufacturing, tech-flex, warehousing, distribution, and processing facilities as well as heavy commercial uses. Industrial land use areas should have direct access to major regional roadways without passing through residential areas and industrial sites should be well buffered from less intensive uses.

The East Polk and the West Polk Soil and Water Conservation Districts coordinate and administer the Polk County Water Plan (Water Plan). Polk County adopted the Water Plan in 2012 for the ten-year period 2012-2022, with an implementation plan updated every five years. The Plan focuses on water and related land resource issues. The Local Water Plan strives to identify existing and potential problems and opportunities for protection, management and development of water resources, and related land resources in Polk County and to protect, maintain, and improve the quality of wetlands, rivers, lakes, and groundwater. The Project is within the Red Lake River Watershed. The main resource concerns in the watershed are wind and water erosion, nutrient management, wetland management, surface water quality, flood damage reduction, and wildlife habitat. Many

resource concerns relate directly to flooding and increased sediment and pollutant loadings to surface waters. The Minnesota Board of Water and Soil Resources approved A One Watershed One Plan for the Red Lake River Watershed and can be found on the internet here: https://westpolkswcd.org/red-lake-river-1w1p.html.

The Project is within the City. The City is an area of Environmental Justice Concern where at least 40% of the people reported income level less than 185% of the federal poverty level. The MPCA's Environmental Justice Policy provides for the rights of low-income communities the enjoyment of a healthy environment and to fair treatment with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies. The MPCA is able to use its authority and influence to identify and support opportunities that improve environmental conditions in areas of concern, both by enhancing environmental quality and by providing economic opportunities and to ensure that all have the opportunity to participate in decisions that may affect their environment or health.

iii. Zoning, including special districts or overlays such as shoreland, floodplain, wild and scenic rivers, critical area, agricultural preserves, etc.

The Project site is zoned I-1 Heavy Industrial. Surrounding land is zoned Industrial with the exception of single-family residential zoning adjacent to the northeast corner of the Project. The Project is not within the 100-year floodplain of the Red Lake River, or any other floodplains. The Project is not within any special districts or zoning overlays. Figure 6, Zoning Map, is an excerpt of the City's current zoning Map that shows zoning of the Project and surrounding area.

b. Discuss the project's compatibility with nearby land uses, zoning, and plans listed in Item 9a above, concentrating on implications for environmental effects.

The Project is compatible with the I-1 Heavy Industrial zoning of the Project and surrounding area. The proposed use is a permitted use in the I-1 Heavy Industrial District under the City's Codes and Ordinances (Crookston Code) which permits the manufacturing, compounding, packaging, treatment, or storage associated with feed and grain milling. Crude oil storage tanks are also a permitted land use in the I-1 District. Open storage, which is planned on a seasonal basis to accommodate incoming soybeans during the fall harvest, is an allowed conditional use in the I-1 District.

The Project meets all of the districts building setback requirements but exceeds the zoning district's height restrictions, which are a maximum of 35 feet. Epitome will need a variance to allow proposed structures to exceed 35 feet in height. Service of the Project is by adjacent rail and major transportation corridors. Design of the proposed Site Plan was to provide a buffer between areas of greatest site activity and the existing residential land uses to the northeast. The Project will utilize roadways that avoid passing through residential areas. It is anticipated that almost 100% of the truck traffic utilizing the Project will come from the west, leave to the west, and avoid the residential area entirely. The setback between the closest processing building and the nearest residential district lot line is over 350 feet. The siding tracks for rail car storage will be the closest activity to the residential district to the northeast. Epitome will construct a screening berm with evergreen trees along the northeast boundary of the Project to provide visual screening and noise mitigation within the buffer area. The siding tracks are

immediately adjacent to other existing industrial rail sidings and the junction of the Minnesota Northern Railroad, and the BNSF mainline.

The potential land use conflicts with adjacent single-family residential land uses to the northeast include visual, noise, air and traffic impacts discussed in individual sections of this EAW. Epitome will be required to meet the standards established in the Crookston Code (with the exception of the variance request to exceed maximum building height), the Polk County Local Water Plan, Soil and Water Conservation District, and appropriate state and federal agency regulations including state noise and air emission standards.

Environmental Justice involves the fair treatment and meaningful involvement of all people regardless of race, color, national origin or income. The MPCA's Environmental Justice policy supports fair treatment so that no group of people bear a disproportionate share of negative environmental consequences and opportunities for meaningful involvement. Meaningful involvement includes:

- Providing people the opportunity to participate in decisions about activities that may affect their environment and/or health;
- Providing the opportunity for public participation to influence the decision making process;
- Considering concerns that are expressed during the decision-making process; and
- Facilitating public involvement of those groups that are potentially affected.

Epitome will address environmental impacts through an environmental review process including preparation of this Environmental Assessment Worksheet, which examines potential impacts and mitigation measures. The EAW is an information-gathering document used to inform decision makers including those issuing land use and environmental permits that are required for the Project (See Section 8 of this EAW). The environmental review process provides opportunity for public input during the public comment period. To be inclusive of those who have limited access to, or understanding of, the public comment process, the opportunity for public involvement will be expanded beyond the formal public notice. The MPCA will hold a virtual public information meeting during the public review period of the EAW and will notify surrounding residences. The process for reviewing and providing comments on the EAW will be explained at that meeting to facilitate participation and the process of providing public comment by potentially affected groups.

The permitting process is a public and transparent process and includes opportunities for public input and comment at both the City and State level. In addition to the EAW public comment period, opportunities for participation include formal public hearings for approval of a City Conditional Use Permit, and public comment period for the MPCA Air permit.

Further, Epitome developed a public outreach program to further expand opportunities for public input and comment. Epitome has adopted a policy of public engagement since initial introduction to the City in 2019. Public outreach has included presentations to the City Council, articles in the local newspaper, airtime on the local radio station (KROX) including online website stories, as well as a number of local public meetings including a neighborhood meeting hosted by the City Council. Epitome provides a Project update to the City Council on a quarterly basis. Additional public meetings will be held associated with the environmental review process and

the Conditional Use permitting process described above. Attachment 1 lists public outreach conducted to date.

c. Identify measures incorporated into the proposed project to mitigate any potential incompatibility as discussed in Item 9b above.

In accordance with the Crookston Code, the Council may require screening and fencing along lot lines adjacent to residential districts. The Project includes a combination of screening berm and evergreen trees along the northeast corner of the Project that adjoins the residential district, which will serve to screen the Project and railyard from the end of the residential zoning district. Discussion of measures to mitigate potential land use conflicts between the Project and adjacent residential land uses are in subsequent sections of this EAW.

Epitome has promoted collaboration and engagement with community members through a number of public meetings and open houses. The local permitting process will require a public hearing providing nearby residents the opportunity to participate in the decision-making process.

Epitome will provide additional job opportunities for the local communities with an estimated creation of 50-55 full time jobs. Economic impacts will extend to the surrounding soybean producers in the Crookston region by providing certainty and creating new markets for soybeans.

10. Geology, soils and topography/land forms:

a. Geology - Describe the geology underlying the project area and identify and map any susceptible geologic features such as sinkholes, shallow limestone formations, unconfined/shallow aquifers, or karst conditions. Discuss any limitations of these features for the project and any effects the project could have on these features. Identify any project designs or mitigation measures to address effects to geologic features.

The Project is in an area where the quaternary deposits are mapped as ancient alluvium and overbank sediment. These deposits are composed of sand, silt, and clay that are commonly more than three feet thick. Deposition of these soils was on the floodplain of ancient rivers and on the Glacial Lake Agassiz plain.[1] Beneath the lake, deposits are glacial sediments that extend down to the bedrock. Bedrock is approximately 220-225 feet below the ground surface. The bedrock subcrop is mapped as mafic to intermediate volcanic rocks.[2] The Project will not affect geologic features. There are no susceptible geologic features, such as sinkholes, shallow limestone formations, unconfined shallow aquifers, or karst conditions on the Project.

b. Soils and topography - Describe the soils on the site, giving NRCS (SCS) classifications and descriptions, including limitations of soils. Describe topography, any special site conditions relating to erosion potential, soil stability or other soils limitations, such as steep slopes, highly permeable soils. Provide estimated volume and acreage of soil excavation and/or

[1]Kenneth L. Harris 2006 Miscellaneous Map Series Map M-173 Plate 2 —Quaternary Lithostratigraphic Map, Crookston Quadrangle

[2] Miscellaneous Map Series Map M-80 Bedrock Geology, northwestern Minnesota

grading. Discuss impacts from project activities (distinguish between construction and operational activities) related to soils and topography. Identify measures during and after project construction to address soil limitations including stabilization, soil corrections or other measures. Erosion/sedimentation control related to stormwater runoff should be addressed in response to Item 11.b.ii.

Soils: According to the NRCS Web Soil Survey, the Project soils consist of silty loams, silty clay, clay loams, and silty clay loams. Two main soil types make up the Project soils. These are the Bearden-Fargo complex, composed of silty clay and silty clay loam and the Colvin-Perella silty clay loam. These lake deposit silts and clays have a Hydrologic Soil Group (HSG) rating of C and C/D, indicating somewhat poorly drained to poorly drained soils. The NRCS maps both soil types as Prime Farmland if Drained.

The soils on the Project site do not have a high erosion potential or soil stability limitations, such as steep slopes. The soils are not highly permeable. The NRCS Soil Map and Report is included as Attachment 2. Table 4, NRCS Soil Types, lists the relative occurrence of the different soil types across the Project site.

Table 4: NRCS Soil Types

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
I627A	Bearden-Fargo complex, 0 to 2 percent slopes	44.9	74.8%
I666A	Colvin-Perella silty clay loams, 0 to 1 percent slopes	14.9	24.8%
I903A	Urban Land-Aquolls complex, 0 to 2 percent slopes	0.2	0.4%
Totals for Area of Interest		**60**	**100.0%**

Epitome will need to strip topsoil in building areas. Expectation is for topsoil depths to be approximately 1.0-1.2 feet across the Project. Excavations for footings will be required as well as minor site grading to achieve final building pad, road, and rail elevations. Epitome will excavate an estimated 150,000-200,000 cubic yards of material, and 50-55 acres will be disturbed during construction of the Project. Epitome will reuse excavated materials on-site for site grading and screening berms.

Topography: The Project site topography is nearly level throughout the property with elevations ranging from 880 feet above mean sea level (msl) along the eastern portion to 878 feet above msl along the western portion. Figure 2, USGS Quad Map Excerpt, illustrates the general topography of the site and surrounding area.

11. Water resources:

a. Describe surface water and groundwater features on or near the site in a.i. and a.ii. below.

i. Surface water - lakes, streams, wetlands, intermittent channels, and county/judicial ditches. Include any special designations such as public waters, trout stream/lake, wildlife

lakes, migratory waterfowl feeding/resting lake, and outstanding resource value water. Include water quality impairments or special designations listed on the current MPCA 303d Impaired Waters List that are within 1 mile of the project. Include DNR Public Waters Inventory number(s), if any.

Surface water features on the Project itself include two small wetland basins. The wetlands were field delineated by Stantec. The Wetland Delineation Report is included as Attachment 3. Classification of the wetlands is actively farmed Seasonally Flooded Basins within the sugar beet field. All portions of the wetlands are currently in a cropping system. Classification of the wetlands is Type 1/PEMA farmed wetlands. Wetland 1 is 0.34 acres and Wetland 2 is 0.11 acres in size. Figure 7, Wetlands, illustrates the location of the wetlands on the Project site. The Minnesota Wetland Conservation Act regulates these wetlands and potentially under the jurisdiction of the US Army Corp of Engineers (ACOE).

There are also stormwater ditches along South Front Street. The wetland delineation identified these as manmade ditches constructed in historically upland areas and not considered regulated wetlands. A ditch (CD 62) along the south side of Ingersoll Ave is part of the Polk County Ditch System. Establishment of the ditch was in 1949 before annexation of property to the south into the City. Polk County has not abandoned the segment of the ditch that runs through the City, so it is still under the Polk County ditch authority.

Surface water features within one mile of the Project include scattered National Wetland Inventory wetlands (NWI), shown on Figure 8. The NWI map identifies a complex of municipal/industrial water features just over one-half mile to the northwest of the Project. In addition to CD 62, there are several other county ditches near the Project. These include CD 78, CD 63, and CD 142.

There are no public waters or special waters on the Project site or immediately adjacent to the Project. The only public water within one mile of the Project site is the Red Lake River, which is approximately one-half mile to the northeast. The reach of the Red Lake River closest to the Project that winds through City is on the MPCA's draft 2020 impaired waters list and is the only impaired water within one mile of the Project. Stormwater from the Project does not enter the Red Lake River within one mile of the Project, but rather enters Burnham Creek three to four 3-4 miles to the west of the Project before eventually converging with the Red Lake River approximately seven miles from the Project. The Red Lake River's impairments are Aquatic Life (Turbidity), and Aquatic Consumption (Mercury in Fish Tissue). Burnham Creek is impaired for Aquatic Life and include Benthic macroinvertebrate bioassessments and Fish Bioassessments. There are several county ditches within one mile of the Project. The Project site drains to the county ditch system and does not drain directly to an impaired water.

ii. Groundwater – aquifers, springs, seeps. Include: 1) depth to groundwater; 2) if project is within a MDH wellhead protection area; 3) identification of any onsite and/or nearby wells, including unique numbers and well logs if available. If there are no wells known on site or nearby, explain the methodology used to determine this.

1) Depth to groundwater is approximately 11.5 feet based on area well logs and soil boring data available for portions of the City owned property just outside of the Project area.

2) The Project is not in a Wellhead Protection Area or a Drinking Water Supply Management Area. Based on information from the City's Wellhead Protection Report,[3] the City obtains its water supply from six wells. City wells 1 (unique no. 147243), 2 (unique no. 191552), 3 (unique no. 191553), and 4 (unique no. 191554) are approximately 12 miles east of the city, at the southwest corner of Red Lake County. City wells 5 (unique no. 685466) and 6 (unique no. 685465) are approximately 19 miles east-southeast of the city.

3) There are no known wells on the Project site. Historical photos show no evidence of past home sites or building activity on-site. The Minnesota well index database identifies some active water supply wells to the northeast, east, and south of the Project. The City's municipal water services provides water to American Crystal Sugar to the northwest of the Project and the area north and northeast of the Project. Table 5 indicates active water supply wells within one-half mile of the Project, unique well number, depth, water level, and aquifer. Nearby wells are all completed below the surficial water table in a buried quaternary aquifer under confined conditions. Figure 9, MN Well Index Wells, illustrates the locations of these wells with respect to the Project. Attachment 4 includes well logs for nearby water supply wells.

Table 5: Water Supply Wells within One-Half Mile of Project

Unique Well Number	Well Owner	Use	Depth of well (feet)	Water Level (feet)	Aquifer
132722	Gary Ricord	Domestic	181	22	Quat. Buried
221051	Great Northern Railroad	Commercial	195	25	Quat. Buried
221634	Elizabeth Hutchins	Domestic	183	9	Quat. Buried
221635	Armour Ag Chemical	Commercial	207	6	Quat Buried
221636	Red River Alfalfa Co.	Commercial	205	Not listed	Quat. Buried

b. Describe effects from project activities on water resources and measures to minimize or mitigate the effects in Item b.i. through Item b.iv. below.

i. Wastewater - For each of the following, describe the sources, quantities and composition of all sanitary, municipal/domestic and industrial wastewater produced or treated at the site.

Epitome will generate wastewater as part of the oil extraction process, and includes industrial wastewater generated from the extraction process and cooling tower blow down.

[3] Leggette, Brashears & Graham, Inc. August 2006. Part I Wellhead Protection and Vulnerability Assessment Report City of Crookston, Polk County, Minnesota.

Epitome anticipates the quantity of wastewater generated from the Project to be 85,000 gallons per day (0.085 mgd) at full production. Wastewater from the Project consists primarily of clear water with some vegetable oil and elevated Biological Oxygen Demand (BOD), Total Suspended Solids (TSS) and Dissolved Solids from the cooling water blowdown.

Epitome will also generate domestic sanitary wastewater from the on-site sanitary facilities. Based on the number of employees projected for the Project and a generation rate of 17.5 gallons per day per employee per eight-hour shift, the Project is expected to generate up to 1,000 gpd of domestic sanitary wastewater.

The Project will generate wastewater from hydrostatic testing of storage tanks.

Epitome will discharge wastewater from all of the above sources to the City's municipal wastewater treatment plant. Epitome has been involved with on-going discussions with the City regarding their ability to accept wastewater generated from the Project. The City has indicated they have sufficient treatment and flowrate capacity to accept the wastewater discharge from the Project.

1) If the wastewater discharge is to a publicly owned treatment facility, identify any pretreatment measures and the ability of the facility to handle the added water and waste loadings, including any effects on, or required expansion of, municipal wastewater infrastructure.

Epitome will discharge wastewater to the City's municipal sewer system and wastewater treatment plant (WWTP) approximately one-mile northwest of the Project. The City's WWTP operates under MPCA's NPDES permit MN0021423. Wastewater from the Project will be pretreated using a skim pit, a concrete baffled structure designed to skim oil from the wastewater. Epitome may perform additional pretreatment to adjust pH, remove solids using flocculants, and reduce BOD and/or TSS as needed to meet the discharge requirements of the City's industrial wastewater discharge permit. See Part 12.b for discussion on disposal of flocculants and solids resulting from pretreatment.

The Project will include Trench drains installed at the rail and truck loading and transfer areas to collect liquid spills (vegetable oil and hexane), which will be piped to collection totes. The containment totes will be approximately 200 gallons in size. If there is a spill, Epitome will exchange the used tote for an empty one and the used tote will be transported to a licensed disposal facility. Epitome will cover transfer areas to prevent stormwater from entering the trench drains.

According to the MPCA's NPDES Fact Sheet for the WWTP's NPDES Permit[4], the City's wastewater treatment plant consists of one main lift station and at least eight minor lift stations. The City's treatment system consists of three individual primary cells that transfer to three secondary cells. Design of the Project is to treat an average wet weather flow of 1.4 million gallons per day (mgd) with a five-day carbonaceous

[4] National Pollutant Discharge Elimination System (NPDES)/ State Disposal System (SDS) Permit Program Fact Sheet Permit Reissuance MN0021423

biochemical oxygen demand concentration of 127 milligrams per liter (mg/L). Current calendar year average daily inflow, based on 2019 permit reissuance fact sheet and information from the City's public works director, is around 60% of the plant capacity with a calendar year average daily flow of 0.80-0.90 mgd. Wet weather flows are higher than wintertime flows. The City's WWTP has the capacity to accept the Project's wastewater flows. The primary cells are large providing extended detention time for the wastewater prior to transfer to the secondary cells.

The City will extend sewer and water through the road alignment as part of the Agriculture Road project. Planned utilities include a 10-inch sanitary sewer line and an 8-inch water line running along the west side of the right of way with services provided to Epitome. The City will be responsible for obtaining required permits associated with extension of their municipal services.

2) If the wastewater discharge is to a subsurface sewage treatment systems (SSTS), describe the system used, the design flow, and suitability of site conditions for such a system.

Not Applicable.

3) If the wastewater discharge is to surface water, identify the wastewater treatment methods and identify discharge points and proposed effluent limitations to mitigate impacts. Discuss any effects to surface or groundwater from wastewater discharges.

Not Applicable.

ii. Stormwater - Describe the quantity and quality of stormwater runoff at the site prior to and post construction. Include the routes and receiving water bodies for runoff from the site (major downstream water bodies as well as the immediate receiving waters). Discuss any environmental effects from stormwater discharges. Describe stormwater pollution prevention plans including temporary and permanent runoff controls and potential BMP site locations to manage or treat stormwater runoff. Identify specific erosion control, sedimentation control or stabilization measures to address soil limitations during and after project construction.

Existing Stormwater: Currently stormwater runs off the nearly flat agricultural fields. Approximately 20 acres drain to the north towards Ingersoll Avenue and approximately 40 acres drain west and southwest off-site. Drainage to the north enters CD 62 approximately 500 feet north of the Project. CD 62 runs along the south side of Ingersoll Avenue and flows westerly approximately four miles until it reaches Burnham Creek. Drainage to the west and southwest flows west to the ditch along the east side of TH 75 and flows south 2,600 feet to CD 63, then flows westerly approximately three miles until it reaches Burnham Creek. Burnham Creek is an impaired water. Section 11.a.i lists the impairments.

Epitome will create new hard surfaces including rooftops, paved roadways, and gravel yard areas. The increased hard surfaces will result in an increase in the rates and volume of runoff from the Project. Permanent stormwater management will be required to reduce the rates of runoff and provide water quality treatment.

During construction, the Project will require an MPCA NPDES Construction Stormwater (CSW) permit. Epitome will also be required to obtain and operate under an MPCA General

Industrial Stormwater Permit. Both permits require Epitome to prepare and implement a site-specific Stormwater Pollution Prevention Plan (SWPPP). Because the Project will disturb over 50 acres and discharges stormwater within one mile of an impaired water, Epitome must submit the SWPPP to the MPCA for review and approval, along with the application for the CSW Permit.

The SWPPP includes several best management practices (BMPs) used during construction to minimize erosion and sedimentation from leaving the Project. Epitome implements these practices to minimize erosion and sedimentation and improve the stormwater quality leaving the Project site. Temporary measures Epitome will implement during construction include:

- Minimizing the disturbed area exposed to precipitation by phasing or sequencing construction and preserving existing vegetation where possible.
- Diverting stormwater away from disturbed or exposed areas when possible.
- Using perimeter controls on downslope portions of the Project.
- Installing temporary soil erosion control BMPs such as mulch or erosion control blankets, and temporary seeding. Erosion Control BMPs will be initiated immediately when construction activity has permanently or temporarily ceased on any portion of the Project site and must be completed within 7 calendar days after the construction activity has ceased on any portion of the Project site.
- Conducting regular site inspections and properly maintaining BMPs.
- Revising the required plan as site conditions change during construction and improve the plans if BMPs are not effectively controlling erosion and sediment.

Because the Project will create more than one-acre of impervious surface, permanent structural BMPs will be required. Preliminary plans include two stormwater management areas one in the northern portion of the Project site to manage stormwater flowing north and one in the southwest corner of the Project to manage stormwater flowing west, generally maintaining the existing stormwater drainage patterns for the Project site. Epitome has not completed design of stormwater management yet but will include infiltration basins designed to treat one inch of runoff from hard surfaces that generate stormwater runoff. Discharge of wastewater or stormwater that comingles with wastewater generated on-site must be to the sanitary sewer system that discharges to the municipal wastewater treatment facility. If the Project includes infiltration basins on-site, the SWPPP will include measures to protect the infiltration basin areas from compaction from equipment or sediment discharges during construction. Alternatively, if on-site soils are not suitable for infiltration (due to high clay content or high-water table) a wet sedimentation basin that provides live storage and water quality treatment in accordance with the CSW permit will be designed and constructed.

Epitome will manage stormwater that collects within the secondary containment areas for the storage tanks in accordance with the PPP. Removal of accumulated stormwater will be on a regular basis to maintain the storage capacity of the secondary containment system. Accumulated stormwater can only be released from the containment area after it has been inspected and determined to be uncontaminated by a visual check for sheen, floating debris, odors, unusual color, cloudiness, or other evidence of contamination. Documentation and recording of the inspections and releases will be in the facilities PPP.

Epitome will release clean stormwater to an on-site stormwater pond. Epitome will pump stormwater found to be contaminated and not suitable for release to the skim tank or a tote for transport to a licensed disposal facility.

Design of the Project drainage will prevent comingling of wastewater with stormwater. The truck and rail loading areas will be covered with a roof and the floor of the load out area beneath the will be sloped to a trench drain serving these areas. The roof will keep precipitation from entering the loadout area. The exterior grading will be sloped away from the loadout areas. Precipitation falling on the roof will drain away from the loadout areas to prevent stormwater from entering the loadout areas and draining towards the trench drains. Covering the loadouts and site grading will prevent comingling of wastewater and stormwater. Epitome will utilize a skim tank to pretreat wastewater and remove oils prior to discharge to the City's WWTP. Depending upon final design, oil/water separators may be associated with some of the floor drains within various production buildings.

iii. Water appropriation - Describe if the project proposes to appropriate surface or groundwater (including dewatering). Describe the source, quantity, duration, use and purpose of the water use and if a DNR water appropriation permit is required. Describe any well abandonment. If connecting to an existing municipal water supply, identify the wells to be used as a water source and any effects on, or required expansion of, municipal water infrastructure. Discuss environmental effects from water appropriation, including an assessment of the water resources available for appropriation. Identify any measures to avoid, minimize, or mitigate environmental effects from the water appropriation.

Epitome will utilize approximately 250,000 gallons per day (gpd) of water to process the soybeans. The Project uses most of this water to generate steam used in the oil extraction process and for make-up water for the evaporative losses associated with the cooling towers. Epitome plans to use all excess process water from American Crystal Sugar, which generates a potential water source as part of their sugar beet processing, and from the City's greywater ponds for all Project process water needs.

Epitome also needs an estimated 3,600 gpd (1.3 mgy) of potable water to serve the Project. The City will provide potable water. The City of Crookston's municipal water supply operates under two water appropriations permits 77-1760 and 2004-1100 with a combined water appropriation of 940 mgy. The most recent water use data available from the MDNR [5] indicates that the City's 2018 consumption was 341.7 mgy. An April 21, 2021, memo from the MDNR with comments on the City of Crookston's wellhead Protection Plan, Part II, indicates that the DNR has water use records since 1985 with the highest groundwater use of 411.8 mgy reported by the City in 1985. The memo also indicates that since 2011, the City has used an average of 323.7 mgy. Based on the 2018 water use numbers, with Epitome's potable water supply needs of an anticipated 1.3 mgy coming from the City's municipal water supply, it will bring the total usage to approximately 343.0 mgy. Adding Epitome's

[5] Water Use data 1988-2018 retrieved on-line at: https://www.dnr.state.mn.us/waters/watermgmt_section/appropriations/wateruse.html updated August 19, 2019.

potable water use to the City's historic high of 411.8 mgy would increase use to 413.10 mgy, below the current appropriation limit of 940 mgy.

Epitome will hydrostatically test tanks before placing them into service. Water for the hydrostatic test will come from with the City's municipal water supply or greywater from American Crystal Sugar's water treatment plant. A Minnesota DNR water appropriations permit is not required for use or reuse of water already authorized by a permit.

Epitome will not require a water appropriation permit from the DNR to operate however, it is possible that construction dewatering will be required at the Project site to facilitate construction of footings and utilities and a MDNR Temporary Projects General Permit 1997-2005 will be required if construction dewatering exceeds 10,000 gallons per day. The General permit authorizes temporary water appropriations for construction dewatering subject to the following criteria:

- Projects must have a minimal potential for causing adverse environmental impacts,
- Water appropriations cannot exceed 50 million gallons per year;
- Water appropriations must be completed within one year from the start of pumping;
- Prior authorization to use General Permit 1997-0005 must be obtained by applying using the MPARS -MNDNR Permitting and Reporting System; and
- Records of monthly water appropriation volumes must be maintained and submitted to the Department on or before February 15th of the year following water use using the MPARS -MNDNR Permitting and Reporting System.

iv. Surface Waters

a) Wetlands - Describe any anticipated physical effects or alterations to wetland features such as draining, filling, permanent inundation, dredging and vegetative removal. Discuss direct and indirect environmental effects from physical modification of wetlands, including the anticipated effects that any proposed wetland alterations may have to the host watershed. Identify measures to avoid (e.g., available alternatives that were considered), minimize, or mitigate environmental effects to wetlands. Discuss whether any required compensatory wetland mitigation for unavoidable wetland impacts will occur in the same minor or major watershed, and identify those probable locations.

The wetland delineation identified two wetland basins totaling 0.45 acres. Epitome cannot avoid these wetland basins. A wetland replacement application will be prepared and submitted to the LGU for the Wetland Conservation Act (WCA). West Polk SWCD and the Army Corps of Engineers.

The wetland delineation identified manmade wetland ditches constructed in historically upland areas along South Front Street. The LGU will decide as to whether or not these ditches are incidental and not regulated. The Army Corps of Engineers will make a similar jurisdictional determination regarding the ditches. If the ditches are WCA regulated, or ACOE jurisdictional Epitome will need to obtain a WCA wetland replacement application/ACOE permit. Some of the delineated area of the manmade ditches indicated in Table 6 include portions of the ditch that extend off site into City right of way along South Front Street.

Table 6: Summary of Wetland Features

Feature Name	Classification	Size (acres)	Notes
Wetland 1	Type 1/PEMAf	0.34	Farm Wetland
Wetland 2	Type 1/PEMAf	0.11	Farm Wetland
TOTAL WETLAND AREA		0.45	
Ditch Wetland 1	Type 2/PEM1C	0.08	Manmade Ditch
Ditch Wetland 2	Type 2/PEM1C	0.07	Manmade Ditch
Ditch Wetland 3	Type 2/PEM1C	0.16	Manmade Ditch
Ditch Wetland 4	Type 2/PEM1C	0.72	Manmade Ditch
TOTAL DITCH IMPACT		1.03	

b) Other surface waters- Describe any anticipated physical effects or alterations to surface water features (lakes, streams, ponds, intermittent channels, county/judicial ditches) such as draining, filling, permanent inundation, dredging, diking, stream diversion, impoundment, aquatic plant removal and riparian alteration. Discuss direct and indirect environmental effects from physical modification of water features. Identify measures to avoid, minimize, or mitigate environmental effects to surface water features, including in-water Best Management Practices that are proposed to avoid or minimize turbidity/sedimentation while physically altering the water features. Discuss how the project will change the number or type of watercraft on any water body, including current and projected watercraft usage.

No alterations to other surface waters are proposed.

12. Contamination/Hazardous Materials/Wastes:

a. Pre-project site conditions - Describe existing contamination or potential environmental hazards on or in close proximity to the project site such as soil or ground water contamination, abandoned dumps, closed landfills, existing or abandoned storage tanks, and hazardous liquid or gas pipelines. Discuss any potential environmental effects from pre-project site conditions that would be caused or exacerbated by project construction and operation. Identify measures to avoid, minimize or mitigate adverse effects from existing contamination or potential environmental hazards. Include development of a Contingency Plan or Response Action Plan.

There are no known existing contamination or potential environmental hazards on the Project site itself. MPCA's What's in My Neighborhood[6] database indicates that there was a reported leak site in 1991 east of the Project at the JR Simplot property where Fuel oil 1 and 2 leaked into

[6] Available at: https://mpca.maps.arcgis.com/apps/webappviewer/index.html?id=9d45793c75644e05bac197525f633f87

the soil. They excavated 500 cubic yards of soil. Closure of the site was in 1998. Completion of a vapor assessment was in 2018. Another reported leak site was at the Randt Used Oil Storage Facility northeast of the Project. Detection of the leak was in 2003 and the site closed in 2004. There are registered existing storage tanks in the surrounding area listed as containing diesel fuel, asphalt and asphaltic blends, and waste oil. Epitome does not anticipate construction or operation of the Project to cause or exacerbate pre-Project conditions.

b. Project related generation/storage of solid wastes - Describe solid wastes generated/stored during construction and/or operation of the project. Indicate method of disposal. Discuss potential environmental effects from solid waste handling, storage and disposal. Identify measures to avoid, minimize or mitigate adverse effects from the generation/storage of solid waste including source reduction and recycling.

Epitome will generate general construction debris. Construction debris will be managed using covered roll-off boxes picked up as needed by a licensed hauler and transported to a solid waste facility for recycling or disposal.

Soybean meal and soybean hulls are by-products produced during the soybean oil extraction process. Epitome will sell soybean meal and hulls as animal feed. Solid wastes generated during the process include 3-5 oil-soaked filter socks per day and sludge from the wastewater pre-treatment process, which Epitome will collect and landfill in accordance with waste disposal requirements. Epitome will generate small quantities of municipal solid waste during operation. Epitome will implement recycling opportunities for office waste, paper, cardboard, aluminum etc. A licensed hauler will collect the solid waste on a regular basis.

Epitome will remove and haul to a licensed waste disposal facility sludge that accumulates at the bottom of the soap stock tank. Epitome does not anticipate sludge to accumulate in the other tanks.

c. Project related use/storage of hazardous materials – Describe chemicals/hazardous materials used/stored during construction and/or operation of the project including method of storage. Indicate the number, location, and size of any above or below ground tanks to store petroleum or other materials. Discuss potential environmental effects from accidental spill or release of hazardous materials. Identify measures to avoid, minimize or mitigate adverse effects from the use/storage of chemicals/hazardous materials including source reduction and recycling. Include development of a spill prevention plan.

Table 7 lists the storage tanks used at the Project to store various substances and product. The table includes the number, contents, capacity, and if the substance is classified as hazardous. The Site Plan, Figure 3, shows the location of the tanks. All tanks will be above ground storage tanks (ASTs). The tanks will be outdoors except for the Sodium Hydroxide and Citric Acid tanks, which will be indoor tanks. Generally, all the tanks larger than 30,000 gallons will be field erected and tanks smaller than 30,000 will be shop fabricated. Depending upon pricing, tanks near the 30,000-gallon capacity may be either field erected or shop fabricated. Epitome will use carbon steel to construct the tanks, except for the sodium hydroxide and citric acid tanks, which will be plastic.

Table 7: Proposed Above Ground Storage Tanks

Contents of tank	Number of tanks	Capacity each tank (Gallons)	Hazard Classification
RBD Oil	4	310,000	Non-Hazardous
Off Spec Oil	2	30,000	Non-Hazardous
Soapstock	2	30,000	Non-Hazardous
Hexane	3	36,500	Hazardous Substance
Crude Oil	3	310,000	Non-Hazardous
Crush shift	1	66,000	Non-Hazardous
Bleaching Feed	1	30,000	Non-Hazardous
Deodorizing Feed	1	60,000	Non-Hazardous
Fatty Acid	1	30,000	Non-Hazardous
Fire/Process Water	1	1,000,000	Non-Hazardous
Sodium Hydroxide	1	13,000	Hazardous Substance
Citric Acid	1	13,000	Hazardous Substance

Note: Final Project design may result in modification to tank sizes and locations.

Small quantities of water treatment chemicals will also be stored on-site. Epitome will use railcars to store crude oil and RBD oil as construction of trains to ship to market.

Epitome will operate under an Aboveground Storage Tank Major Facility Permit. Vegetable oils, which include soybean oil, are not hazardous materials, but they are subject to state and federal oil pollution control regulations. Epitome will prepare and implement a Federal SPCC Plan that incorporates the requirements of the State Spill Response Plan. The purpose of the SPCC Plan is to help prevent the discharge of oil from non-transportation related facilities into adjacent surface waters or groundwater. The SPCC Plan will outline measures adopted at the Project to respond effectively and reliably to worst-case discharges and include best management practices, training, inspections, and emergency response actions. The AST Major Facility Permit and SPCC Plan will establish a routine inspection and testing schedule for the tanks and piping which will include frequent inspection of the outside of the tanks for signs of deterioration, discharges, or accumulation of oil inside diked areas. Epitome will maintain records of inspections and tests. The AST Major Facility Permit and SPCC will establish the frequency and type of integrity testing and takes into consideration the size, configuration, and tank designs.

Secondary containment requirements for the crude oil and RBD oil tanks is met by providing a secondary containment dike with a compacted clay liner using native or amended soils meeting the permeability requirements indicated in Table 8.[7] Geotechnical testing will define the depth to water table and ultimately guide the secondary containment design specifications.

[7] According to the MPCA's Guidance "Secondary Containment for Aboveground Storage Tanks #4.01 December 2008", Class B substances include crude oil, diesel, kerosene, jet fuel, fuel oil types one through four, waste oils, and mixtures or blends of these with Type C substances. Type C substances include asphalt cement, roofing flux, fuel oil types 5 and 6, and other regulated substances which are not petroleum based and not hazardous materials.

Table 8: Permeability rates to water for secondary containment areas made of native or amended soils (pre-November 2, 2008, tanks only)

Substance Classification	If ground water or bedrock is < 10 feet from grade or AST is within 100 feet of Class 2 water	If ground water or bedrock is ≥ 10 feet from grade or AST is within 100 feet of Class 2 water
Type A	Minimum of three feet of soil at 1×10^{-5} cm/sec	Minimum of three feet of soil at 1×10^{-4} cm/sec
Type B	Minimum of three feet of soil at 1×10^{-4} cm/sec	Minimum of three feet of soil at 1×10^{-3} cm/sec
Type C	Minimum of three feet of soil at 1×10^{-3} cm/sec	No minimum permeability standard

Secondary containment of the Offspec Oil, Soap stock, Hexane, Bleaching Feed, Deodorizing Feed, Fatty Acid, Sodium Hydroxide, and citric acid will be concrete. Firewater tanks do not require secondary containment.

Epitome will size secondary containment to accommodate a failure of the largest tank in the containment area plus additional volume to accommodate precipitation. Additional volume to accommodate precipitation will be 110% of the volume of the largest tank, or the volume necessary to contain the volume of the largest tank plus precipitation from a 25 year, 24-hour event, whichever is greater.

The tanks will have high-level instrumentation to monitor volume. The hexane tanks will have automatic shutoff. Control of emergency shutoff will be electronic at the manned control room where there will be safety locks integrated into the control system to enable plant shut down.

The tanks will not have passive venting. There will not be a vapor recovery system or a vapor combustion system. Hexane will run through a closed loop system. Project process piping will be above ground. Trench drains and associated piping, stormwater, water main, sanitary sewer, and natural gas piping will be below ground.

Secondary containment and spill response provisions are required in loading and transfer areas and apply to railcar storage of soybean oil. The railyard will utilize track pans and drainage systems to convey a potential spill to a secondary containment area sized to accommodate the volume of a single tank car plus additional volume to accommodate precipitation.

The fire/process water tank will be heated in the winter with an electric submersible heater, which will not produce emissions.

Epitome will have 24/7 security including camera surveillance. Epitome will fence the Project except along the railyard and railroad right-of-way.

d. Project related generation/storage of hazardous wastes - Describe hazardous wastes generated/stored during construction and/or operation of the project. Indicate method of disposal. Discuss potential environmental effects from hazardous waste handling, storage, and disposal. Identify measures to avoid, minimize or mitigate adverse effects from the generation/storage of hazardous waste including source reduction and recycling.

Hexane is the solvent used in the extraction process. The solvent is evaporated from both the solvent/oil mixture and the soybean flakes using steam. Epitome will recover the evaporated solvent for reuse in the process and a mineral oil absorber is used to recover and reuse hexane from the extractor. This closed loop system recycles hexane and does not generate a hazardous waste.

Epitome does not anticipate generating hazardous wastes. However, they will obtain a hazardous waste generator's license, if necessary, based on the actual materials they use. Epitome will collect and recycle waste lubricating oils generated.

13. Fish, wildlife, plant communities, and sensitive ecological resources (rare features):

a. Describe fish and wildlife resources as well as habitats and vegetation on or near the site.

There are no known fish or wildlife resources, or habitats on or near the Project. Current vegetation at the Project site is row crops with limited value as wildlife habitat.

b. Describe rare features such as state-listed (endangered, threatened or special concern) species, native plant communities, Minnesota County Biological Survey Sites of Biodiversity Significance, and other sensitive ecological resources on or within close proximity to the site. Provide the license agreement number (LA-____) and/or correspondence number (ERDB-20200247) from which the data were obtained and attach the Natural Heritage letter from the DNR. Indicate if any additional habitat or species survey work has been conducted within the site and describe the results.

There are no known rare features on or within proximity to the Project. The Minnesota Department of Natural Resources queried its' Natural Heritage Information database and identified one state listed threatened species in the Red Lake River, over one-half mile from the Project as indicated in Table 9. Other state listed mussels, fish, and amphibians have been documented within the Red Lake River. A copy of the review letter is included as Attachment 5.

Table 9: Minnesota State Listed Species within one-mile of Project

Rare Species	State Listing
Fluted Shell (Lasmigona costata)	Threatened Mussel Species

c. Discuss how the identified fish, wildlife, plant communities, rare features and ecosystems may be affected by the project. Include a discussion on introduction and spread of invasive species from the project construction and operation. Separately discuss effects to known threatened and endangered species.

Epitome does not anticipate disturbing the riverbed, changing water flows, or negatively affecting water quality (sedimentation/siltation, nutrient loading, or temperature impacts) of the Red Lake River, therefore negative impacts to mussels or other state listed species in the river are not likely to result from the Project.

d. Identify measures that will be taken to avoid, minimize, or mitigate adverse effects to fish, wildlife, plant communities, and sensitive ecological resources.

Epitome will comply with the MPCA CSW permit requirements with respect to stormwater quality and erosion and sedimentation control. Epitome will conduct water quality testing of stormwater discharges in compliance with the CSW Permit to demonstrate that benchmark

water quality parameters are met or determine if additional BMPs are necessary to protect downstream surface water quality.

14. **Historic properties:**

Describe any historic structures, archeological sites, and/or traditional cultural properties on or in close proximity to the site. Include: 1) historic designations, 2) known artifact areas, and 3) architectural features. Attach letter received from the State Historic Preservation Office (SHPO). Discuss any anticipated effects to historic properties during project construction and operation. Identify measures that will be taken to avoid, minimize, or mitigate adverse effects to historic properties.

A Minnesota State Historic Preservation Office's (SHPO) cultural database search was requested for Section 1, Township 149, Range 47. The results of the search concluded that there are no previously known archaeological sites or historic properties in near the Project. Attachment 6 includes the correspondence from SHPO regarding their data base review from SHPO.

15. **Visual:**

Describe any scenic views or vistas on or near the project site. Describe any project related visual effects such as vapor plumes or glare from intense lights. Discuss the potential visual effects from the project. Identify any measures to avoid, minimize, or mitigate visual effects.

The Project will have the general appearance of other processing facilities and industrial uses in the surrounding area. Heights of processing buildings will reach 90 feet above ground. Bin storage will reach heights of 50-130 feet and various stacks will reach heights up to 170 feet above grade.

Security lighting and lighting of parking and truck staging/transfer areas will be downcast and designed to minimize glare. A plume from the stacks of the cooling towers may be noticeable under certain atmospheric conditions, particularly during cold weather. The prevailing winds across the Project are from the north-northwest to the south southeast based on wind rose data for the Crookston airport. This will carry the water vapor plume away from the residential land uses to the northeast. The stacks will be elevated which will help to quickly dissipate the plume.

The Project will include a screening berm with landscaping along the northeast corner of the Project to provide screening of the railyard and potions of the Project from the residential land uses immediately north of the railyard.

16. **Air:**

a. **Stationary source emissions - Describe the type, sources, quantities and compositions of any emissions from stationary sources such as boilers or exhaust stacks. Include any hazardous air pollutants, criteria pollutants, and any greenhouse gases. Discuss effects to air quality including any sensitive receptors, human health or applicable regulatory criteria. Include a discussion of any methods used assess the project's effect on air quality and the results of that assessment. Identify pollution control equipment and other measures that will be taken to avoid, minimize, or mitigate adverse effects from stationary source emissions.**

Type:

Emissions from the Project include primarily particulate matter (PM), particulate matter less than or equal to 10 microns (PM_{10}), particulate matter less than or equal to 2.5 microns ($PM_{2.5}$), Volatile Organic Compounds (VOC), and the hazardous air pollutant (HAP) n-Hexane. In addition,

emissions from combustion sources also include nitrogen oxides (NOx), sulfur dioxide (SO_2), carbon monoxide (CO), lead (Pb), other HAPs, and greenhouse gases (GHG) expressed as carbon dioxide equivalents (CO_2e).

Sources:
Particulate Matter emissions (includes PM/PM_{10}/$PM_{2.5}$) will result from product receiving, transferring, and storage operations (including outdoor bean storage), as well as preparation processes, hull handling, extraction, handling of meal, and cooling tower drift as described in Section 6. Epitome will receive soybeans via semi-trailer truck and rail. Truck and rail receiving operations will each have a baghouse to control particulate matter. Epitome will entirely enclose the receiving building during unloading operations. The Project will convey soybeans from receiving to the storage bins and from the storage bins to the preparation building. The Project will have four whole bean storage bins equipped with a bin vent filter for particulate matter control. Bean handling from receiving to storage bins will be equipped with one baghouse for particulate control. During the preparation phase the soybeans are, cleaned, conditioned, dehulled, cracked, and rolled flat into "flakes" in the preparation area. Cyclones/baghouses are used as process equipment to recover material as well as control particulate matter from the preparation phase of the process. There are additional baghouses to control some preparation process and meal handling equipment. VOC and n-Hexane emissions will result from the extraction process. Two steam boilers and one natural gas boiler, all-natural gas fired, serve as ancillary equipment with low-NOx burners inherent to the process. NOx control equipment on the two steam boilers will include flue gas recirculation. Other ancillary equipment includes an emergency diesel fire pump, an emergency diesel generator, cooling towers, material storage tanks, and paved roads. Ancillary emissions (from ancillary equipment such as cooling towers, storage tanks, soybean storage piles, and combustion sources of boilers and emergency engines) consist of PM, PM_{10}, $PM_{2.5}$, NOx, SO_2, CO, VOC, GHG, and HAPs. Epitome will pave internal haul roads to reduce fugitive dust emissions from haul traffic.

There are numerous cyclones, bin vent filters and baghouses on the process equipment considered material recovery equipment as they recover a valuable commodity and therefore not considered add-on control equipment. There are also some control processes considered process equipment. Table 10 summarizes these below, in addition to the add-on control equipment associated with processes:

Table 10: Emission sources and associated controls

Process	Control
Receiving and Bean Handling	Add-on Control: Baghouses
Bean Storage Bins	Add-on Control: Bin Vent Filters
Bean Preparation	Material Recovery Equipment: Cyclones and Baghouses
Trash/Pods, Hull Grinding, Hull Pellet Handling/Storage Bins	Add-on Control: Baghouses
Trash/Pods Handling	Material Recovery Equipment: Baghouse
Hull Screening	Material Recovery Equipment: Cyclone Add-on Control: Baghouse
Hull Pellet Cooler	Material Recovery Equipment: Cyclone
Extraction DT/DC Dryer/Cooler Decks	Material Recovery Equipment: Cyclones

Process	Control
Extraction Mineral Oil System, Hexane Storage Tanks	Inherent Process Equipment: Mineral Oil Absorber
Meal Grinding, Meal Handling, Meal Storage Bins, Meal Rail Loadout, Meal/Hull Truck Loadout	Add-on Control: Baghouses
Steam Boilers 1 & 2	Inherent Process Equipment: Low NOx Burners Add-on Control: Flue Gas Recirculation
Deodorizer Boiler	Inherent Process Equipment: Low NOx Burners
Emergency Fire Pump, Emergency Generator	None (engines will meet new source performance standards)
Process materials storage bins (calcium, bleaching earth, filter aid) (insignificant activities)	Material Recovery Equipment: Bin Vent Filters
Process materials receivers (bleaching earth, silica, filter aid) (insignificant activities)	Material Recovery Equipment: Baghouses
Bleaching absorbent filters	Material Recovery Equipment: Cyclones
Process materials and oil storage tanks (insignificant activities)	
Fugitive Extraction Leaks	None (must meet NESHAP solvent loss limit)
Fugitive Paved Roads	Good housekeeping, sweeping with dust suppression
Fugitive Bean Storage Pile	Good housekeeping
Cooling Tower	Inherent Process Equipment: Mist Eliminator

Quantities and Composition:
Epitome will be a new facility permitted as a major source under federal New Source Review (NSR) Prevention of Significant Deterioration (PSD) regulations. As shown in the Table 11, unrestricted potential emissions from the Project are above the PSD major source threshold of 250 tons per year (tpy) for VOCs, PM, PM_{10}, and $PM_{2.5}$. Epitome will be required to utilize Best Available Control Technology (BACT) to control emissions of PM, PM_{10}, $PM_{2.5}$, and VOCs.

Unrestricted potential emissions are less than the 250 tpy threshold for CO, NOx, SO_2, and lead, and controlled emissions for these pollutants are less than the threshold where an Air Quality Analysis is required for each pollutant in a PSD application. GHG expressed as CO_2e are above the PSD significant emission rate (SER) of 75,000 tpy. Epitome is proposing a voluntary synthetic minor limit for CO_2e that will not avoid the need of a Title V (PSD) permit.

Epitome performed potential air emission calculations and associated air dispersion modeling methods and results for the Project as part of the air permit application and EAW process.

Table 11 presents the results including unrestricted potential emissions and controlled emissions with the proposed pollution control equipment. Epitome did not take any operational limits.

Table 11: Summary of Potential Emissions Associated with the Project

Pollutant	Unrestricted Potential Emissions (tpy)	Title V (PSD) Threshold (tpy)	Controlled Potential Emissions (tpy)	PSD Significant Emission Rate (tpy)	Proposed PSD Synthetic Minor Limit (tpy)
PSD Major Source					
PM	3,029	250	113.8	25	--
PM_{10}	1,666	250	101.5	15	--
$PM_{2.5}$	391	250	85.34	10	--
SO_2	0.5	250	0.5	40	--
NO_x	42	250	28	40	--
VOC	517	250	517	40	--
CO	70	250	70	100	--
Lead	4.0 E-04	10	4.0E-04	0.6	--
CO_2e	97,279	100,000	71,250	75,000	71,250
Major HAP Source					
n-Hexane (single (HAP)	329	10	329	--	--
Total HAPs	329	25	329	--	--

Air Dispersion Modeling:

MPCA's EAW air assessment practices require Epitome to conduct refined air dispersion modeling for the Project to assess compliance with the NAAQs for PM_{10}, $PM_{2.5}$, SO_2, NO_2, and CO. Modeling may exclude pollutants emissions if they are below the Significant Impact Level (SIL). SILs are defined concentrations of criteria pollutants in the ambient air that are considered inconsequential in comparison to the NAAQS. Epitome evaluated maximum potential emissions as described above and compared to the SIL. The screening analysis of the maximum potential emissions for CO, NO_2, and SO_2 demonstrate that they are below the SIL (See Table 12).

Table 12: SIL analysis for CO, NO_2, SO_2, PM_{10}, and $PM_{2.5}$.

Pollutant & Avg Period	SIL ($\mu g/m^3$)	Maximum Modeled Concentration ($\mu g/m^3$)	Percent of SIL (%)
1-hour CO	2000	12.77	0.64%
8-hour CO	500	9.21	1.84%
1-hour NO_2	7.52	4.35	57.88%
Annual NO_2	1	0.12	12.48%
1-hour SO_2	7.86	0.09	1.12%
3-hour SO_2	25	0.08	0.32%
24-hour SO_2	5	0.04	0.72%

Annual SO_2	1	0.002	0.25%
24-hour PM_{10}	5	24.16	483.23%
24-hour $PM_{2.5}$	1.2	8.98	748.43%
Annual $PM_{2.5}$	0.3	1.29	428.34%

The screening analysis identified that Project emissions exceed the SIL for PM_{10} and $PM_{2.5}$. Therefore, refined modeling was required to demonstrate that impacts would not exceed the National Ambient Air Quality Standards (NAAQS) and the Minnesota Ambient Air Quality Standards (MAAQS).

Epitome explicitly modeled point sources representing well-defined stacks, volume sources representing the bean pile, fugitive leaks/venting, paved roads, and area sources representing the cooling towers at the Project. A comparison of the modelling results to the NAAQS and the MAAQS are included in Table 13. Modelling results illustrate that the Project emissions demonstrate compliance with ambient air quality standards.

Air dispersion modeling for the Project used AERMOD, a steady-state plume model that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain. AERMOD is the MPCA preferred air dispersion model for use in air assessments in an EAW.

A technical summary of the air dispersion modelling process and results is included as Attachment 7.

Table 13: NAAQS/MAAQS Model Results

Pollutant	Averaging Period	NAAQS Standard ($\mu g/m^3$)	MAAQS Standard ($\mu g/m^3$)	Maximum Modeled Concentration (includes background) ($\mu g/m^3$)	Percent of Standard (%)	
					NAAQS	MAAQS
PM_{10}	24-hr	150	150	83.19	55.46%	55.46%
$PM_{2.5}$	24-hr	35	35	30.69	87.69%	87.67%
	Annual	12	12	10.28	85.67%	85.69%

Air Emission Risk Analysis (AERA)

The MPCA has required an AERA for the Project. The Project uses an AERA to evaluate and quantify potential human risks associated with emissions from the proposed Project. An AERA was prepared in accordance with the MCPA AERA guidance and requirements for qualitative analysis. MPCA approved the AERA on January 7, 2022.

The AERA includes evaluation of n-Hexane, a hazardous air pollutant. Acute (short-term) exposure to hexane may cause dizziness, slight nausea, headache and irritation to the eyes and throat. Chronic (long-term) exposure is associated with numbness in the extremities, muscular

weakness, blurred vision, headache, and fatigue observe.[8] The AERA assesses both the short-term acute inhalation hazard and the long-term chronic acute inhalation cumulative excess cancer risk and hazard.

The AERA analyzed the impact of the proposed Project, describing air toxics emissions from the proposed emission units. The assessment included potential human health impacts from the various processes associated with the Project including both the short-term acute inhalation hazard and the long-term chronic acute inhalation cumulative excess cancer risk and hazard. Criteria pollutants emitted from the combustion of natural gas and HAP (n-Hexane) losses from the extraction processes were included in the assessment.

The results of the AERA indicate that the calculated cumulative excess cancer risks and hazards are below the Minnesota Department of Health (MDH) risk management levels. The Project does not significantly change the rural risk and hazard levels. The acute inhalation hazard was calculated using conservative high-end emission inputs and exposure parameters. The values are comparable to a risk guideline of 1, where estimated risks or hazards above 1 would require further reductions. The acute inhalation hazard was less than 1.0. The chronic multi-pathway hazard analysis was also less than 1.0. The chronic lifetime excess cancer risk estimate for each parameter was less than the MDH threshold of 10E-5, or one in 100,000. The analysis supports that the construction and operation of the Project is not expected to adversely affect human health.

A technical summary of the AERA process and results is included as Attachment 8.

Cumulative Impacts

Epitome identified American Crystal Sugar - Crookston (ACSC), CHS Inc. dba Mid-Valley Coop (CHS), SunOpta Grains & Foods Inc (SunOpta), and Ag Innovation Campus (AIC) as nearby sources that could influence ambient air concentrations near the Project. To account for potential cumulative impacts, ACSC, SunOpta, and AIC were modeled explicitly as nearby sources in the $PM_{2.5}$ analyses for dispersion modeling and the AERA. Epitome modeled ACSC, CHS Inc dba Mid-Valley Coop (CHS), SunOpta, and ACI explicitly as nearby sources for PM_{10}.

b. Vehicle emissions - Describe the effect of the project's traffic generation on air emissions. Discuss the project's vehicle-related emissions effect on air quality. Identify measures (e.g. traffic operational improvements, diesel idling minimization plan) that will be taken to minimize or mitigate vehicle-related emissions.

Epitome anticipates receiving the majority of soybeans and other production materials by truck with some soybeans potentially by rail. Epitome anticipates sending the majority of product (meal, hulls, and oil) by rail with some potentially by truck. An increase in traffic and congestion results in an increase in vehicle emissions. Vehicle emissions can affect air quality by emitting airborne pollutants. Diesel exhaust contains fine particulate matter, ozone forming nitrogen

[8] USEPA hazard Summary retrieved online at: https://www.epa.gov/sites/default/files/2016-09/documents/hexane.pdf

oxides, and HAPs. The Project is not within a maintenance area or non-attainment area for any priority pollutants as regulated and described in NAAQS regulations.

The capacity of the roadway system Epitome will use is sufficient that Epitome does not expect the traffic generated from the Project to create congestion. Multiple site access points further reduce congestion. Epitome does not expect vehicle emissions to cause any significant decrease in air quality. Traffic will generally come from US 75 and from CSAH 9 and avoid local streets adjacent to residential areas or the downtown Crookston area.

c. Dust and odors - Describe sources, characteristics, duration, quantities, and intensity of dust and odors generated during project construction and operation. (Fugitive dust may be discussed under item 16a). Discuss the effect of dust and odors in the vicinity of the project including nearby sensitive receptors and quality of life. Identify measures that will be taken to minimize or mitigate the effects of dust and odors.

Fugitive dust emissions from the Project will come from paved Project roads, bean storage piles, cooling towers and material and process storage tanks. Table 14 lists fugitive dust sources and Best Management Practices (BMPs) that Epitome will use to control fugitive dust. The Project design and layout includes the short length of roads such as the distance from the entrance to the delivery point (e.g., grain receiving location), which will inherently limit the speed of traffic. Epitome does not propose specific speed limits, as the Project design/layout will effectively limit on-site speeds.

A noticeable toasted soybean meal odor can be associated with crushing and extraction plants. There may also be an exhaust smell in the immediate area from idling diesel trucks in the truck staging area. The Project is in an area that is zoned I-1 Heavy Industrial. Surrounding land is zoned Industrial with the exception of single-family residential zoning located adjacent to the northeast corner of the Project. Development of the Project layout has been to maximize the distance between the truck staging area and the residential land uses. The nearby terrain is flat and the area does not appear prone to temperature inversions that could cause odors to settle. Although odors may be present, Epitome does not anticipate a significant impact and the Project is not expected to create odors that will cause adverse impacts to the surrounding facilities. Process buildings are setback from residential land uses and stack heights provide for dispersion.

Table 14: Fugitive dust sources and controls

Process Type	Source Description	Pollutant	Proposed BMP
Fugitive	Paved Roads	PM PM_{10} $PM_{2.5}$	Good housekeeping practices, Vacuum sweeping with water flush, internal company-imposed speed limits
	Bean Storage Pile 1		Good housekeeping practices
	Cooling Tower 1		Mist Eliminator

17. Noise

Describe sources, characteristics, duration, quantities, and intensity of noise generated during project construction and operation. Discuss the effect of noise in the vicinity of the project including 1) existing noise levels/sources in the area, 2) nearby sensitive receptors, 3)

conformance to state noise standards, and 4) quality of life. Identify measures that will be taken to minimize or mitigate the effects of noise.

Existing noise levels at the Project are typical of agricultural lands with occasional farm equipment operating in the fields. Surrounding noise sources include noise associated with the adjacent railroad junction and siding tracks and includes trains travelling on the mainline as well as railcar movement along the siding tracks.

The majority of noise generated by the Project will be from machinery that is within buildings. There may be an emergency generator as well as some smaller mobile equipment (skid steer, loader, etc.) similar to those found in typical agricultural operations that will operate outside. The majority of noise generated will be from trucks and rail cars coming into the Project to load and unload and the movement of railcars within the railyard.

The nearest sensitive receptors are residences along the northern boundary of the Project and residences, including a mobile home park, east of Front Street and the railroad right of way. The truck and rail receiving area is in the southern portion of the Project with the closest residence to the receiving buildings approximately 1200 feet to the northeast of the Project. The railyard including siding tracks will extend to the northern boundary of the Project. The closest residential dwelling is approximately 250 feet from the end of the siding tracks.

Epitome will be subject to the Minnesota State Noise Standards. The basis of the standards established are on preservation of health and welfare and are consistent with speech, sleep, annoyance, and hearing conservation requirements of receptors associated with various land use classifications.

Noise standards vary as to the type of receptors and land uses surrounding the Project. Residential land uses are included in Noise Area Classification 1 (NAC1). Railroad and agricultural related activities are NAC3. NAC1 is subject to the most stringent noise standards and include both a daytime and nighttime standard. Definition of daytime hours is 7:00 a.m. to 10:00 p.m. and nighttime hours 10:00 p.m. to 7:00 a.m. Nighttime standards are more restrictive than daytime standards. Epitome will operate during both daytime and nighttime hours.

There is an L10 and L50 standard for each NAC. The L10 standard means that during a one-hour period of monitoring, noise levels cannot exceed the standard for more than 10 percent of the time (six minutes) and cannot exceed the L50 standard for more than 50 percent of the time (30 minutes). Table 15 lists the State noise standards.

Table 15: Minnesota Noise Standards

NAC	Daytime 7 am - 10 pm		Nighttime 10:00 pm – 7:00 am	
	$L_{10\ (dBA)}$	$L_{50\ (dBA)}$	$L_{10\ (dBA)}$	$L_{50\ (dBA)}$
1	65	60	55	50
2	70	65	70	65
3	80	75	80	75

Estimated noise levels near the truck and rail-receiving buildings is anticipated to be approximately 86 dBA, based on a study of occupational exposures of farm related tasks[9] which included unloading at a grain elevator (86 dBA).

Sound energy dissipates over distance according to the following formula:

$i2/i1=(d1/d2)^2$
$\Delta L=10*\text{Log}(i2/i1)$
where ΔL is the difference in sound levels (L1-L2) in dB (or dBA).
The quotient i2/i1 is the sound intensity ratio.

Assuming that the exposures were 30 feet from the source, an estimated 32.04 dBA reduction in sound energy levels (53.96 dBA) is expected at the closest receptor, 1200 feet from the source. The Project is expected to meet the Daytime standards, but nighttime standards may be exceeded during harvest season when unloading operations are expected to occur at peak levels and sound levels at the receiving buildings will be relatively constant.

Noise from the railyard will typically not be of a continuous nature but rather is expected to occur more intermittently as railcars are moved, coupled, or uncoupled, etc. Although the sounds may be audible, they will be too short to violate the noise standards.

Epitome will implement noise reduction measures. These include internal speed limits*, prohibiting jake braking, internally routing trucks in a circuitous manner, and placing a berm around the northeast corner of the receiving area to deflect and absorb noise from this area. Berms have been shown to provide a reduction of at least 3 dBA and are most effective when placed close to the source. With a berm in place, Epitome expects to meet daytime and nighttime noise standards. If noise does become an issue for adjacent residents, the berm height can be increased providing further noise attenuation. The Project will include a berm at the northern end of the railyard. The berm will wrap around the corner of the property and provide noise attenuation of the intermittent noise sources associated with the railyard and visual screening of the railyard from residences just north of the railyard.

* Internal speed limits are not enforceable by state or local public safety departments. Internal speed limits are part of BMPs that management adopts to control fugitive dust and as implementation of their health and safety programs. It is a BMP similar to good housekeeping practices that allow the company to develop, modify, expand upon to achieve the desired results.

18. Transportation

a. Describe traffic-related aspects of project construction and operation. Include: 1) existing and proposed additional parking spaces, 2) estimated total average daily traffic generated, 3) estimated maximum peak hour traffic generated and time of occurrence, 4) indicate source of

[9] 2013 Humann, M.J., et.al. Task-Based Noise Exposures for Farmers Involved in Grain Production. University of Iowa and University of Kentucky.

trip generation rates used in the estimates, and 5) availability of transit and/or other alternative transportation modes.

1) proposed parking spaces: Epitome will add approximately 50-60 parking spaces to accommodate employees and visitors.

2) estimated total average daily traffic generated: Estimated total average daily traffic generated is 526 trips per day. Average daily trips will be distributed as follows 144 trips inbound bean deliveries from South Front Street, 382 employee, delivery, vendor and empty bean delivery trucks west to Agriculture Road.

3) estimated maximum peak hour traffic generated and time of occurrence: The estimated maximum peak hour traffic generation is 75 trips/hour. Peak hour will occur at a shift change and will depend upon the shift hours.

4) indicate source of trip generation rates used in the estimates: The average trip generation rates are based on the annual volume of beans received, oil, meal, and hulls produced, employee, and vendor trips. The basis of the estimate on the majority of beans, approximately 92.5%, received by truck. During the winter months, Epitome anticipates receiving some beans by rail.

Epitome estimates to generate average daily bean delivery (288 trips), approximately 20% of oil, 32% of meal, and 50% of hulls produced will be shipped by truck (86 trips), and employee and vender trips (152) per day. The basis of the traffic generation figures are on 25 tons/truck load weight.

The peak hour estimates are based on the bean receiving capacity which is limited to 16 trucks per hour or 32 truck trips, employees coming to work and leaving work at a shift change, and 10% of the daily vendor and visitor traffic occurring during peak. The peak hour will occur during a shift change and will depend upon the work schedule adopted by Epitome.

5) availability of transit and/or other alternative transportation modes: The Project will also be served by rail. Epitome will ship the majority of oil and meal and about 50% of the hulls produced by rail. Epitome will fill approximately 27-28 railcars per day with oil, meal and hulls. In addition, during the winter months, Epitome will receive an average of 12 rail cars of beans. As Epitome fills the railcars, the railyard will allow for storage of cars. The railcars will be built into strings within the railyard to join unit trains on the main line.

b. Discuss the effect on traffic congestion on affected roads and describe any traffic improvements necessary. The analysis must discuss the project's impact on the regional transportation system.

An internal management plan will use two access points to disperse traffic generated at the Project. Epitome's main access for receiving beans will be on the southern boundary, off South Front Street. South Front Street is a local road with less than 200 average daily traffic (ADT). The access will require land acquisition or lease agreement with the property to the south. The property is currently vacant and owned by Calumet. The Project will close South Front Street to the north of the S. Front Street entrance with access from the south.

After beans have been unloaded, trucks will continue to the west and exit onto Agriculture Road then north to CSAH 9 (Ingersoll Avenue) an Urban Minor Arterial and then west to US 75. Use of these two access points will be for approximately 70 percent of all traffic generated. Use of the

third access point also off Agriculture Road, but further to the north, will be primarily for employees and trucks hauling oil, meal, or hulls from the Project. Nearly 100% of the trucks will enter the Project from the west of the City and exit to the west and will not travel through the residential area to the east of the Project. Epitome will ship the majority of finished product by rail.

Data from MNDOTs traffic mapping program indicates the following traffic counts: US 75: 2350 ADT (2019 data), CSAH 9 (Ingersoll Avenue west of South Front Street): 960 ADT (2017 data) and S. Front Street east of Project 170 ADT (2017 data). The capacity of the roadway system is adequate.

c. Identify measures that will be taken to minimize or mitigate project related transportation effects.

The three Project access points help to distribute traffic generated by the Project. Access points are along the west and south boundaries of the Project away from the residential district. Development of a railyard and use of rail to ship the majority of product from the Project reduces overall traffic generation from the Project.

Cumulative potential effects: The Ag Innovation Campus is a proposed project planned for construction on approximately five acres just northwest of the Project. The campus will access Agriculture Road from Ingersoll Avenue. Construction of Agriculture Road will be in phases with the initial 825 feet being constructed in conjunction with the construction of the Ag Innovation Campus. Extension of the road will be in conjunction with the construction of the Project. The design of Agriculture Road has been to accommodate traffic from both the Ag Innovation Campus and the Project. With the construction of the new access road, the Project will eliminate potential access conflicts onto Ingersoll with no anticipation of cumulative potential effects.

19. Cumulative potential effects: (Preparers can leave this item blank if cumulative potential effects are addressed under the applicable EAW Items)

The EAW discusses cumulative effects under appropriate sections of the EAW.

a. Describe the geographic scales and timeframes of the project related environmental effects that could combine with other environmental effects resulting in cumulative potential effects.

The Project is in the southern part of the City in an area zoned Industrial. There are existing industries that are in the general vicinity of the Project and impacts are taken under consideration as existing conditions except as indicated specifically within a topic, such as air emissions and American Crystal Sugar - Crookston.

b. Describe any reasonably foreseeable future projects (for which a basis of expectation has been laid) that may interact with environmental effects of the proposed project within the geographic scales and timeframes identified above.

The Ag Innovation Campus serves as a research facility for agricultural innovations, working to foster new and novel products, create jobs, and increase the value of agriculture in the region and state. The campus will include mechanical crush systems for soybeans and will be available for use by universities, commodity organizations and private businesses to specially process their oilseed commodities.

c. Discuss the nature of the cumulative potential effects and summarize any other available information relevant to determining whether there is potential for significant environmental effects due to these cumulative effects.

20. Other potential environmental effects: If the project may cause any additional environmental effects not addressed by items 1 to 19, describe the effects here, discuss the how the environment will be affected, and identify measures that will be taken to minimize and mitigate these effects.

A possible effect of the Project is the attraction of rodents by the storage of soybeans. Epitome will utilize professional rodent control.

Two other potential environmental effect have been identified, Climate Change and Resiliency and GHG Emissions. On September 15, 2021, the Environmental Quality Board approved implementation of a Pilot Program to assess the efficiency and effectiveness of climate information included on the draft revised Environmental Assessment Worksheet (EAW form). The development of this EAW preceded implementation of the Pilot program, but Epitome and MPCA recognize the benefit of addressing these topics. This will allow decision makers, Epitome, and the public to understand how the Project may contribute to, or detract from, achieving progress in meeting state and local GHG reduction goals as well as providing information needed to mitigate climate change.

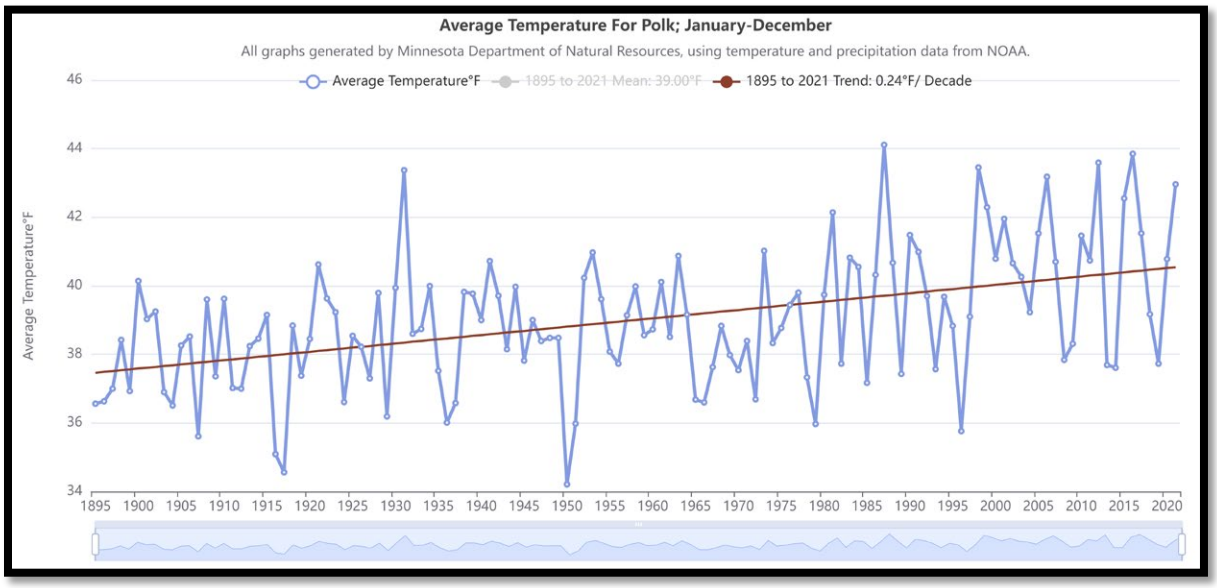
Climate Change and Resiliency

The following information describes the climate trends for Polk County, Minnesota and how climate change is anticipated to affect the Project location during the life of the Project.

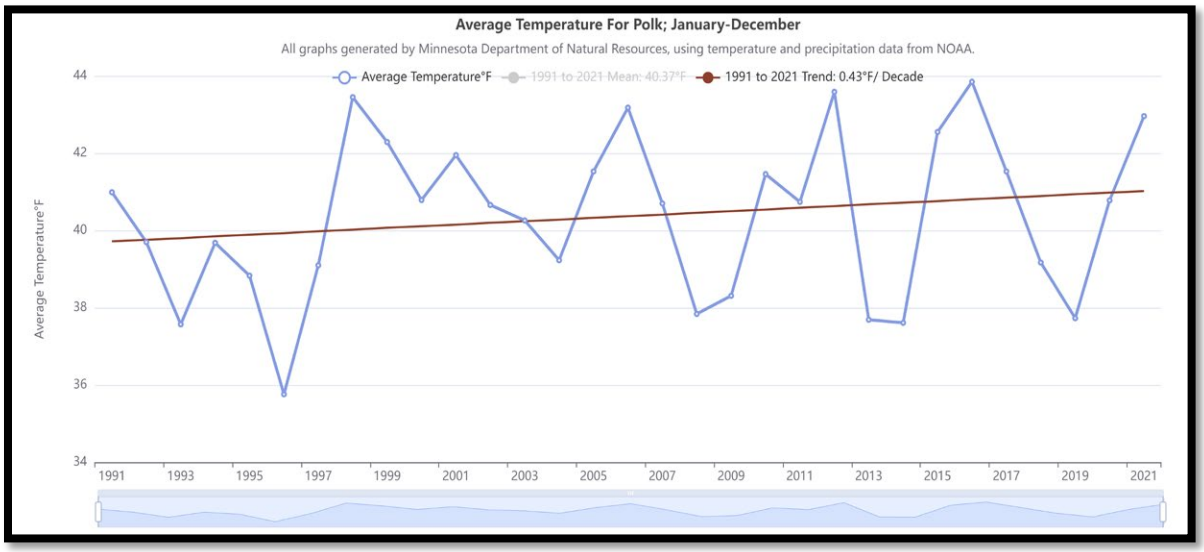
According to information from the MDNR climate explorer website[10], from 1895 to present, Polk County's mean average annual temperature has increased by 0.24° F per decade. Based on the DNR website, current trends are increases in the mean average annual temperature are even greater, with a mean average annual temperature increase of 0.43° F per decade from 1991 to 2021. Based on the DNR website, if current trends continue, it can be expected that the mean average annual temperature will increase 2.15° F in the next 50 years. Graph 1 illustrates the average annual temperature trends since 1895 and Graph 2 illustrates the more recent past 30-year trends in Polk County.

[10] Climate Explorer Map. *Minnesota Climate Explorer* Available at: https://arcgis.dnr.state.mn.us/ewr/climateexplorer/main/historical

Graph 1: Historic Average Annual Temperatures 1895-2021 – Polk County



Graph 2: Past 30- year Average Annual Temperatures 1991-2021 – Polk County

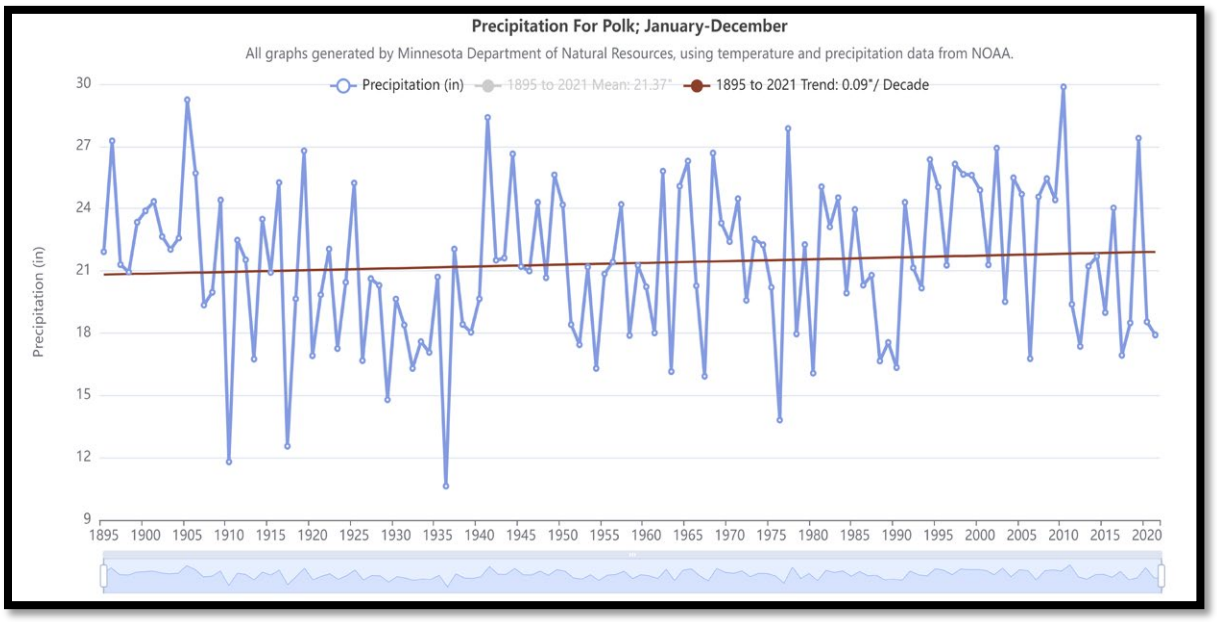


According to information from the MDNR climate explorer website,[11] historical precipitation trends indicate that in Polk County, there has been an increase in average annual precipitation amount of 0.09 inches per decade since the year 1895 with a mean average annual rainfall of 21.37 inches.

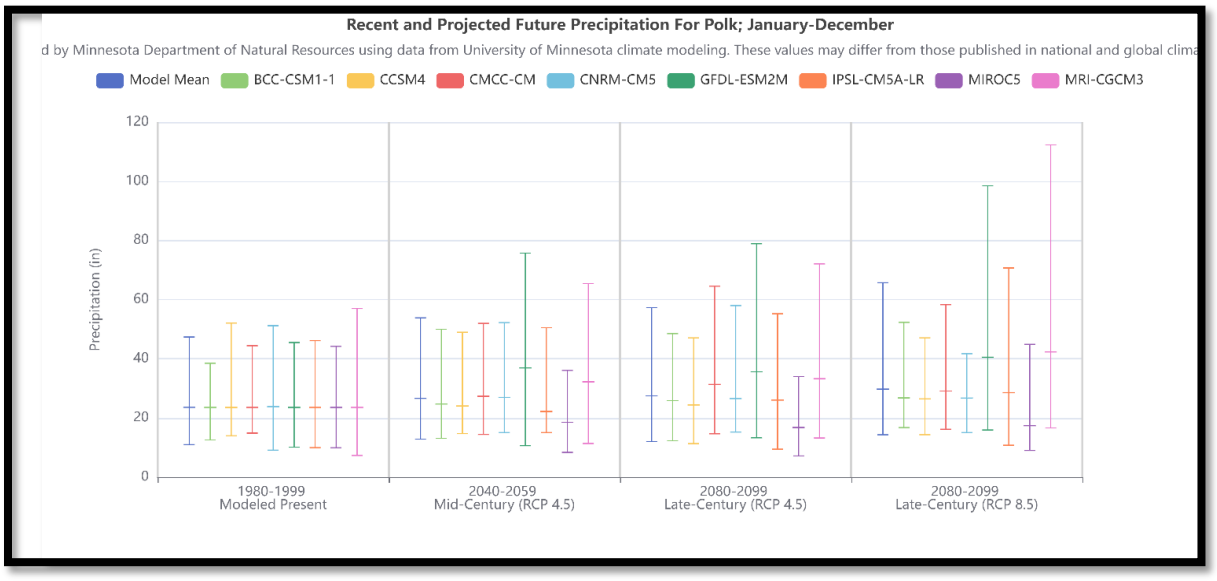
[11] Climate Explorer Map. *Minnesota Climate Explorer* Available at: https://arcgis.dnr.state.mn.us/ewr/climateexplorer/main/historical

Various model projections on the DNR website generally predict an increase in precipitation through 2099 with the model mean increasing from a present day average annual precipitation amount of 23.62 inches per year to 29.73 inches per year by late century. Graph 3 illustrates the Average Annual Precipitation 1895-2021 Polk County and Graph 4 illustrates projected average annual precipitation trends for various models.

Graph 3: Average Annual Precipitation 1895-2021 Polk County

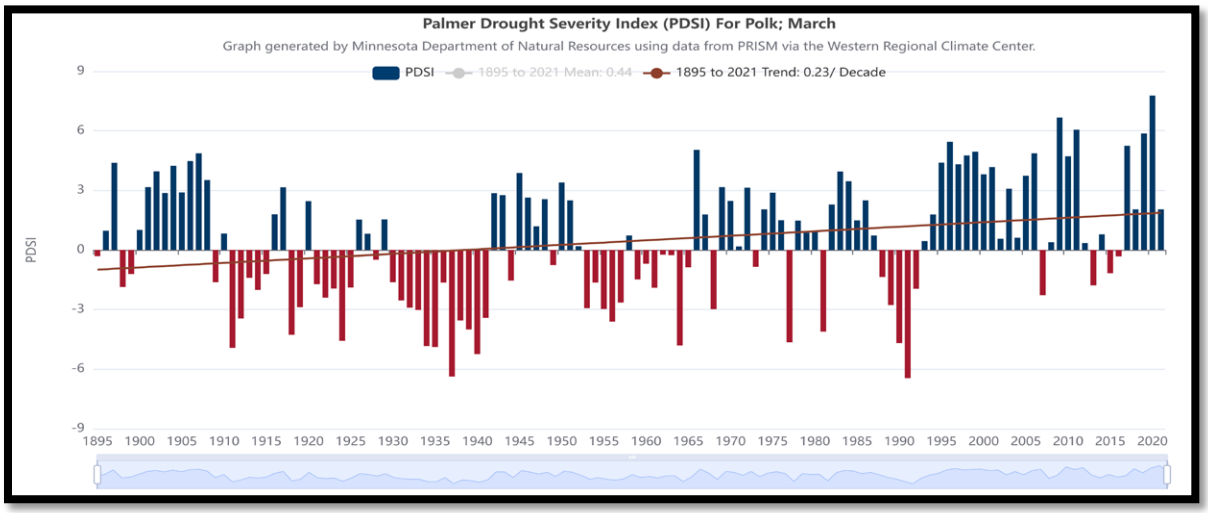


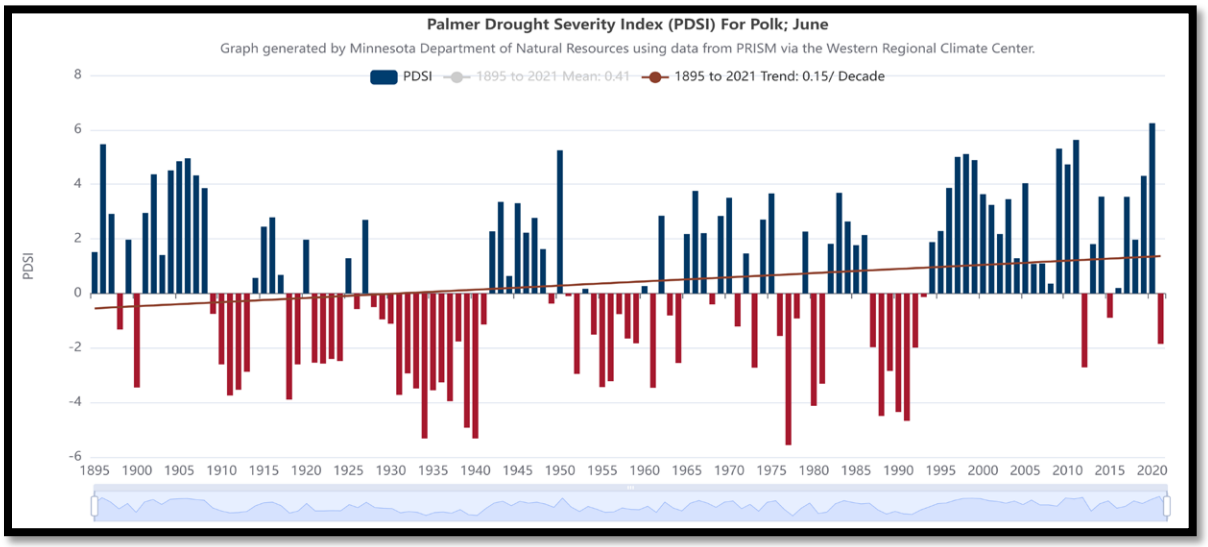
Graph 4: Predicted Future Precipitation Trends Polk County



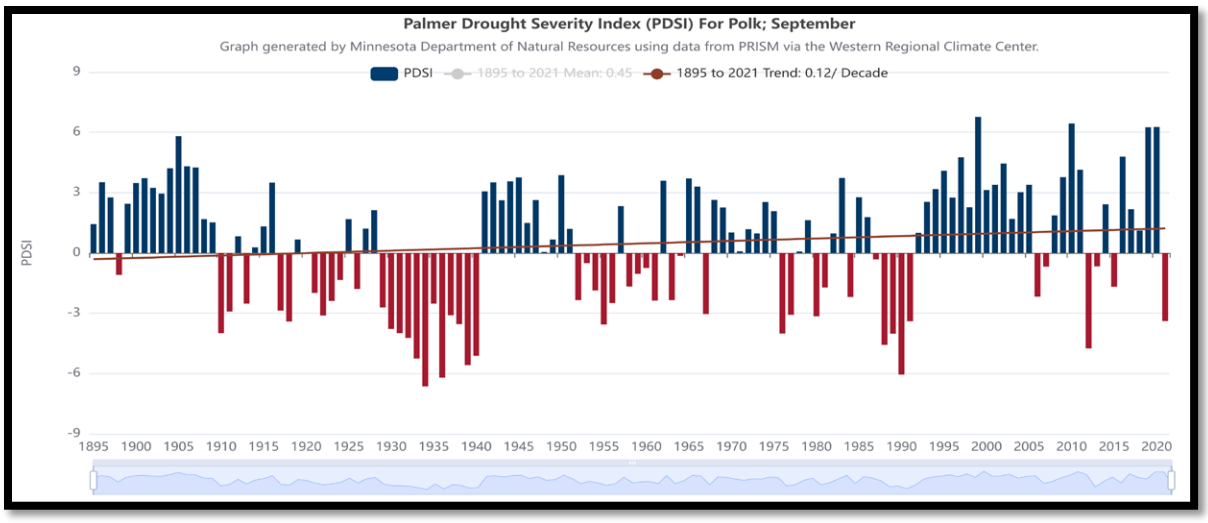
The Palmer Drought Severity Index (PDSI) uses readily available temperature and precipitation data to estimate relative dryness, typically on a scale of 1 to 10. It is a standardized index quantifies long-

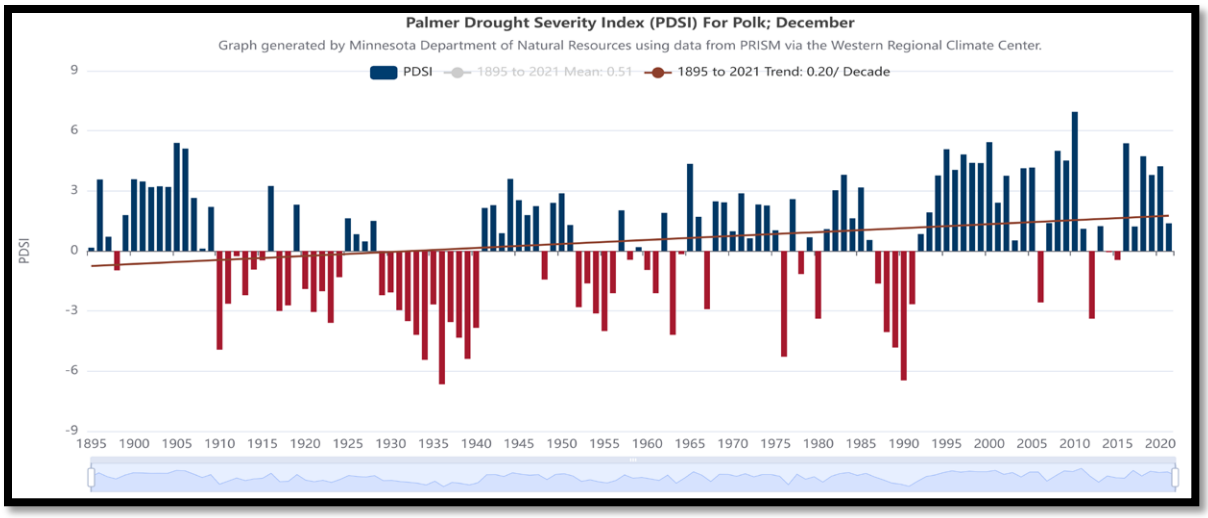
term drought using temperature data and a physical water balance model.[12] Using data March, June, September, and December the PDSI shows increasing values of 0.23, 0.15, 0.12, and 0.20 per decade, indicating wetter conditions for each individual month.





[12] https://climatedataguide.ucar.edu/climate-data/palmer-drought-severity-index-pdsi





The weather is expected to get warmer and wetter in the Project Area in the future. Increased rainfall and the flashier nature of events can result in increased flooding frequency and higher flood stages. An increase in the frequency or extreme rainfall events within the area of the Project is predicted to result in result in minor risk of flooding within the Crookston area.[13]

Project Interaction with Climate Trends

Epitome will convert approximately 60 acres of agricultural land to developed area increasing imperious surfaces. The increased impervious surface along with increases in precipitation and frequency of extreme rainfall events could lead to flooding and contamination of stormwater runoff. The roofing and pavement materials will absorb heat and radiate it for longer periods than agricultural crops.

[13] Flood Factor for zip code 55379. Flood Factor available at: https://floodfactor.com/environmental-changes

Epitome has not yet developed Project grading and stormwater management systems but they will be designed to accommodate higher intensity rainfall events and sufficient freeboard to protect structures that could be damaged by flooding events of increased magnitude.

Epitome will reuse process water from American Crystal Sugar and greywater from the City's wastewater treatment plant, which will decrease discharges into the Red Lake River helping and decrease flooding impacts during higher intensity rainfall events and off set drought impacts during periods of low rainfall.

Greenhouse Gas Emissions (GHG) and Carbon Footprint

The purpose of this greenhouse gas (GHG) emissions section is to discuss generally information on the emissions from the proposed Project that contribute to global climate change.

When released GHGs from their sources, they are trapped in the Earth's atmosphere, act as a layer of insulation that prevents heat from escaping. This is the greenhouse effect, and results in a warming of the planet. Gases that contribute to the greenhouse effect are called GHGs. GHGs are primarily carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), sulfur hexafluoride (SF_6), and two families of gases known as hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs). These gases trap Earth's heat and contribute to climate change. CO_2e is a unit of measurement that standardizes the effects of the different GHGs to that of carbon dioxide.

Quantification of GHG emissions

Categorization of sources of GHG's are as Direct or Indirect emissions. Direct emissions are emissions released directly from properties owned or under the control of the project proposer (Scope 1). Indirect emissions are emissions produced from off plant generation of electricity (Scope 2). Scope 3 emissions including upstream product purchase and delivery of goods and services (bean delivery) downstream product delivery (hulls, mal and oil), and employee commutes, all of which are not included in the analysis. The main sources of emissions are quantified and are listed below.

Scope 1

1. Construction Emissions
2. Stationary combustion (boilers, emergency generators, and fire pump)
3. Mobile sources combustion (on-site mobile equipment owned or controlled by Proposer)
4. Fugitive Sources (A/C and Fire Suppression)

Scope 2

5. Purchased electricity

1. Construction emissions are emissions produced by mobile equipment sources. Epitome estimates construction to take 12 months. Epitome prorates total construction emission to develop a construction emission rate per year over the life of the Project, which is expected to be 50 years. Construction emissions include 50 gasoline passenger cars, 15 off-road diesel construction units, 10 diesel medium-heavy duty trucks, and 10 diesel light-duty trucks. A summary of construction emission sources and emissions is included as Table 16 and calculated with full equations in

Attachment 9. Variables shown in Attachment 9 were put into EPA's SGEC calculator[14] on the "Mobile Sources" tab, and factors chosen for said variables are linked to referenced sources.

Table 16: Construction Emission Estimates

	CO_2e annualized over 50-year life of Project			
Emission Source	CO_2 CO_2e short tons/yr	CH_4 CO_2e short tons/yr	N_2O CO_2e short tons/yr	Total CO_2e short tons/yr
Gasoline- mobile passenger cars and light duty trucks	1.50	0.00	0.01	1.50
Diesel mobile sources - Off Road	58.17	0.13	1.48	59.78
Diesel mobile sources - medium to heavy duty trucks	0.49	0.00	0.00	0.49
Diesel mobile sources - light duty trucks	0.46	0.00	0.00	0.46
			Total	**62.24**

2. The stationary combustion sources will be the most significant source of GHG emissions from the Project. Stationary sources include the natural gas combustion of the three boilers, emergency fire pump, and emergency generator. Epitome is subject to an MPCA air permit and conducted air modelling to determine the Project's potential emissions. As part of the air permit application and air modeling, GHG emissions for combustion sources were calculated. Table 17 summarizes the annual estimated actual CO_2e emissions from stationary sources. Worksheets detailing the calculations are included in Attachment 9. Air modelling protocol and results are included in the air permit application submitted to the MCPA.

Table 17: Stationary Sources:

Source	**CO_2e short tons per year**
Boiler 1	31,716.28
Boiler 2	31,716.28
Boiler 3	3,171.63
Fire pump 1	8.25
Emergency Generator 1	8.25
Total	66,620.69

3. The basis for mobile sources of combustion during Project operations is an estimated diesel fuel consumption of 1,000 gallons per year on vehicles all made in 2022. CO2e emissions were calculated

[14] https://www.epa.gov/climateleadership/simplified-ghg-emissions-calculator

using the EPA's Simplified GHG Emissions Calculator (SGEC).[15] There is an estimated 11.42 CO2e short tons/yr of mobile source emissions from the facility. The worksheet with the calculation is included in Attachment 9. Mobile sources including upstream goods and services (bean delivery (trucks & rail), employee commutes to and from the workplace, and product transport leaving the facility (oil, meal, and hulls) are not included as they are considered a Scope 3 emission.

4. Fugitive Emissions included air conditioning (AC) and fire suppression systems and are summarized in Table 18 below. Worksheets with the calculations are included in Attachment 9. There will be one AC unit serving the Administration building. The calculations prorate replacement and disposal of the unit assuming a 20-year life over the 50-year Project life expectancy. The main fire control for the Project will be a water-based system. Emissions from ten handheld extinguishers throughout the Project were included under fire control.

Table 18: Scope 1 Fugitive Emissions

Type of Emission	Total CO_2e (Short ton/yr)
AC	24.85
Fire Suppression	0.0015
Total	24.85

5. Off-site Electricity

The estimation of off-site electricity generation for the Project is to produce 44,161 short tons CO_2e per year. Off Site electricity generation worksheet is included in Attachment 9

Table 19: Construction and Operations Emission Estimates Summary

Type of Emission	**Total CO_2e Emissions (short tons per year)**
Scope 1 Construction Sources	62.24
Scope 1: Mobile Equipment Combustion	11.42
Scope 1: Stationary Equipment Combustion	66,620.69
Scope 2: Fugitive Emissions	24.85
Scope 2: Off-site Electricity	48,679.44
TOTAL	**115,398.64**

[15] U.S. EPA Center for Corporate Climate Leadership EPA Simplified GHG Emissions Calculator. Version 7 June 2021.

Mitigation:

The Project incorporates several features into the design to reduce GHG emissions and the Project's carbon footprint. These are as follows:

1. Epitome will produce feedstock for biodiesel production. Biodiesel is cleaner burning fuel compared to diesel, with a lower GHG emission factor per gallon of fuel combusted. According to the Minnesota Department of Agriculture 2022 Annual Report on Biodiesel[16], "biodiesel is considered an advanced biofuel as well as 'biomass-based diesel' in the Renewable Fuel Standards classification of renewable fuels. Advanced biofuels under that classification must demonstrate at least a 50% greenhouse gas benefit over the fossil fuel that it replaces." Biodiesel produced 5.54 units of energy for every unit of fossil energy consumed over its life cycle[13]. According to the EPA's GHG Emissions Calculator, emissions from the biomass portion of the fuel are considered a net zero emission source[12]. The emission factor for regular diesel fuel is 10.21 kg CO_2/gallon and for biodiesel is 9.45 kgCO2/gallon in the SEGC. This is a reduction of approximately 7%. Biodiesel and biodiesel/diesel blends reduce almost all forms of air pollution compared to petroleum diesel. Biodiesel also reduces greenhouse gas emissions since it is a replacement for a fossil fuel.[13] Producing feedstock for biodiesel production will facilitate the distribution and use of this cleaner burning fuel and will help slow the rate of GHG's in the atmosphere and decrease the rate of global warming.

2. As a supplier selling product into the biodiesel market, Epitome will use biodiesel or renewable fuels in company owned mobile equipment to the extent feasible. An estimated 90% of the diesel fuel used on site will be biodiesel. The calculations above do not include any credit for biodiesel use.

3. Epitome will purchase electricity from Otter Tail Power Company. Otter Tail Power is investing in solar and wind alternative energy resources for their service area. By the end of year 2023, Otter Tail Power Company predicts customers will receive 35% of their energy from renewable resources. This includes 20% from wind energy and 15% solar energy. [17] The calculations above do not consider alternative energy sources.

4. Epitome will investigate the feasibility of installing on site solar to offset purchased electricity.

5. Epitome is researching ways to reuse and recycle water on a community wide basis with ongoing discussions with adjacent industries.

6. Epitome will plant evergreen trees as part of the facility landscaping and screening Plan.

[16] (Agriculture, Minnesota Department of, 2022)
[17] https://www.otpco.com/ways-to-save/renewable-energy-residential/

RGU CERTIFICATION. (The Environmental Quality Board will only accept **SIGNED** Environmental Assessment Worksheets for public notice in the EQB Monitor.)

I hereby certify that:

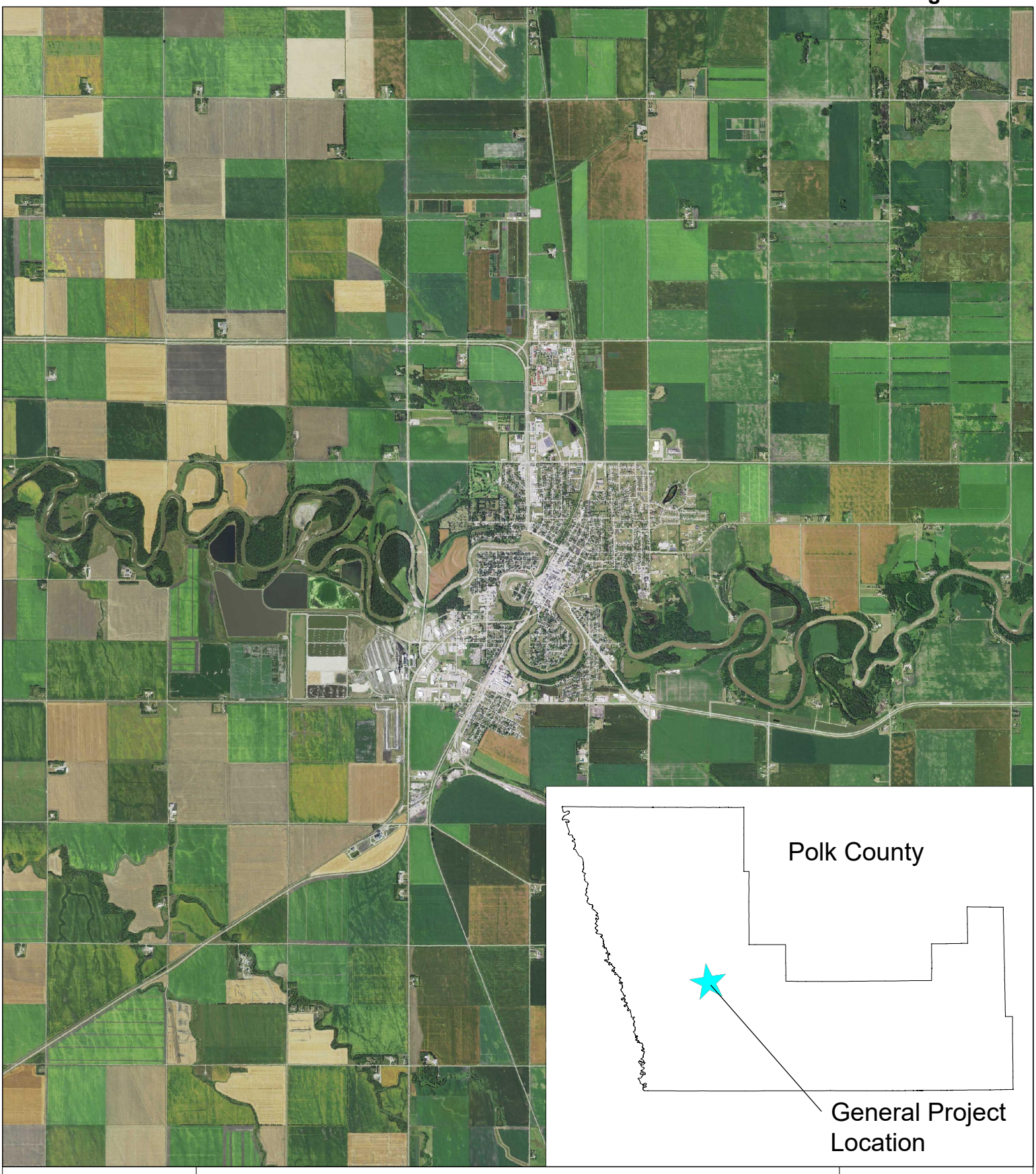
- The information contained in this document is accurate and complete to the best of my knowledge.
- The EAW describes the complete project; there are no other projects, stages or components other than those described in this document, which are related to the project as connected actions or phased actions, as defined at Minnesota Rules, parts 4410.0200, subparts 9c and 60, respectively.
- Copies of this EAW are being sent to the entire EQB distribution list.

Signature Dan R. Card, P.E. Date 07/11/2022

Supervisor
Environmental Review Unit
Title Resource Management and Assistance Division

Figures 1 - 9

Figure 1



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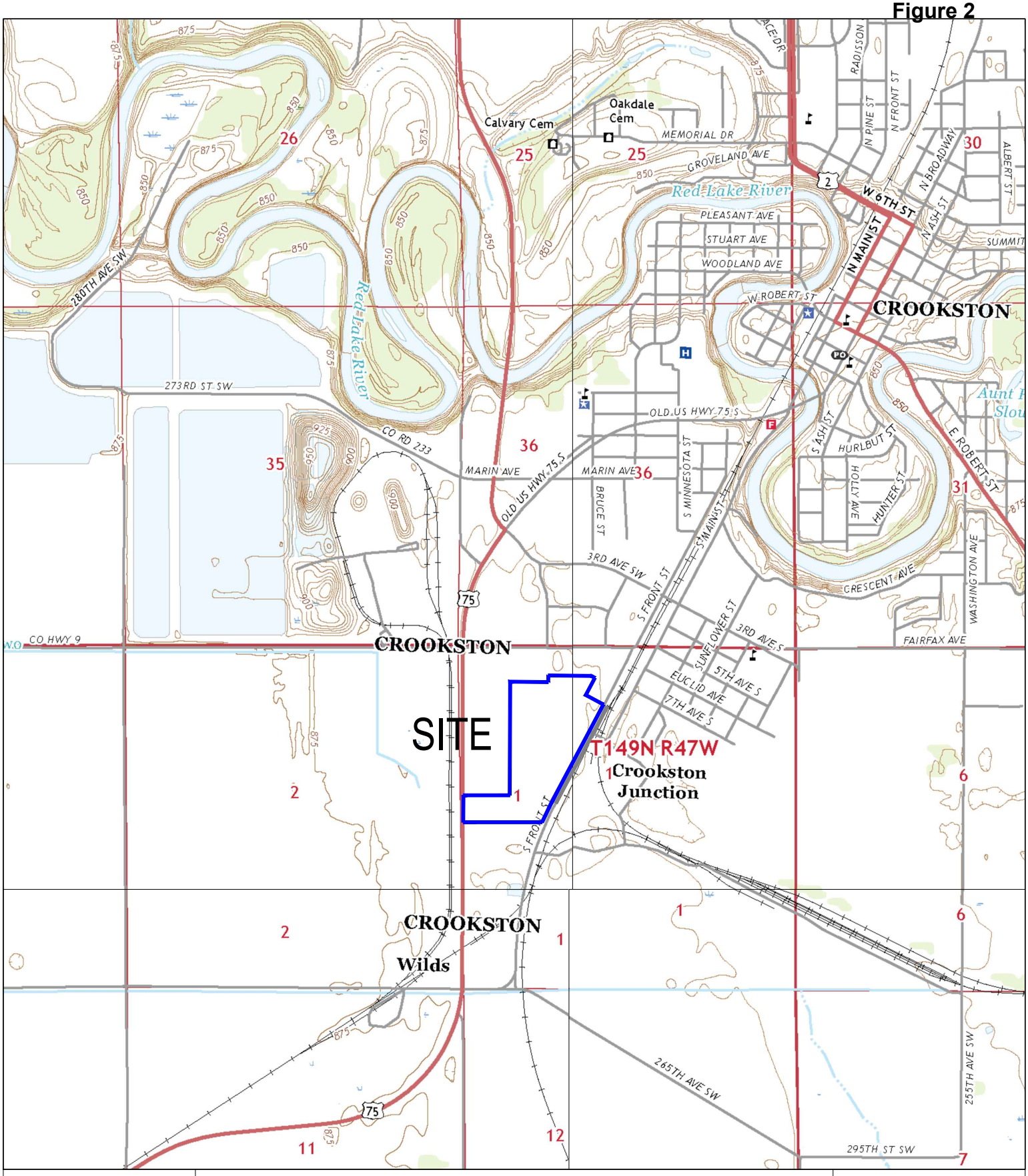
Not to Scale

County Location Map

Epitome Energy
2021 EAW

Sunde Engineering, PLLC.

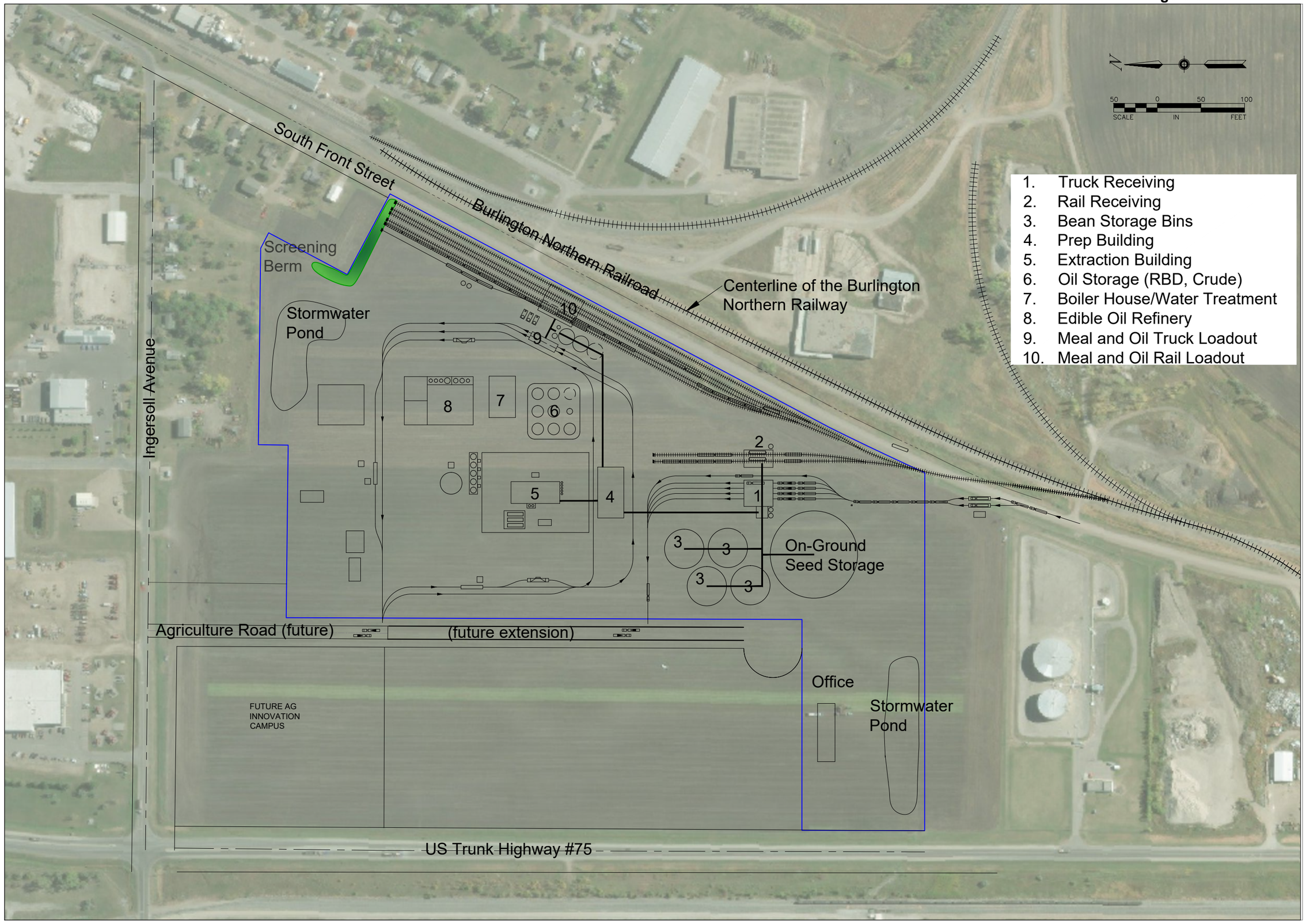
Figure 2



USGS Quadrangle Map Excerpt

Epitome Energy
2021 EAW

Figure 3



Sunde Engineering, PLLC.
CIVIL AND ENVIRONMENTAL ENGINEERING SERVICES
10830 NESBITT AVENUE SOUTH
BLOOMINGTON, MINNESOTA 55437
(952) 881-3344 TELEPHONE
(952) 881-1913 FAX
www.sundecivil.com

Epitome Energy

2021 EAW

DATE	REVISION
5/18/2022	REVISE RAILYARD

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

KIRSTEN PAULY

DATE: 8/25/2021 REG. NO.: 21842

INFORMATION:

PROJECT NO.:

DRAWN BY:

CHECKED BY:

APPROVED BY:

SCALE:

DATE:

DESCRIPTION:

Concept Site Plan

SHEET NO:

Figure 3

XOFX

#PROJECT T.TWP , R.RG , S.SEC DRAWN DRAWING: \\Kirstensoldpc\DWGS\Epitome Energy\2021 EE EAW\Figures\2022-5-18 Revised Figure and PDFs\revised Figure 3 2022-5-18.dwg LAYOUT: P001 General Site Plan

Figure 4

N

0 500 1000

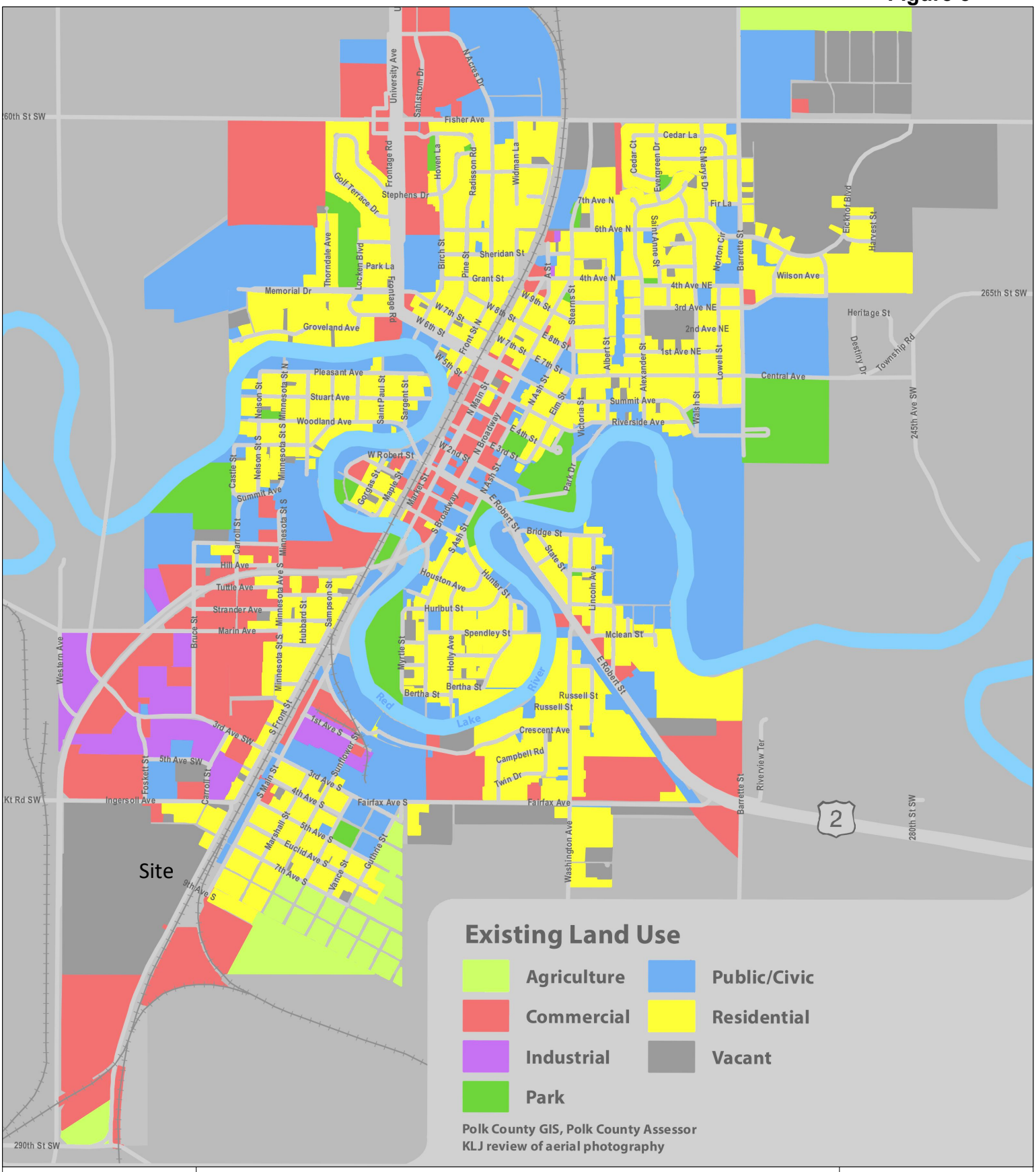
SCALE IN FEET

Aerial Photograph

Epitome Energy
2021 EAW

Sunde Engineering, PLLC.

Figure 5

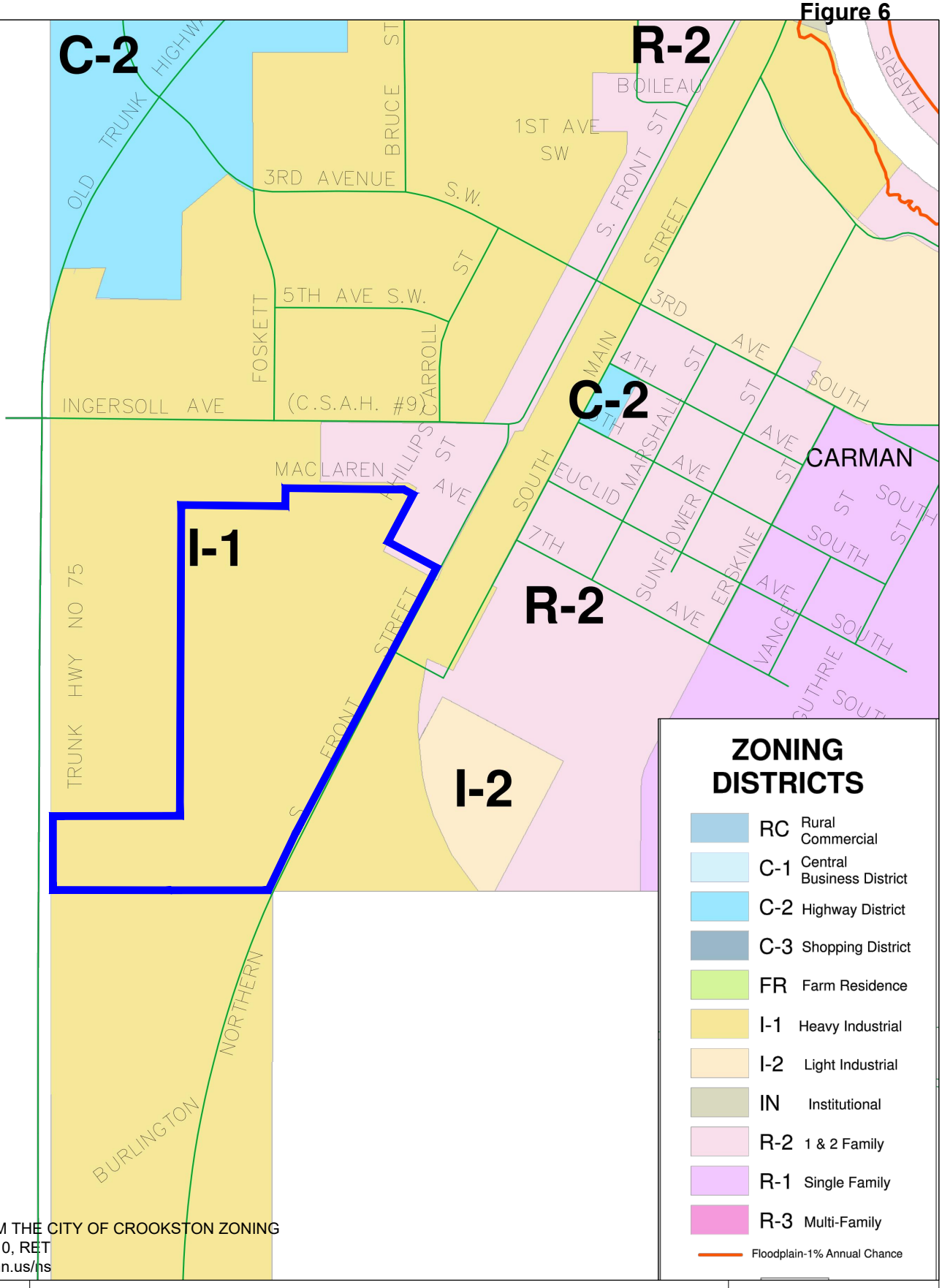


Existing Land Use

Epitome Energy
2021 EAW

Sunde Engineering, PLLC.

Figure 6



NOTE: EXCERPT FROM THE CITY OF CROOKSTON ZONING MAP, DATED 2019-01-10, RET
https://www.crookston.mn.us/ns

N

0 400 800
SCALE IN FEET

Zoning Map

Epitome Energy
2021 EAW

Sunde Engineering, PLLC.

Figure 7

N

0 250 500

SCALE IN FEET

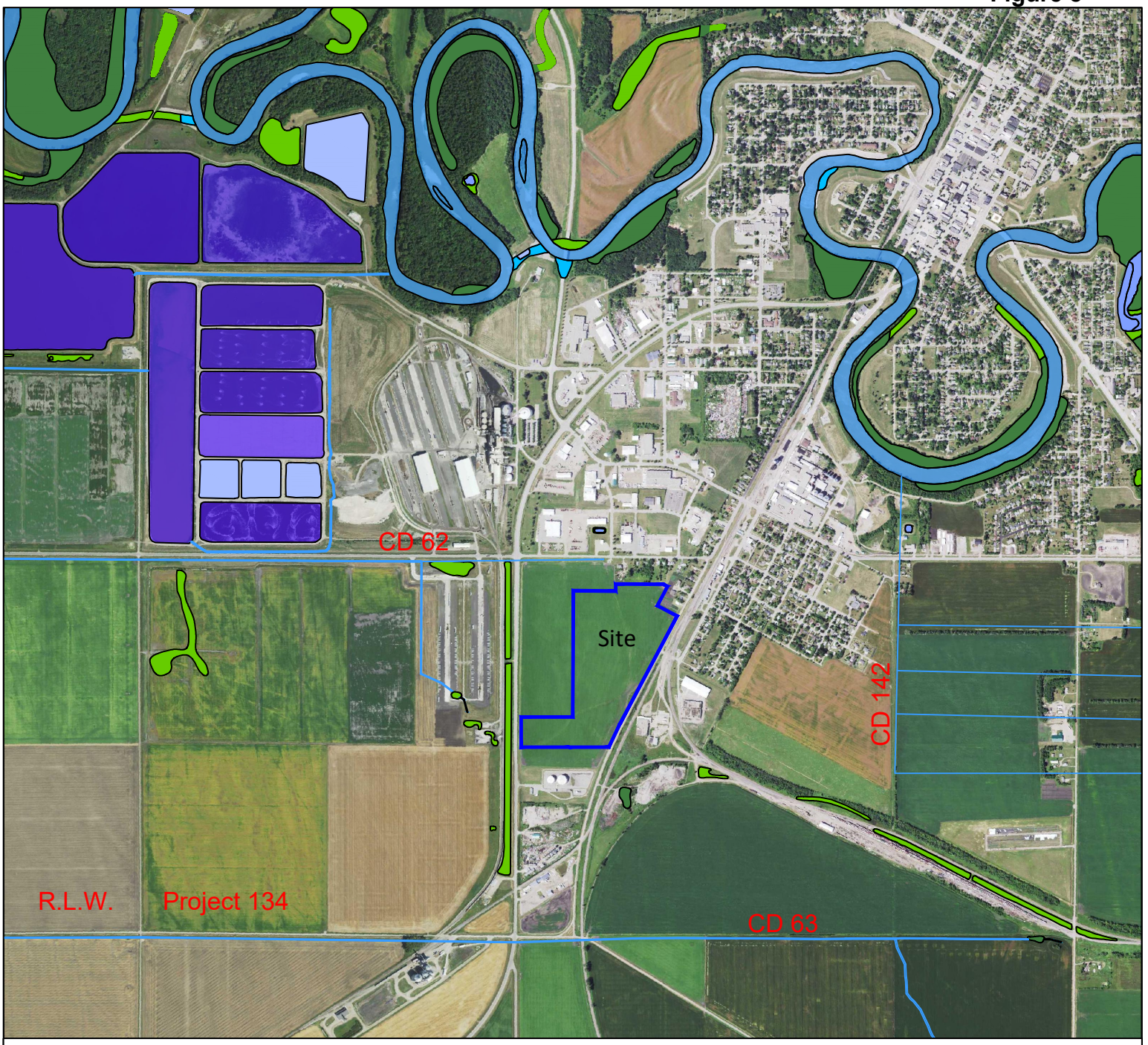
Delineated Wetlands

Epitome Energy

2021 EAW

Sunde Engineering, PLLC.

Figure 8



KEY:

- Riverine
- Freshwater Forested/ Shrub Wetland
- Freshwater Emergent Wetland
- Lake
- Freshwater Pond

USGS Quadrangle Map
Wetland Information from the MN DNR Data Deli

N

0 1000 2000

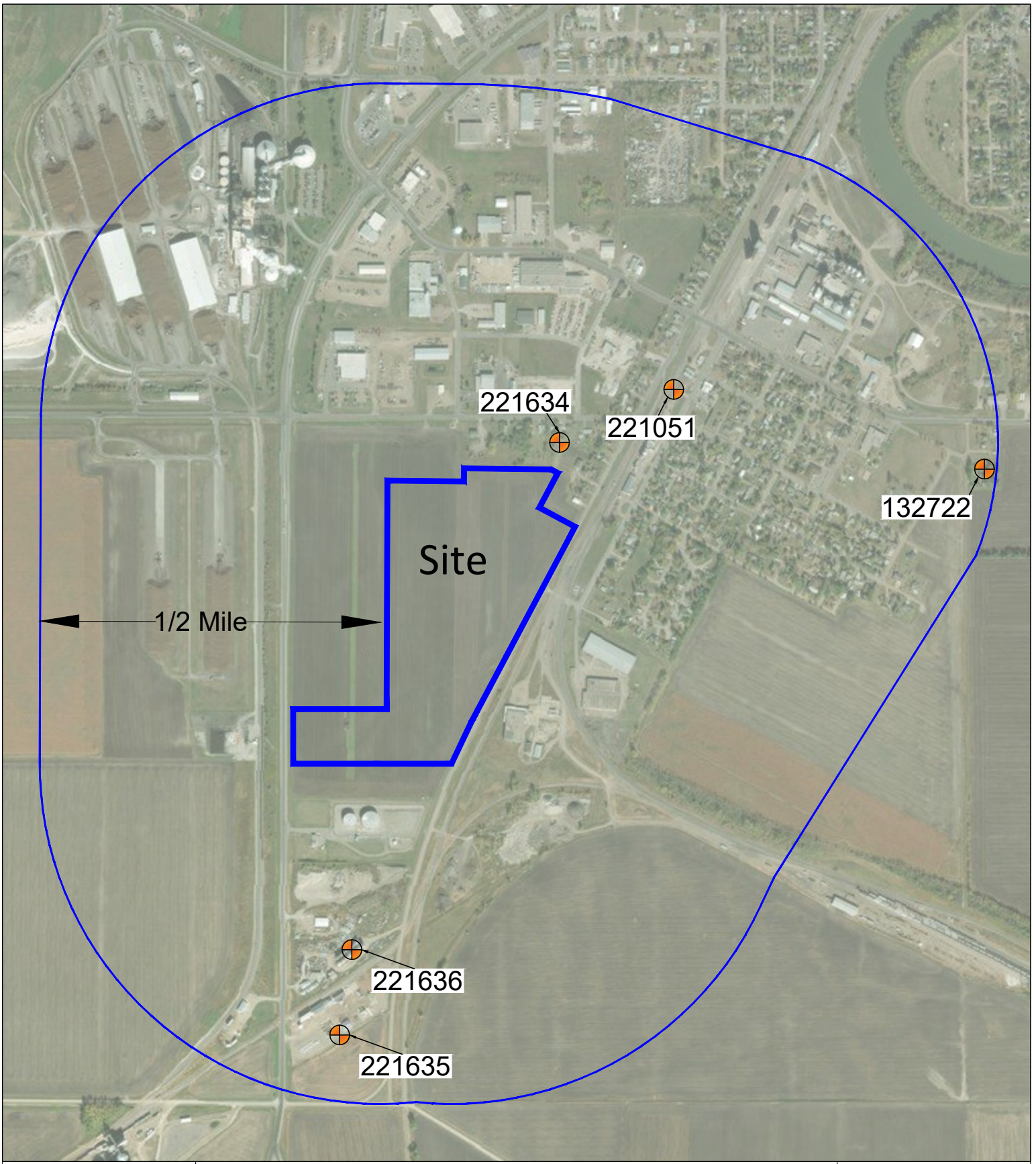
SCALE IN FEET

National Wetland Inventory Map

Epitome Energy
2021 EAW

Engineering, PLLC.

Figure 9



N

0 500 1000

SCALE IN FEET

MWI Wells Within One Half Mile

Epitome Energy
2021 EAW

Sunde Engineering, PLLC.

Attachments 1 - 9

Media:
Crookston Time – Local Newspaper
Aug 17 2021
July 21 2021
June 14 2021
March 17 2021

KROX Radio/Web Site Story recap of public meeting/presentation radio + online article
July 20 2021
June 10 2021
May 11 2021
March 16 2021
May 12 2020
May 11 2020
Jan 8 2020
Nov 5 2019
Oct 29 2019

Meetings Open to Public:

Public Hearing	Aug 19, 2019
Public Meeting	April 3, 2019
Public Meeting	April 2, 2019
CHEDA Board	Aug 25, 2021
Open House	Sept 5, 2020
Northern Growers	April 25, 2019
Northern Crop	May 9, 2019
City Council	June 24, 2019
Ag Leaders Polk Co	July 19, 2019
Farm Fest Booth	Aug 5,6,7 2019
Advisory Meeting	Sept 24, 2019
Sen Bonding Tour	Oct 2, 2019
Crookston Neighborhood	Oct 17, 2019
Northwest Entrepreneurs	Oct 29, 2019
Newfolden Soybean Growers	Dec 5, 2019
Prairie Grain Conf	Dec 11, 2019
CHEDA Board	Jan 8, 2020
Grower Update Crookston UMC	Jan 8, 2020
CHEDA and City Leaders	Feb 6, 2020
Mahnomen Growers	Feb 7, 2020
Ag Farm Service	Feb 7, 2020
Hallock Growers	Feb 7, 2020
Newfolden Growers	Feb 19, 2020
Crookston Advisors	Feb 19, 2020
Ada Growers	Feb 20, 2020
Fertile Growers	March 18, 2020
Farmers Union	March 25, 2020
Green Bush Roseau Growers	April 7, 2020
Farmers Union	May 11, 2020
CHEDA Advisory	May 12, 2020
Crookston Community	Sept 8, 2020
ADA Growers	Sept 8, 2020
Red Lake Falls	Sept 16, 2020
Crookston Press	Oct 28, 2020
Polk Co Growers	Nov 17, 2020
City Council	May 10, 2021
CHEDA Board	July 20, 2021

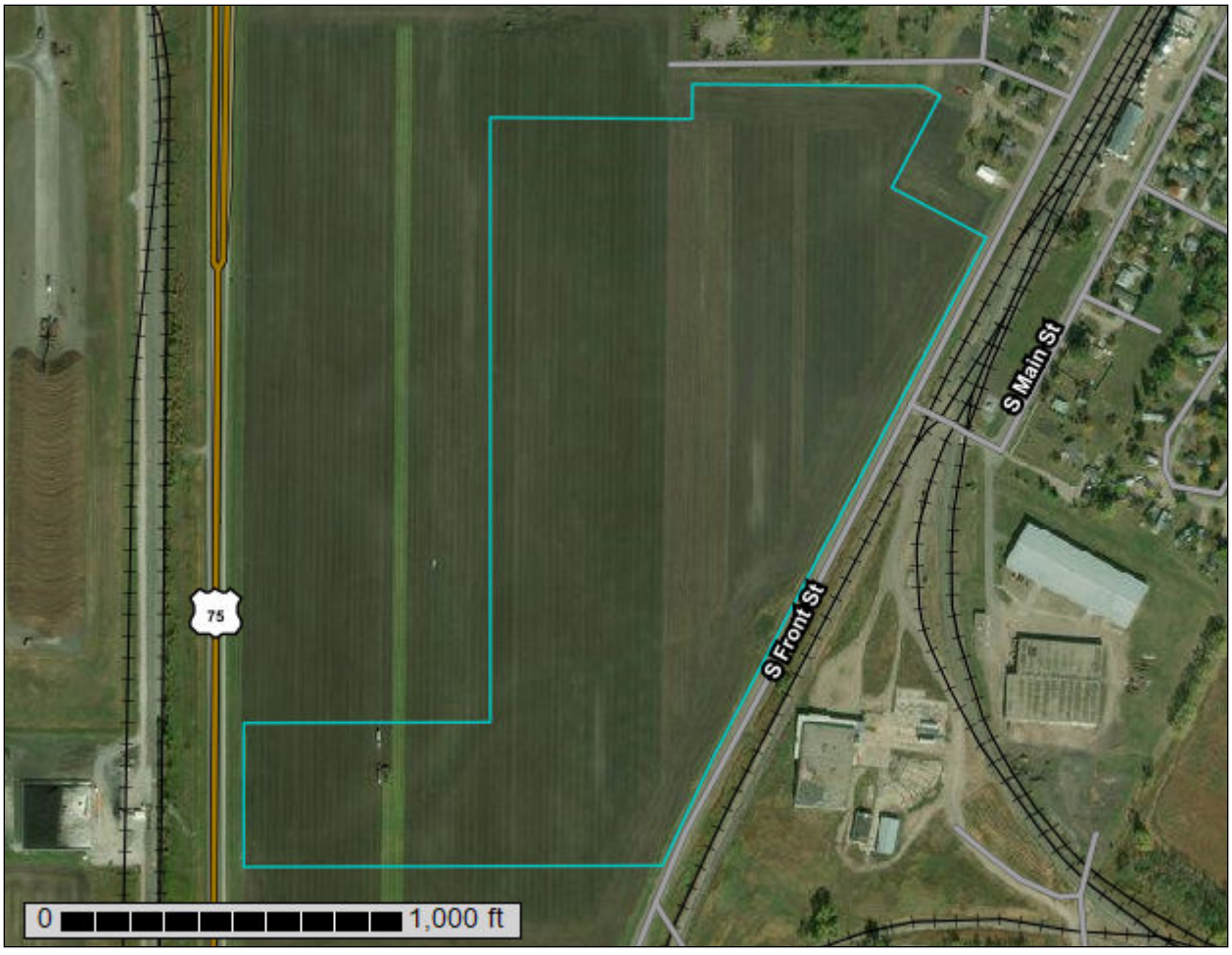
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Polk County, Minnesota

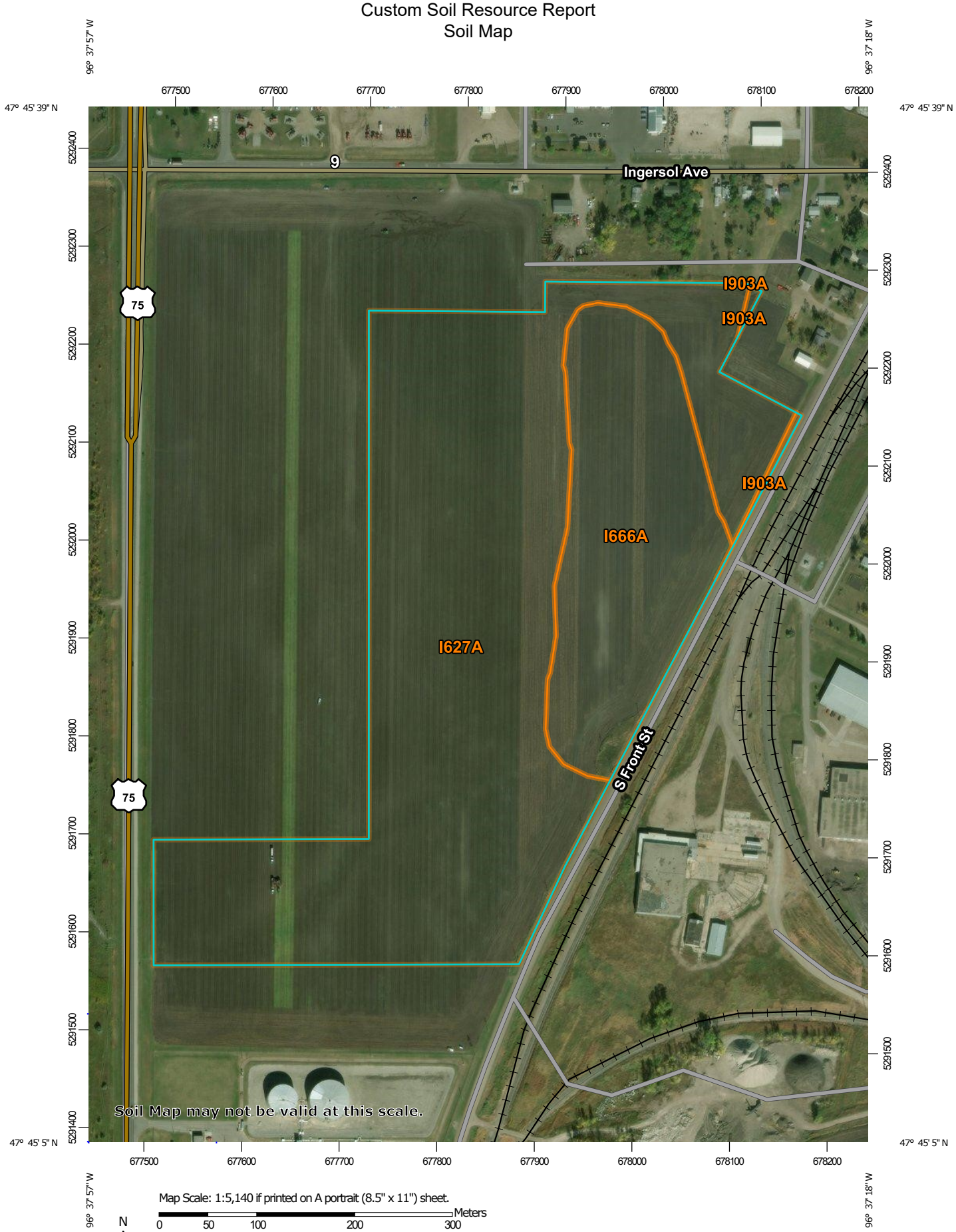


August 19, 2021

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:5,140 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Polk County, Minnesota
Survey Area Data: Version 15, Jun 10, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 6, 2014—Mar 31, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
I627A	Bearden-Fargo complex, 0 to 2 percent slopes	44.9	74.8%
I666A	Colvin-Perella silty clay loams, 0 to 1 percent slopes	14.9	24.8%
I903A	Urban Land-Aquolls complex, 0 to 2 percent slopes	0.2	0.4%
Totals for Area of Interest		**60.0**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Polk County, Minnesota

I627A—Bearden-Fargo complex, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2pgbc
Elevation: 750 to 1,480 feet
Mean annual precipitation: 20 to 26 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 110 to 160 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Bearden and similar soils: 50 percent
Fargo and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bearden

Setting

Landform: Flats
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Fine-silty glaciolacustrine deposits

Typical profile

Ap - 0 to 8 inches: silty clay loam
ABk - 8 to 15 inches: silty clay loam
Bk - 15 to 39 inches: silty clay loam
C - 39 to 79 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 1.42 in/hr)
Depth to water table: About 18 to 42 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 40 percent
Gypsum, maximum content: 3 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 10.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: R056XY087ND - Limy Subirrigated
Forage suitability group: Subirrigated (G056XY700ND)
Other vegetative classification: Subirrigated (G056XY700ND)

Hydric soil rating: No

Description of Fargo

Setting

Landform: Flats
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Clayey glaciolacustrine deposits

Typical profile

Ap - 0 to 8 inches: silty clay
A - 8 to 13 inches: silty clay
Bss - 13 to 21 inches: silty clay
Bkg - 21 to 32 inches: silty clay
Cg - 32 to 79 inches: silty clay

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low (0.01 to 0.14 in/hr)
Depth to water table: About 0 to 18 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 25 percent
Gypsum, maximum content: 3 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 9.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Ecological site: R056XY084ND - Clayey
Forage suitability group: Clayey Subsoil (G056XY210ND)
Other vegetative classification: Clayey Subsoil (G056XY210ND)
Hydric soil rating: Yes

Minor Components

Colvin

Percent of map unit: 5 percent
Landform: Depressions
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: R056XY102ND - Wet Meadow
Other vegetative classification: Wet (G056XY900ND)
Hydric soil rating: Yes

Bearden, slightly saline

Percent of map unit: 5 percent
Landform: Flats

Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: R056XY087ND - Limy Subirrigated
Other vegetative classification: Subirrigated (G056XY700ND)
Hydric soil rating: No

Perella

Percent of map unit: 5 percent
Landform: Depressions
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: R056XY102ND - Wet Meadow
Other vegetative classification: Wet (G056XY900ND)
Hydric soil rating: Yes

l666A—Colvin-Perella silty clay loams, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2pgfs
Elevation: 750 to 1,480 feet
Mean annual precipitation: 20 to 26 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 110 to 160 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Colvin and similar soils: 50 percent
Perella and similar soils: 40 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Colvin

Setting

Landform: Depressions
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Fine-silty glaciolacustrine deposits

Typical profile

Ap - 0 to 9 inches: silty clay loam
Ak - 9 to 14 inches: silty clay loam
Bkg - 14 to 31 inches: silty clay loam
Cg - 31 to 79 inches: silty clay loam

Properties and qualities

Slope: 0 to 1 percent

Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low (0.01 to 0.14 in/hr)
Depth to water table: About 0 to 18 inches
Frequency of flooding: None
Frequency of ponding: Occasional
Calcium carbonate, maximum content: 45 percent
Gypsum, maximum content: 3 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Ecological site: R056XY102ND - Wet Meadow
Forage suitability group: Wet (G056XY900ND)
Other vegetative classification: Wet (G056XY900ND)
Hydric soil rating: Yes

Description of Perella

Setting

Landform: Depressions
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Fine-silty glaciolacustrine deposits

Typical profile

Ap - 0 to 14 inches: silty clay loam
Bg - 14 to 24 inches: silty clay loam
Cg1 - 24 to 30 inches: silt loam
Cg2 - 30 to 79 inches: silt loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 1.42 in/hr)
Depth to water table: About 0 to 18 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 11.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Ecological site: R056XY102ND - Wet Meadow
Forage suitability group: Wet (G056XY900ND)
Other vegetative classification: Wet (G056XY900ND)

Hydric soil rating: Yes

Minor Components

Bearden

Percent of map unit: 7 percent
Landform: Flats
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: R056XY087ND - Limy Subirrigated
Other vegetative classification: Subirrigated (G056XY700ND)
Hydric soil rating: No

Fargo

Percent of map unit: 3 percent
Landform: Flats
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: R056XY084ND - Clayey
Other vegetative classification: Clayey Subsoil (G056XY210ND)
Hydric soil rating: Yes

I903A—Urban Land-Aquolls complex, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2qkts
Elevation: 750 to 1,250 feet
Mean annual precipitation: 19 to 24 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 110 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 65 percent
Aquolls, fine-silty, and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Lake plains

Interpretive groups

Land capability classification (irrigated): None specified
Forage suitability group: Not suited (G056XY000ND)
Other vegetative classification: Not suited (G056XY000ND)

Description of Aquolls, Fine-silty

Setting

Landform: Lake plains
Landform position (three-dimensional): Talf, dip, rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Fine-silty glaciolacustrine deposits

Typical profile

Ap - 0 to 7 inches: silty clay loam
ABk - 7 to 18 inches: silty clay loam
Bk - 18 to 36 inches: silty clay loam
C - 36 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 1.42 in/hr)
Depth to water table: About 18 to 42 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 40 percent
Gypsum, maximum content: 3 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 3.9 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water supply, 0 to 60 inches: High (about 10.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: R056XY087ND - Limy Subirrigated
Forage suitability group: Subirrigated (G056XY700ND)
Other vegetative classification: Subirrigated (G056XY700ND)
Hydric soil rating: No

Soil Information for All Uses

Suitabilities and Limitations for Use

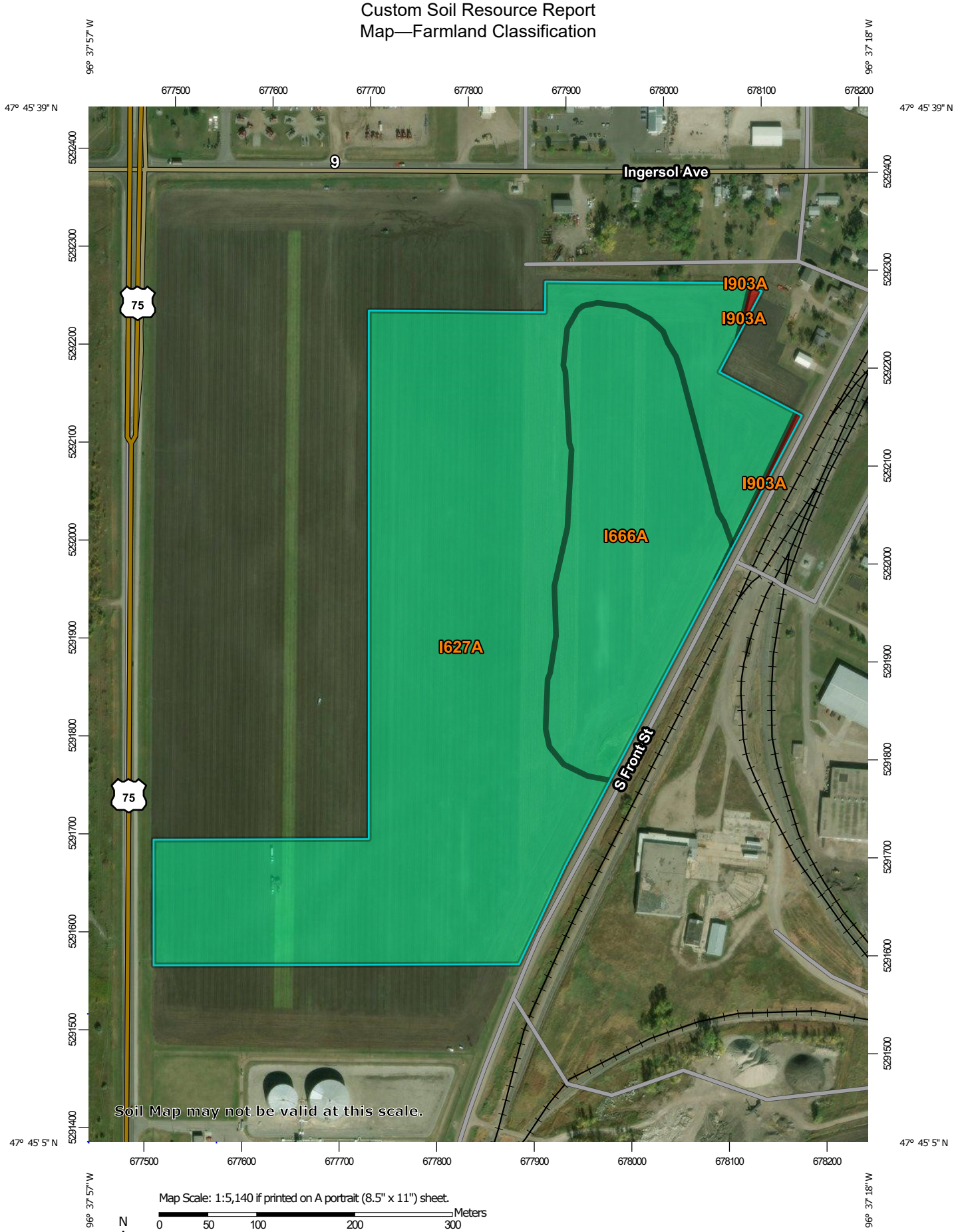
The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

Land Classifications

Land Classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Farmland Classification

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.



Map Scale: 1:5,140 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

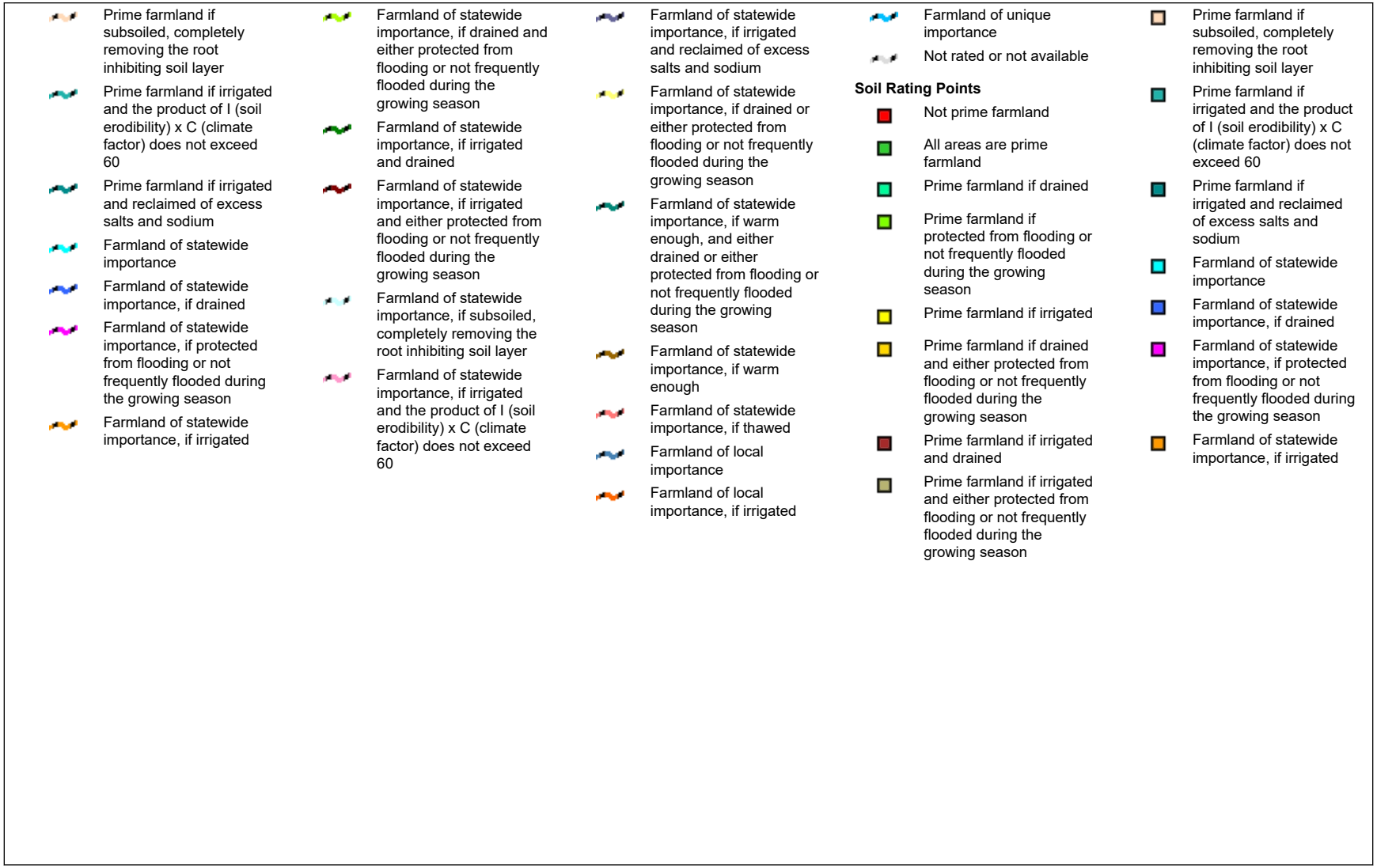
Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of statewide importance, if drained
- Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated
- Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated and drained
- Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough
- Farmland of statewide importance, if thawed
- Farmland of local importance
- Farmland of local importance, if irrigated
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season


Prime farmland if subsoiled, completely removing the root inhibiting soil layer
Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
Prime farmland if irrigated and reclaimed of excess salts and sodium
Farmland of statewide importance
Farmland of statewide importance, if drained
Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
Farmland of statewide importance, if irrigated
Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
Farmland of statewide importance, if irrigated and drained
Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
Farmland of statewide importance, if warm enough
Farmland of statewide importance, if thawed
Farmland of local importance
Farmland of local importance, if irrigated
Farmland of unique importance
Not rated or not available
Soil Rating Points
Not prime farmland
All areas are prime farmland
Prime farmland if drained
Prime farmland if protected from flooding or not frequently flooded during the growing season
Prime farmland if irrigated
Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
Prime farmland if irrigated and drained
Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
Prime farmland if subsoiled, completely removing the root inhibiting soil layer
Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
Prime farmland if irrigated and reclaimed of excess salts and sodium
Farmland of statewide importance
Farmland of statewide importance, if drained
Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
Farmland of statewide importance, if irrigated

- Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated and drained
- Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough
- Farmland of statewide importance, if thawed
- Farmland of local importance
- Farmland of local importance, if irrigated
- Farmland of unique importance
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Polk County, Minnesota
Survey Area Data: Version 15, Jun 10, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 6, 2014—Mar 31, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
I627A	Bearden-Fargo complex, 0 to 2 percent slopes	Prime farmland if drained	44.9	74.8%
I666A	Colvin-Perella silty clay loams, 0 to 1 percent slopes	Prime farmland if drained	14.9	24.8%
I903A	Urban Land-Aquolls complex, 0 to 2 percent slopes	Not prime farmland	0.2	0.4%
Totals for Area of Interest			**60.0**	**100.0%**

Rating Options—Farmland Classification

Aggregation Method: No Aggregation Necessary

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The majority of soil attributes are associated with a component of a map unit, and such an attribute has to be aggregated to the map unit level before a thematic map can be rendered. Map units, however, also have their own attributes. An attribute of a map unit does not have to be aggregated in order to render a corresponding thematic map. Therefore, the "aggregation method" for any attribute of a map unit is referred to as "No Aggregation Necessary".

Tie-break Rule: Lower

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

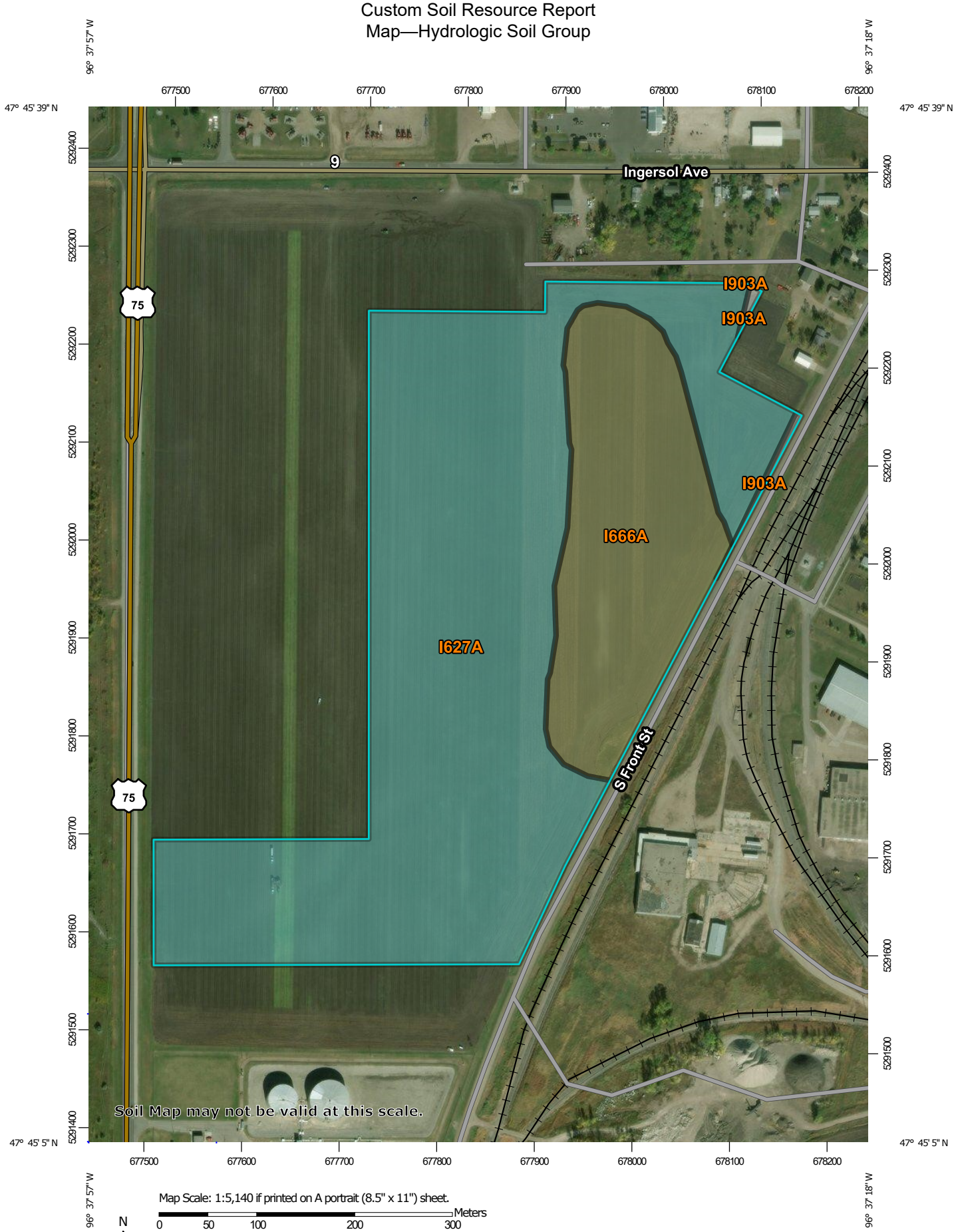
Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at

or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Custom Soil Resource Report
Map—Hydrologic Soil Group



Map Scale: 1:5,140 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Polk County, Minnesota
Survey Area Data: Version 15, Jun 10, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 6, 2014—Mar 31, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
I627A	Bearden-Fargo complex, 0 to 2 percent slopes	C	44.9	74.8%
I666A	Colvin-Perella silty clay loams, 0 to 1 percent slopes	C/D	14.9	24.8%
I903A	Urban Land-Aquolls complex, 0 to 2 percent slopes		0.2	0.4%
Totals for Area of Interest			**60.0**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be

considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

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Attachment 3

WENCK File #1837
July 2020

Wetland Delineation Report: Epitome Site-Crookston, Minnesota

Prepared for:

Sunde Engineering, PLLC *for*
Epitome Energy

10830 Nesbitt Ave S
Minneapolis, MN 55437

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Prepared by:

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Table of Contents

FIGURES

APPENDICES

1.0 Introduction

Wenck Associates, Inc. (Wenck) was authorized by Sunde Engineering, PLLC to conduct a wetland delineation of the property located near S Front St and Ingersoll Ave, Crookston, Polk County, Minnesota. The project area consists of 68.3 acres total, the majority of which is cropland, and is bordered by farmland, manmade ditches, and residential properties. Access to the project area is from S Front St. The project area location is depicted in Figure 1. Field work was conducted on June 16, 2020 by Wenck environmental staff.

1.1 SITE DESCRIPTION

The project area primarily occurs within agricultural land, with the only exception being the surrounding drainage ditches and impervious surfaced roads. The project site was under sugar beet production at the time of the field investigation.

Adjacent properties include residential properties with homes to the north and east, and commercial buildings to the east. There is continuous farmland directly to the south and west. The surrounding area contains a mixture of agricultural, commercial, industrial, and residential land uses. The Project Area resides just south of Crookston, MN, within the ancient Lake Agassiz basin, and is characteristic of the low relief found throughout the Red River Valley.

2.0 Methods

2.1 OFFSITE WETLAND DETERMINATION

For portions of the project area that contain potential wetland areas in active cropland, the appropriate method for determining wetland boundaries includes the analysis of aerial imagery to determine the presence/absence of wetland hydrology signatures. This analysis was conducted according to regulatory guidance in the US Army Corps of Engineers (USACE) and Minnesota Board of Water and Soil Resources (BWSR) Guidance for Offsite Hydrology/Wetland Determinations (2016).

This method requires the analysis of historic aerial imagery to determine the presence/absence of wetland hydrology signatures in the context of antecedent precipitation data. If areas demonstrate wetland hydrology signatures in more than 50% of normal precipitation years, they are typically determined to be wetland. A date of July 1 was used to determine antecedent precipitation conditions (Normal, Wet, or Dry) unless otherwise noted. The normal monthly precipitation values from the period from 1981-2010 were used for comparison.

Wenck analyzed recent aerial photographs from normal precipitation years from MnGEO and other sources for wetland hydrology signatures. Normal years aerials with sufficient image quality included 2003, 2008, 2010, 2013, 2015, and 2017. Wetland hydrology signatures include crop stress (CS), drowned out crops (DO), areas not cropped due to wetness (NC), standing water (SW), altered cropping patterns (AP), signatures of saturated soil (SS) and signatures of wetland vegetation (WS). Areas with normal cropping patterns without wetness signatures were identified as normal vegetation (NV). Some signatures, such as standing water and drowned out crops, are stronger indicators that wetland hydrology is present. By comparison, some apparent signatures of wetness such as crop stress and altered cropping patterns may occur as a result of other factors besides wetness and are weaker indicators of wetland hydrology.

2.2 ONSITE DETERMINATION

An onsite wetland investigation was conducted by Matt Retka, Wenck staff on June 16, 2020 using the on-site methodology set forth in the 1987 U.S. Army Corps of Engineers (COE) Wetlands Delineation Manual (1987 Manual) and the 2010 U.S. Army Corps of Engineers Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region (Version 2.0). Potential wetland areas were examined according to guidelines set forth in these documents and wetland boundaries were determined through analysis of the vegetation, soils, and hydrology.

Wetlands are defined in the Federal Register (1982) as "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

An area must have 3 elements present in order to be delineated as a wetland:

1) Greater than 50% dominance of hydrophytic plant species.
2) A hydric soil substrate.
3) Wetland hydrology during the growing season.

Plant species at both wetland and upland transect points were identified and assigned a wetland indicator status according to the North American Digital Flora: National Wetland Plant List, version 2.4.0 U.S. Army Corps of Engineers, Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory, Hanover, NH, and BONAP, Chapel Hill, NC. (2016). In the text of this report and on the enclosed data forms (Appendix D), the plant indicator status follows the plant's scientific or common name unless a status has not been assigned. According to the 1987 Manual and Regional Supplement, the hydrophytic plant criteria are met when more than 50% of the dominant species within the vegetative strata were assigned an obligate (OBL), facultative wet (FACW), or facultative (FAC) wetland status.

The presence of current wetland hydrology was determined through direct observation of the primary or secondary wetland hydrology indicators as defined in the 1987 Manual and Regional Supplement. The presence of a single primary indicator is sufficient to conclude that wetland hydrology is present. The direct observation of two or more secondary wetland hydrology indicators is required to conclude that wetland hydrology is present.

Hydric soils were determined through use of the Version 8.1, NRCS Field Indicators of Hydric Soils in the United States. Soils were examined and classified by digging soil pits at sample point transects using a Dutch auger. If the soils exhibited indicators of hydric soils as defined by USDA Soil Conservation Service (1994) - a soil that formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part - they were determined to be hydric.

Crop production brings disturbances to native vegetation and may complicate hydrophytic vegetation observations. Some wetlands were delineated in areas disturbed from annual crop production and were done so because of landscape position (depressional areas), and observed soil and hydrologic indicators. Supplemental investigations were done in vegetation surrounding the disturbed area to better understand any hydrophytic vegetative characteristics taking place.

Data sheets were completed for each investigation point and are included in Appendix D. Delineated wetland boundaries were marked with the use of a sub-meter Trimble R1 GPS unit and corresponding tablet. Wetland Delineation pin flags are typically used to physically mark the wetland boundary, but were not used here because of ongoing crop production and their potential damage to farming equipment. The corrected GPS data were then used to create the wetland boundary shapefiles in ArcGIS Pro as presented in the report figures.

Wetlands are classified in the Results section by their Eggers and Reed, Circular 39, and Cowardin classification systems based on observed field conditions.

3.0 Results

3.1 DESKTOP REVIEW

The National Wetlands Inventory (NWI) and National Hydrologic Dataset (NHD) (Figure 2) indicated no presence of wetlands or hydrologic features within the project area. NWI and NHD features were observed outside the subject property to the north, south, and west. The closest was located south of the project area and is noted as a wooded swamp. Additionally, shallow marshes and seasonally flooded basins were identified west across US Highway-75, and to the southeast. One NHD drainage canal, and a complex of municipal/industrial water features was located within ¼ mile.

The Minnesota DNR Public Waters Inventory (PWI) did not identify any public waters within the project area. The nearest public water, the Red Lake River, is located approximately 1 mile north of the project area (Figure 3). In the surrounding area, there are several small, unnamed drainages that are part of the Red Lake River tributary system.

The Polk County Soil Survey revealed the dominant soil map unit is the Bearden-Fargo complex series (I627A; partially hydric), which occupies approximately 68.4% of the project area. Colvin-Perella silty clay loams (I666A; all hydric) comprise 22.0%, and the Urban Land-Aquolls complex (I903A) makes up the remaining 9.6%. The surrounding soil survey information is available in Figure 4 and Appendix B.

Appendix A contains the precipitation conditions at the time of the site visit (30 Day Rolling Total). Climate data from the site visit and the 90 days prior indicate that the precipitation range was normal prior to of the site investigation (Appendix A). It is important to note that there was not sufficient data for the total 90 day precipitation record determination. Therefore, a supplemental precipitation prediction was done using the National Weather Service's (NWS) Advanced Hydrologic Prediction Service for the project area (National Weather Service, 2020). Prior to the site visit there were no major rainfall events suggesting that the soil properties and surrounding vegetative characteristics were being influenced by outside of normal climatic factors, and overall the site climatic conditions appeared relatively normal during the field evaluations.

3.1.1 MN Routine Assessment Method (MnRAM)

A MNRAM was completed by Wenck following the Comprehensive General Guidance, version 3.4 (MN Board of Water and Soil Resources). The method calculates scores for the various wetland functions, and the values used for the calculations are provided and the results from this assessment can be found in Appendix F.

3.2 OFFSITE DETERMINATION

A combination of LIDAR, NWI and soils data were used to identify potential wetland areas within the project area to be further investigated by offsite review. Four potential wetland areas were identified to be investigated by offsite methods within the actively farmed portions of the project area. The results of the offsite determination are summarized in Table 1 below. The offsite review areas and full offsite determination data are shown in

Appendix C. Non-cropped Ditch wetlands that were field delineated are not included in the summary table below but are discussed in Section 3.3.1 below. It should be noted that NV (normal vegetation) was observed at many of the potential identified offsite wetland areas during wet years. All offsite investigation areas were evaluated during the field visit, and boundaries adjusted per observed onsite conditions, as warranted.

Table 1. Offsite Determination Summary

Offsite Area	Normal Years	Normal Years with Wet Signatures	% Normal Years with Wet Signatures	Potential Wetland Hydrology?
1	6	4	67%	Y
2	6	1	17%	N
3	6	1	17%	N
4	6	3	50%	Y

3.3 ONSITE DETERMINATION

3.3.1 Wetlands

Six wetlands were field delineated within the project area as presented in Figure 6 and Table 2. Although four potential wetland areas were investigated offsite, only two contained sufficient onsite wetland indicators. The offsite investigation revealed Area 1 displayed > 50% hydrologic indication, and field investigations determined it contained all three hydric indicators. Offsite Areas 2 and 3 reported wet signatures < 50% of the years, however, only Area 3 contained sufficient hydrology characteristics during field investigations. Lastly, Area 4 was determined as a potential wetland area during the offsite investigations but displayed no hydric indicators in the field. Sample point vegetative, soil, and hydrology characteristics were recorded on data forms and are available in Appendix D. The field delineations only defined the portions of wetlands within the project areas, however, the delineated Ditch Wetlands continued beyond the project area boundaries in most cases. A summary of offsite area findings, field delineated wetlands and waterbodies is included in Table 2 below.

In some locations along the road right-of-way, man-made ditches exhibiting hydrophytic vegetation were encountered. Observations were made to determine if the natural topography adjacent to these ditches was depressional, or if these ditches were constructed in historically upland environments, for regulatory purposes. During the field inspection, man-made constructed ditches were recorded as "Ditches", and were delineated as "Wetland Ditches" if they exhibited wetland characteristics but were in historically non-depressional areas.

Table 2. Summary of Features

Feature Name	Classification	Size (acres)	Notes
Wetland 1	Type 1/PEMAf	0.34	Farm Wetland
Wetland 2	Type 1/PEMAf	0.11	Farm Wetland
Ditch Wetland 1	Type 2/PEM1C	0.08	Manmade Ditch
Ditch Wetland 2	Type 2/PEM1C	0.07	Manmade Ditch
Ditch Wetland 3	Type 2/PEM1C	0.16	Manmade Ditch
Ditch Wetland 4	Type 2/PEM1C	0.72	Manmade Ditch

Wetlands 1 and 2 have been disturbed to varying degrees by past or current farming activities. Ditch Wetlands 1, 2, 3, and 4 were created from the associated constructed ditches.

Wetlands 1 and 2

Wetland 1 and 2 are Type 1 actively farmed Seasonally Flooded Basins within the sugar beet field. All portions of the wetlands are currently in a cropping system. The basins were dominated by sugar beets showing signs of water stressed and/or were drowning out. Wetland 1 is along and within a shallow field drainage ditch, which appears to be removing a portion of the historic hydrology to this area. There are no drainages associated with Wetland 2 and this basin is considered isolated.

The wetland boundaries were determined primarily from the change in water stress and drowned sugar beet plants, existing topography (i.e., LiDAR), as well as the transition from hydric to non-hydric soils.

Ditch Wetlands 1, 2, 3, and 4

Ditch Wetlands 1, 2, 3, and 4 are all Type 2 seasonally flooded wetlands within the manmade drainages along the project area. Specifically, the eastern border of the cropland, and across S Front St. in the project area. These wetlands were dominated by cattails, water smartweed, prairie dogbane, reed canary, prairie cordgrass, and Baltic rush in the herbaceous layer. Quackgrass, a FACU plant, was recorded as a dominant species in one wetland, but the Dominance Test determined the vegetation there was dominated by hydrophytes. The ditch between Ditch Wetland 1 and 2 was observed to be dominated by upland vegetation, and is identified as "Upland Ditch" on Figure 6.

The boundaries of these wetlands were determined primarily by the presence of a hydrophytic vegetative community, and topographic changes likely to supply wetland hydrology.

In an attempt to better determine the nature of the observed wetland characteristics in the ditches, historic aerial photographs were compared to the aerial photographs used in the offsite determinations. If imagery was available before the ditches were constructed, it may have been possible to interpret the pre-ditch hydrological characteristics of the landscape. However, the oldest imagery from 1954 showed the ditches were in place, and the associated road and railroads were then already present. None the less, there does not appear to be natural wetlands present adjacent to these Ditch Wetland features, and these ditches are therefore presumed to be constructed in historically upland areas.

4.0 Conclusion

Four (4) Type 2/PEM1C/Manmade and two (2) Type 1/PEMAf wetlands were identified on the project site. The delineated Wetland Ditches appear to be constructed in historically upland areas and should not be considered jurisdictional or regulatory boundaries in this report.

Activities which impact or could potentially impact wetlands or other jurisdictional waters may be regulated by the USACE (under Section 404 of the Clean Water Act) and by the Local Government Unit administering the Wetland Conservation Act. No grading or filling in wetland basins or other jurisdictional waters should commence until all necessary permits have been obtained or a finding of no jurisdiction has been obtained from applicable regulatory agencies. This wetland delineation meets the standards and criteria described in the 1987 Manual and Regional Supplement and the results represent the conditions present at the time of the field investigation.

Sincerely,

Wenck Associates, Inc.

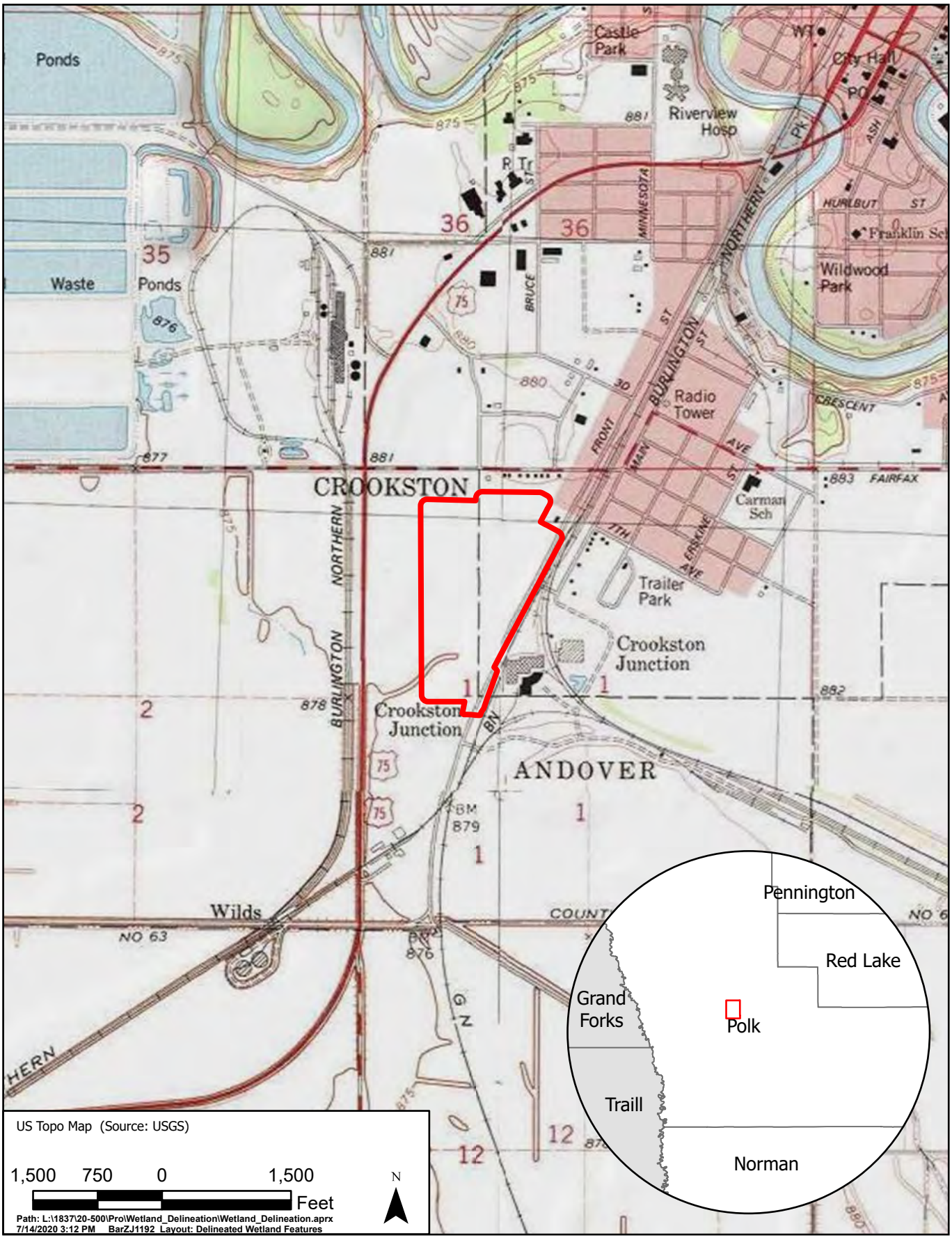
July 27, 2020

Matt Retka
Certified Wetland Delineator #1266

Date

Figures

1. Site Location Map
2. National Wetlands Inventory and National Hydrography Dataset
3. MN DNR Public Waters Inventory (PWI)
4. Polk County Soil Survey
5. Topography and Aerial Photograph
6. Delineated Wetland Features



SUNDE ENGINEERING, PLLC	JUL 2020
Site Location Map	Figure 1

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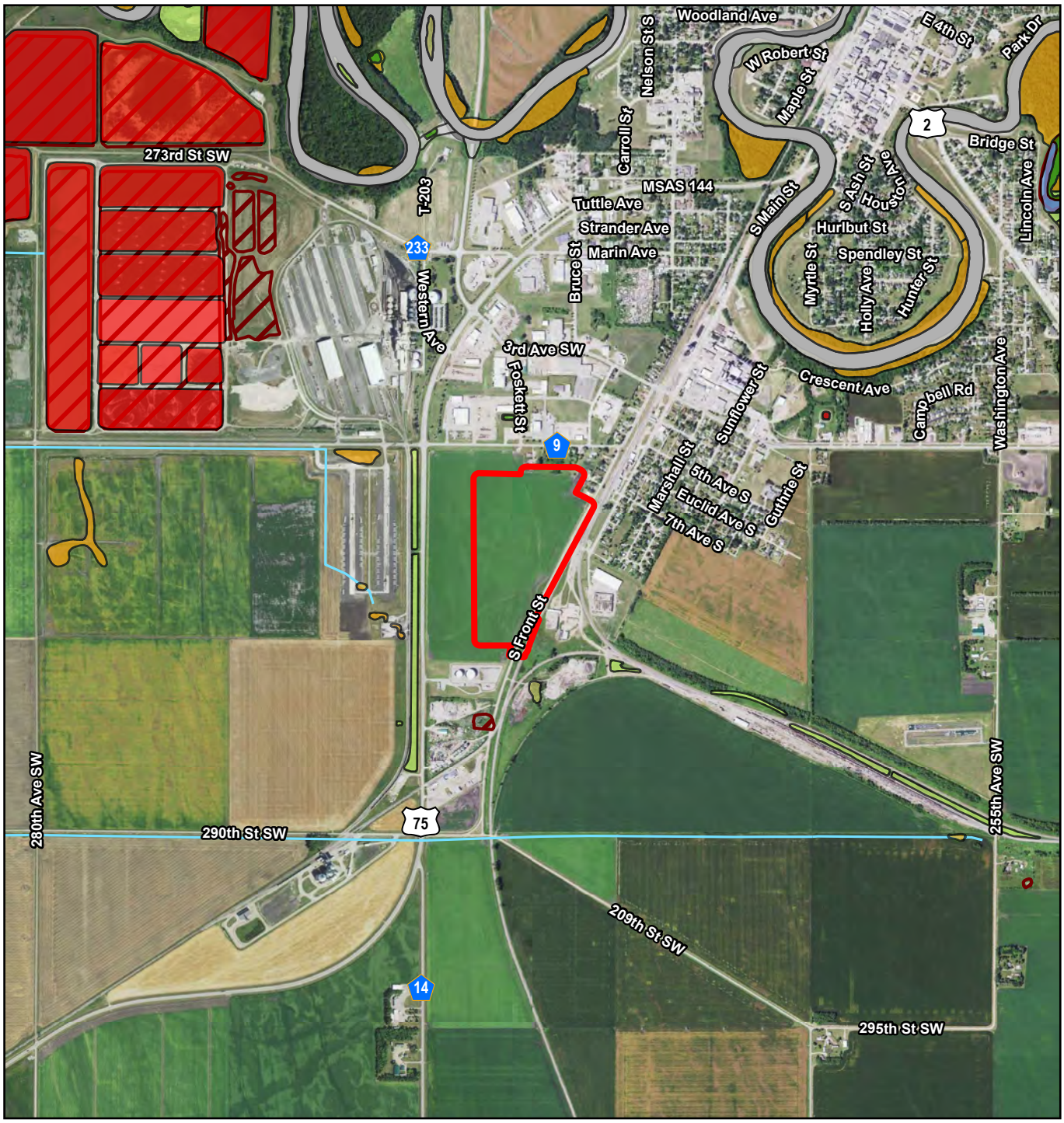

Legend

2017 Aerial Photograph (Source: MnGEO WMS)
Polk County SSURGO (Source: USDA NRCS)

1,500 750 0 1,500 Feet

N

Path: L:\1837\20-500\Pro\Wetland_Delineation\Wetland_Delineation.aprx
7/14/2020 1:17 PM BarZJ1192 Layout: Delineated Wetland Features

- Project Area

National Hydrology Dataset Features
- Lake/Pond
- Stream/River
- Canal/Ditch

National Wetland Inventory
- 1 - Seasonally Flooded Basin or Flat
- 2 - Wet Meadow
- 3 - Shallow Marsh
- 4 - Deep Marsh
- 5 - Shallow Open Water
- 6 - Shrub Swamp
- 7 - Wooded Swamp
- 8 - Bog
- Municipal and Industrial Activities
- Riverine Systems

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National Wetland Inventory and National Hydrologic Dataset

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Figure 2

Legend

Project Area

Minnesota Public Waters Delineations

Public Water Watercourse

Public Ditch/Altered Natural Watercourse

Public Waters Basins

2017 Aerial Imagery (Source: MnGEO WMS)
MN Public Waters Inventory (MN DNR)

1,500 750 0 1,500
Feet

N

Path: L:\1837\20-500\Pro\Wetland_Delineation\Wetland_Delineation.aprx
7/14/2020 5:10 PM BarZJ1192 Layout: Delineated Wetland Features

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MN Public Waters Inventory

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Figure 3

2017 Aerial Photograph (Source: MnGEO WMS)
Polk County SSURGO (Source: USDA NRCS)

300 150 0 300 Feet

N

Path: L:\1837\20-500\Pro\Wetland_Delineation\Wetland_Delineation.aprx
7/14/2020 1:17 PM BarZJ1192 Layout: Delineated Wetland Features

Legend

- Project Area

Hydric Classification

- 0% (Not Hydric)
- 45% (Partially Hydric)
- 93% (All Hydric)

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Polk County Soil Survey		Figure 4

2017 Aerial Photograph (Source: MnGEO WMS)
2' LiDAR Contours (Source: MN DNR)

Legend

2' Contours

Project Area

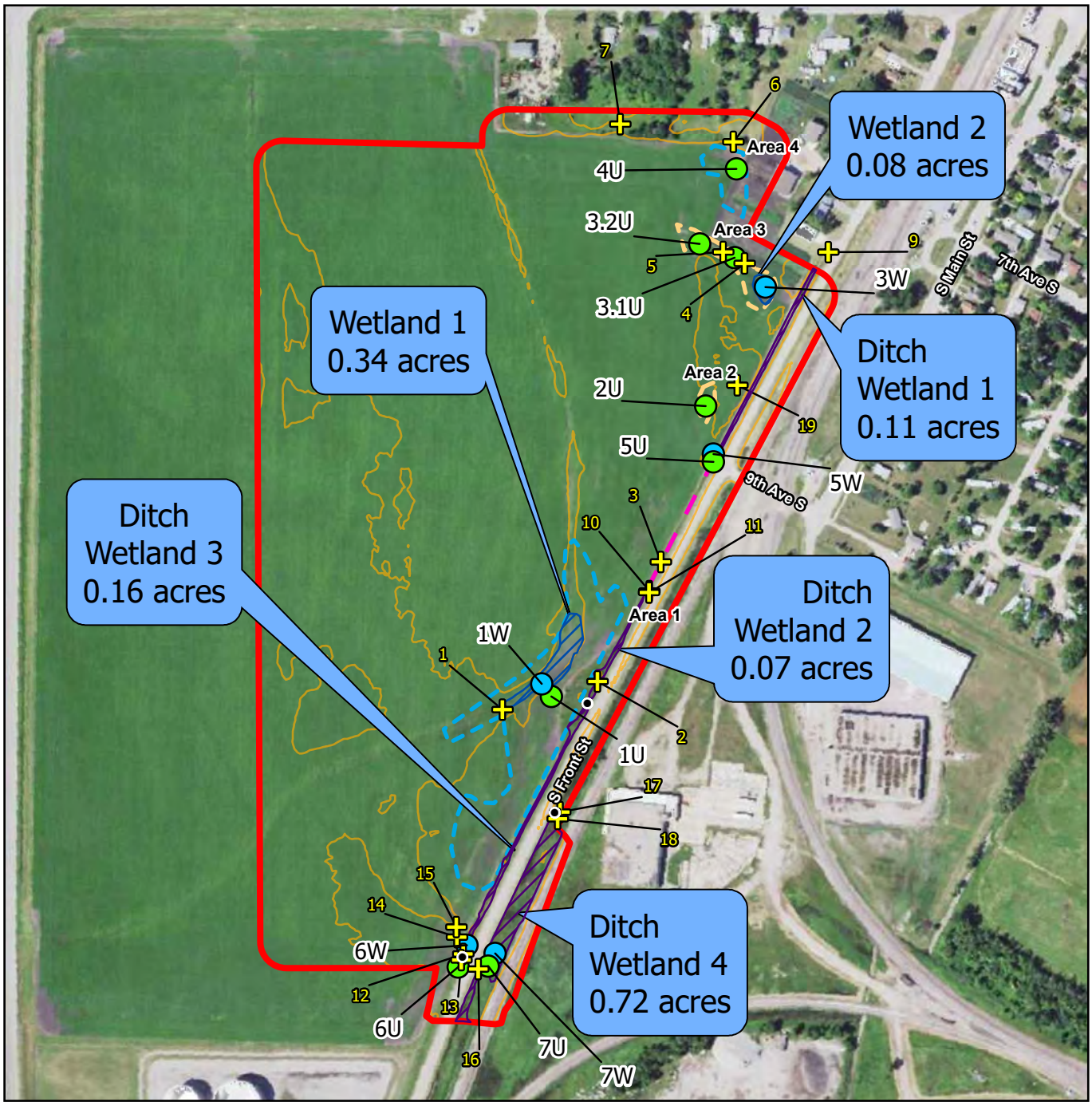
300 150 0 300

Feet

N

Path: L:\1837\20-500\Pro\Wetland_Delineation\Wetland_Delineation.aprx
7/14/2020 1:17 PM BarZJ1192 Layout: Delineated Wetland Features

SUNDE ENGINEERING, PLLC	WENCK Responsive partner. Exceptional outcomes.	JUL 2020
Topography and Aerial Photograph		Figure 5



Legend

2017 Aerial Photograph (Source: MnGEO WMS)
2' Contours (Source: MN DNR)

- Project Area
- Photo Points

Field Inspection Data

Wetland Type
- Wetland
- Ditch Wetland
- Upland Ditch
- Culvert

Sample Type
- Upland
- Wetland

Offsite Review Areas
- Less than 50% Hydrology Indication
- Greater than 50% Hydrology Indication
- 2' Contours

300 150 0 300
Feet

N

Path: L:\1837\20-500\Pro\Wetland_Delineation\Wetland_Delineation.aprx
7/23/2020 10:58 AM BarZJ1192 Layout: Delineated Wetland Features

SUNDE ENGINEERING, PLLC

Delineated Wetland Features

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Figure 6

Appendix A

Precipitation Data

Precipitation data for target wetland location:

County: **Polk**
Township Name: **Andover**
Nearest Community: **Crookston Junction**
Township Number: **149N**
Range Number: **47W**
Section Number: **1**

Aerial photography or site visit date:
Tuesday, June 16, 2020

Month Weights		Score Weights	
first month:	3	dry	1
second month:	2	normal	2
third month:	1	wet	3

Score using 1981-2010 normal period

Values are in inches
A 'R' following a monthly total indicates a provisional value derieved from the radar-based estimates

	First Prior Month: **May 2020**	Second Prior Month: **April 2020**	Third Prior Month: **March 2020**
estimated precipitation total for this location	1.75R	2.18R	.32R
there is a 30% chance this location will have less than	1.88	0.59	0.53
there is a 30% chance this location will have more than	3.61	1.34	1.25
type of month: dry normal wet	dry	wet	dry
monthly score	**3 * 1 = 3**	**2 * 3 = 6**	**1 * 1 = 1**

multi monthly score
6 to 9 (dry) 10 to 14 (normal) 15 to 18 (wet)

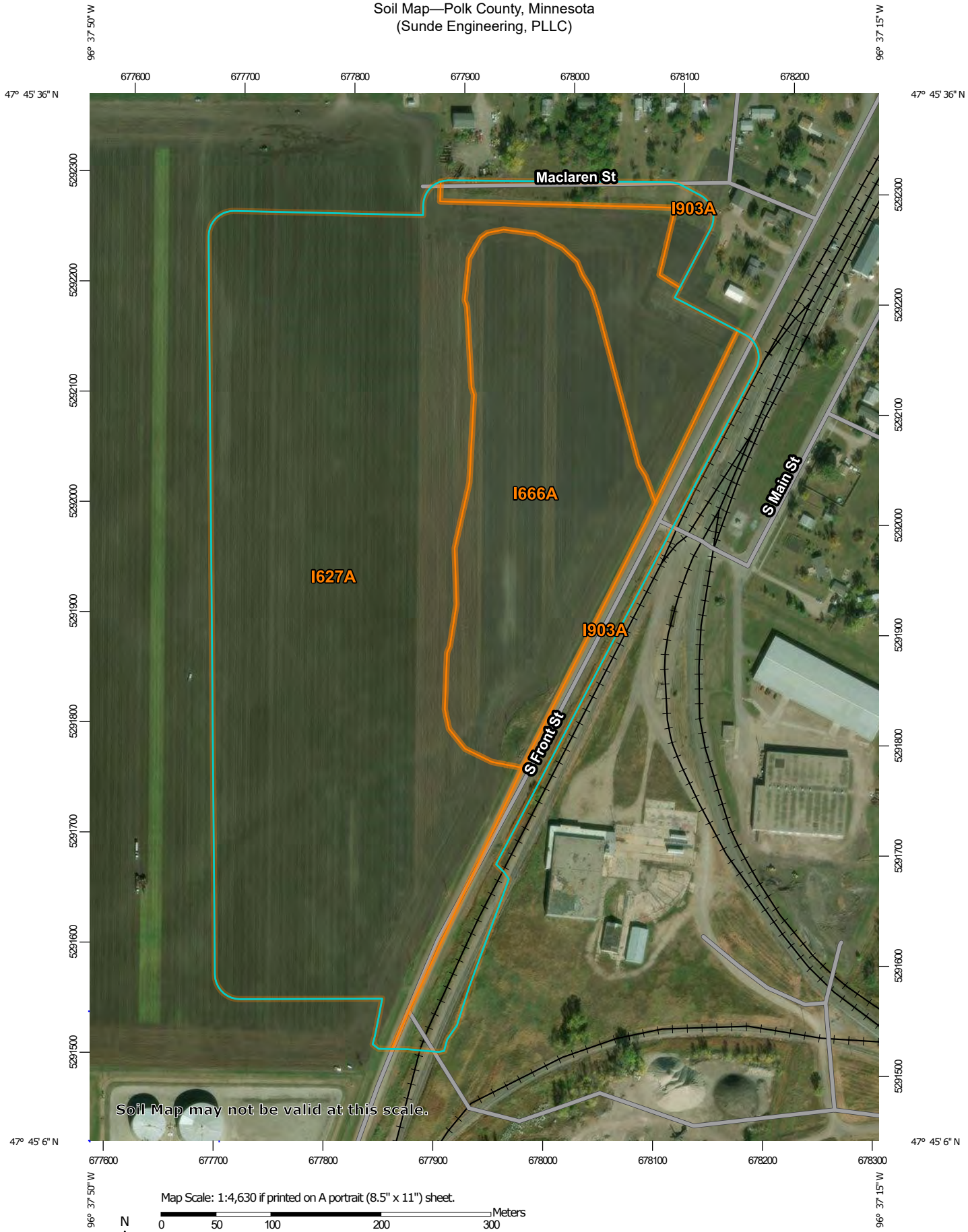
MAR + APR + MAY = **10** (normal)

Sources: Minnesota State Climatology Office- DNR Divison of Ecological and Water Resources
US NOAA- National Weather Service: Advanced Hydrologic Prediction Service

Appendix B

Web Soil Survey Report

Soil Map—Polk County, Minnesota
(Sunde Engineering, PLLC)



Map Scale: 1:4,630 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Polk County, Minnesota
Survey Area Data: Version 15, Jun 10, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 6, 2014—Mar 31, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
I627A	Bearden-Fargo complex, 0 to 2 percent slopes	46.7	68.4%
I666A	Colvin-Perella silty clay loams, 0 to 1 percent slopes	15.0	22.0%
I903A	Urban Land-Aquolls complex, 0 to 2 percent slopes	6.5	9.6%
Totals for Area of Interest		**68.2**	**100.0%**

Appendix C

Offsite Wetland Determination

Off-Site Wetland Determination						
Epitome Energy - Crookston Site						
Investigation Areas			1	2	3	4
Year	Image Source*	Climate Condition (wet, dry, normal; assuming July data)	Hydric Soil Present	Hydric Soil Prsent	Partially Hydric Soil Present	Partially Hydric Soil Present
2017	FSA	Normal	CS	NV	NV	CS
2015	FSA	Normal	NV	NV	NV	NV
2013	FSA	Normal	WS	NV	NV	AP
2012	Google Earth	Wet	SS	SS	SS	NV
2010	FSA	Normal	CS	NC	NC	CS
2009	FSA	Wet	NV	NV	NV	NV
2008	FSA	Normal	NV	NV	NV	NV
2003	FSA	Normal	CS	NV	NV	NV
1991	USGS	Wet	NV	NV	NV	NV
			1	2	3	4
#Normal Yrs.			6	6	6	6
#Normal Yrs with wet signatures			4	1	1	3
% Normal Yrs with wet signatures			67%	17%	17%	50%
Wetland Hydrology ≥ 50% (Y/N)			Yes	No	No	Yes

Legend

2003 Aerial Photograph (Source: MnGEO WMS)

Project Area

Offsite Review Areas

Less than 50% Hydrology Indication

Greater than 50% Hydrology Indication

500 250 0 500 Feet

N

Path: L:\1837\20-500\Pro\Wetland_Delineation\Wetland_Delineation.aprx
7/15/2020 9:14 AM BarZJ1192 Layout: Delineated Wetland Features

SUNDE ENGINEERING, PLLC	WENCK Responsive partner. Exceptional outcomes.	JUL 2020
2003 Aerial Photograph		APP C

2008 Aerial Photograph (Source: MnGEO WMS)
2' LiDAR Contours (Source: MN DNR)

500 250 0 500 Feet

N

Path: L:\1837\20-500\Pro\Wetland_Delineation\Wetland_Delineation.aprx
7/14/2020 3:12 PM BarZJ1192 Layout: Delineated Wetland Features

Legend

- 2' Contours
- Project Area

Offsite Review Areas

- Less than 50% Hydrology Indication
- Greater than 50% Hydrology Indication

SUNDE ENGINEERING, PLLC	WENCK Responsive partner. Exceptional outcomes.	JUL 2020
2008 Aerial Photograph		APP C

2010 Aerial Photograph (Source: MnGEO WMS)
2' LiDAR Contours (Source: MN DNR)

500 250 0 500 Feet

N

Path: L:\1837\20-500\Pro\Wetland_Delineation\Wetland_Delineation.aprx
7/14/2020 3:12 PM BarZJ1192 Layout: Delineated Wetland Features

Legend

- 2' Contours
- Project Area

Offsite Review Areas

- Less than 50% Hydrology Indication
- Greater than 50% Hydrology Indication

SUNDE ENGINEERING, PLLC	WENCK Responsive partner. Exceptional outcomes.	JUL 2020
2010 Aerial Photograph		APP C

2013 Aerial Photograph (Source: MnGEO WMS)
2' LiDAR Contours (Source: MN DNR)

500 250 0 500 Feet

N

Path: L:\1837\20-500\Pro\Wetland_Delineation\Wetland_Delineation.aprx
7/14/2020 3:12 PM BarZJ1192 Layout: Delineated Wetland Features

Legend

- 2' Contours
- Project Area

Offsite Review Areas

- Less than 50% Hydrology Indication
- Greater than 50% Hydrology Indication

SUNDE ENGINEERING, PLLC	WENCK Responsive partner. Exceptional outcomes.	JUL 2020
2013 Aerial Photograph		APP C

2017 Aerial Photograph (Source: MnGEO WMS)
2' LiDAR Contours (Source: MN DNR)

500 250 0 500 Feet

N

Path: L:\1837\20-500\Pro\Wetland_Delineation\Wetland_Delineation.aprx
7/14/2020 3:12 PM BarZJ1192 Layout: Delineated Wetland Features

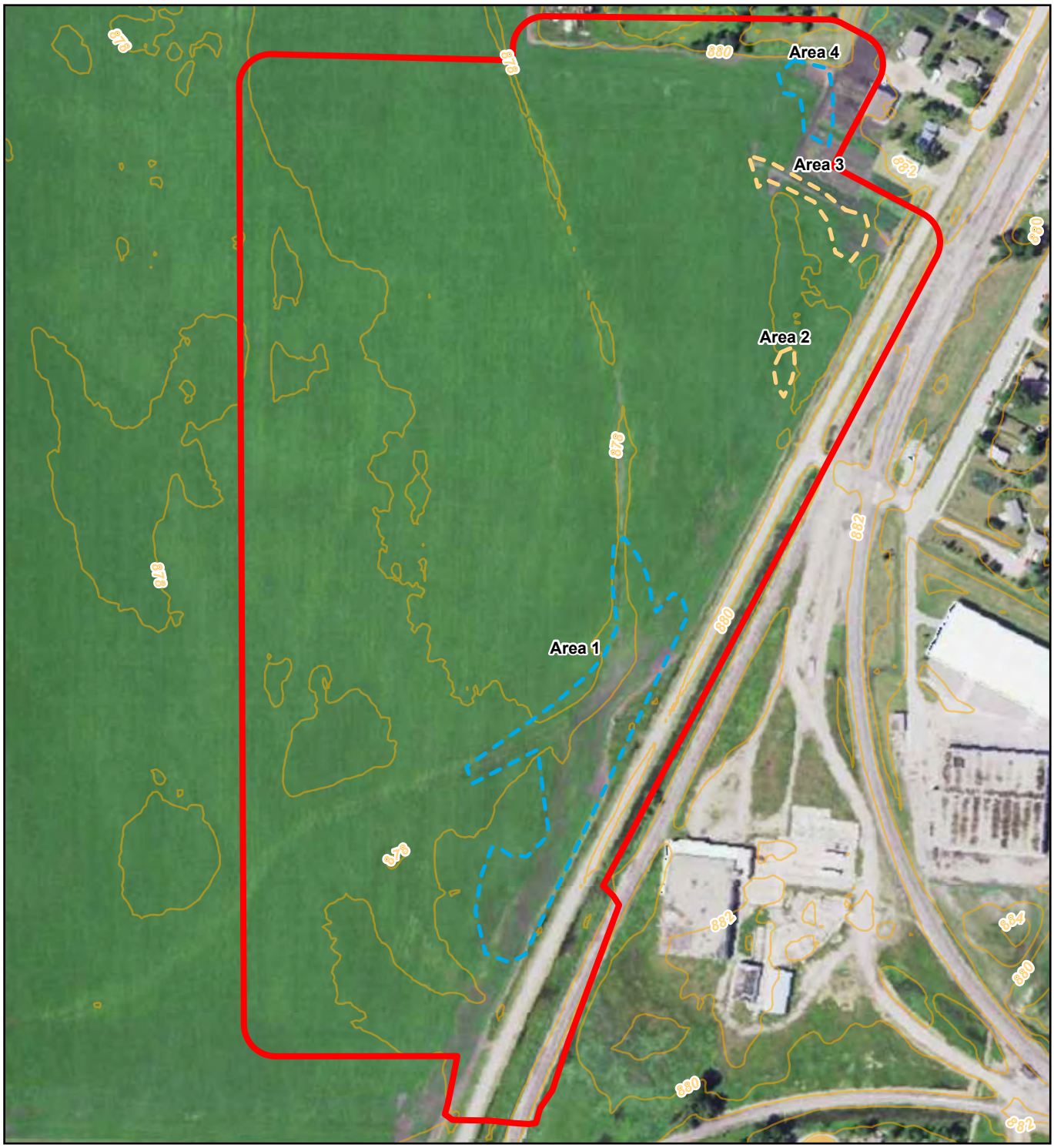
Legend

- 2' Contours
- Project Area

Offsite Review Areas

- Less than 50% Hydrology Indication
- Greater than 50% Hydrology Indication

SUNDE ENGINEERING, PLLC	WENCK Responsive partner. Exceptional outcomes.	JUL 2020
2015 Aerial Photograph		APP C



2017 Aerial Photograph (Source: MnGEO WMS)
2' LiDAR Contours (Source: MN DNR)

500 250 0 500 Feet

N

Path: L:\1837\20-500\Pro\Wetland_Delineation\Wetland_Delineation.aprx
7/14/2020 3:12 PM BarZJ1192 Layout: Delineated Wetland Features

Legend

- 2' Contours
- Project Area

Offsite Review Areas

- Less than 50% Hydrology Indication
- Greater than 50% Hydrology Indication

SUNDE ENGINEERING, PLLC	WENCK Responsive partner. Exceptional outcomes.	JUL 2020
2017 Aerial Photograph		APP C

Appendix E

Field Photographs

Sunde Engineering, PLLC , Crookston
Field Photographs

	**Photo ID: 1** Date Taken: June 16, 2020 Direction Photo is Taken: Northeast Photo Description: Overlooking Wetland 1 on the eastern edge of the project area. Photo was taken near southwest edge of delineated wetland. Note observation of dead vegetation wrack line was used to delineated this wetland.
	**Photo ID: 2** Date Taken: June 16, 2020 Direction Photo is Taken: North Photo Description: Viewing Ditch Wetland 2 east of the sugar beet field.
	**Photo ID: 3** Date Taken: June 16, 2020 Direction Photo is Taken: South Photo Description: Overlooking southern field edge and western upland ditch along S Front St.

Sunde Engineering, PLLC , Crookston
Field Photographs

	**Photo ID: 4** Date Taken: June 16, 2020 Direction Photo is Taken: Southeast Photo Description: Overlooking Wetland 3 where sample point 3W was taken. Photo taken in the northeast corner of the project area.
	**Photo ID: 5** Date Taken: June 16, 2020 Direction Photo is Taken: West Photo Description: Overlooking upland area where sample point 3.2U was taken.
	**Photo ID: 6** Date Taken: June 16, 2020 Direction Photo is Taken: South Photo Description: Overlooking offsite Area 4. Sample point 4U taken near photo.

Sunde Engineering, PLLC , Crookston
Field Photographs

	**Photo ID: 7** Date Taken: June 16, 2020 Direction Photo is Taken: West Photo Description: Overlooking vegetated upland area north of the field.
	**Photo ID: 9** Date Taken: June 16, 2020 Direction Photo is Taken: South Photo Description: Overlooking Ditch Wetland 1 on east edge of the sugar beet field along S Front St.
	**Photo ID: 10** Date Taken: June 16, 2020 Direction Photo is Taken: North Photo Description: Overlooking upland ditch between delineated Ditch Wetland 1 and Ditch Wetland 2 along S Front St.

Sunde Engineering, PLLC , Crookston
Field Photographs

	**Photo ID: 11** Date Taken: June 16, 2020 Direction Photo is Taken: South Photo Description: Overlooking Ditch Wetland 2 where the upland ditch ends and hydrophytes begin.
	**Photo ID: 12** Date Taken: June 16, 2020 Direction Photo is Taken: North Photo Description: Southern end of Ditch Wetland 3 along S Front St.
	**Photo ID: 13** Date Taken: June 16, 2020 Direction Photo is Taken: South Photo Description: Southeastern Boundary of the project area along S Front St. Also overlooking where sample point 6U was taken outside of Ditch Wetland 3.

Sunde Engineering, PLLC , Crookston
Field Photographs

	**Photo ID: 14** Date Taken: June 16, 2020 Direction Photo is Taken: Northwest Photo Description: Overlooking southern portion of Offsite Area 1 which was determined to be upland.
	**Photo ID: 15** Date Taken: June 16, 2020 Direction Photo is Taken: North Photo Description: Overlooking southern portion of Offsite Area 1 which was determined to be upland.
	**Photo ID: 16** Date Taken: June 16, 2020 Direction Photo is Taken: South Photo Description: Overlooking Ditch Wetland 4 on the east side of S Front St. Photo taken near sample points 7U and 7W.

Sunde Engineering, PLLC , Crookston
Field Photographs

	**Photo ID: 17** Date Taken: June 16, 2020 Direction Photo is Taken: North Photo Description: Looking north across Ditch Wetland 4 along northbound S Front S.
	**Photo ID: 18** Date Taken: June 16, 2020 Direction Photo is Taken: South Photo Description: Overlooking Ditch Wetland 4 from the north S Front St. Hydrophytic vegetation is visible.
	**Photo ID: 19** Date Taken: June 16, 2020 Direction Photo is Taken: Southwest Photo Description: Taken near S Front St. looking towards the WSW portion of the project area.

Appendix F

MN Routine Assessment Method (MN RAM) Results

	Date	Wetland name / ID Ditch Wetland 1	Wetland name / ID	Wetland name / ID	Wetland name / ID
	Special Features (from list, p.2--enter letter/s)	-	-	-	-
#1	Community Number (circle each community which represents at least 10% of the wetland)	3A, 3B, 4A, 4B, 7A, 7B, 8A, 8B, 10A, 13A, 13B, 12B, 14A, 15A, 15B, 16A, 16B	3A, 3B, 4A, 4B, 7A, 7B, 8A, 8B, 10A, 13A, 13B, 12B, 14A, 15A, 15B, 16A, 16B	3A, 3B, 4A, 4B, 7A, 7B, 8A, 8B, 10A, 13A, 13B, 12B, 14A, 15A, 15B, 16A, 16B	3A, 3B, 4A, 4B, 7A, 7B, 8A, 8B, 10A, 13A, 13B, 12B, 14A, 15A, 15B, 16A, 16B
#2 & #3	~ Describe each community type individually below ~			~ Describe each community type individually below ~	
Plant Community #1	Community Type (wet meadow, marsh)	16B Seasonally Flooded Basin	- -	- -	- -
	Community Proportion (% of total)	100%			
	Dominant Vegetation / Cover Class	Typha latifolia Persicaria amphibia Apocynum cannabinum Elymus repens			
	Invasive/exotic Vegetation / Cover Class				
	Community Quality (E, H, M, L)	M 0.5	0	0	0
Plant Community #2	Community Type (wet meadow, marsh)	- -	- -	- -	- -
	Community Proportion (% of total)				
	Dominant Vegetation / Cover Class				
	Invasive/exotic Vegetation / Cover Class				
	Community Quality (E, H, M, L)	0	0	0	0
Plant Community #3	Community Type (wet meadow, marsh)	- -	- -	- -	- -
	Community Proportion (% of total)				
	Dominant Vegetation / Cover Class				
	Invasive/exotic Vegetation / Cover Class				
	Community Quality (E, H, M, L)	0	0	0	0
Plant Community #4*	Community Type (wet meadow, marsh)	- -	- -	- -	- -
	Community Proportion (% of total)				
	Dominant Vegetation / Cover Class				
	Invasive/exotic Vegetation / Cover Class				
	Community Quality (E, H, M, L)	- 0	0	0	0
	Circular 39 Types (primary <TAB> others)				
	Cowardin Types				
	Photo ID				
Highest rated community veg. div./integ:		0.5 Medium	0 -	0 -	0 -
Average vegetative diversity/integrity:		0.50 Medium	- -	- -	- -
Weighted Average veg. diversity/integrity:		0.50 Medium	0.00 -	0.00 -	### -
#4	Listed, rare, special plant species?	n Y N	Y N	Y N	Y N
#5	**Rare community or habitat?**	**n Y N**	**Y N**	**Y N**	**Y N**
#6	Pre-European-settlement conditions?	n Y N	Y N	Y N	Y N

Floodplain Forest [1A, 2A, 3A] * Hardwood Swamp [3B] * Coniferous Bog [2A, 4B] * Coniferous Swamp [4B] * Open Bog [1B, 5A, 5B, 6A, 7A, 9A, 10A] * Calcareous Fen [7B, 11B, 14A] * Shrub Swamp [6B] * Alder Thicket [8A] * Shrub-carr [8B] * Sedge Meadow [10B, 11A, 12A, 13A] * Shallow Marsh [13B] * Deep Marsh [12B] * Wet to Wet-Mesic Prairie [14B, 15A] * Fresh (Wet) Meadow [15B] * Shallow, Open Water [9B, 16A] * Seasonally Flooded Basin [16B]

Cover Class	Class Range
1	0 - 3%
2	3 - 10%
3	10 - 25%
4	25 - 50%
5	50 - 75%
6	75 - 100%

*If there are more than four plant community types, use the next column over to enter the rest and do not rely on the automatic average calculations.

MnRAM 3.2 Digital Worksheet, Side 2

	Question Description	User entry	Rating					
	1 Veg. Table 2, Option 4		0.50					
	TOTAL VEG Rating	0.5	Medium					
	4	n	next					
	5	n	next					
	6	n	next					
	7 hydrogeo & topo		#N/A					
	8 Water depth (inches)							
	Water depth (% inundation)							
	9 Local watershed/immedita drainage (acres)							
Digital worksheet, section I	10 Existing wetland size	0.11						
	11 SOILS: Up/Wetland (survey classification + site)							
	12 Outlet characteristics for flood retention	B	0.5					
	13 Outlet characteristics for hydrologic regime	B	0.5					
	14 Dominant upland land use (within 500 ft)	B	0.5	0.5				
	15 Soil condition (wetland)	C	0.1					
	16 Vegetation (% cover)	100%	H	1				
	17 Emerg. veg. flood resistance	B	0.5					
	18 Sediment delivery	B	0.5					
	19 Upland soils (based on soil group)	C	1					
	20 Stormwater runoff pretreatment & detention	A	1	0.1				
	21 Subwatershed wetland density	A	1					
	22 Channels/sheet flow	C	0.1					
	23 Adjacent naturalized buffer average width (feet)	5	L	WQ	0.1	L	0.1	
	24 Adjacent Area Management: % Full	100%	1	1	**1**			
	adjacent area mgmt: % Manicured		0					
	adjacent area mgmt: % Bare	0%	0					
	25 Adjacent Area Diversity & Structure: % Native		0	2	**0.46**			
	adjacent area diversity: % Mixed	90%	0.45					
	adjacent area diversity: % Sparse/Inv./Exotic	10%	0.01					
	26 Adjacent Area Slope: % Gentle	100%	1	1	**1**			
	adjacent area slope: % Moderate		0					
	adjacent area slope: % Steep		0					
	27 Downstream sensitivity/WQ protection	B	0.5					
	28 Nutrient loading	B	0.5					
Digital worksheet, section II	29 Shoreline wetland?	N	N					
	30 Rooted shoreline vegetation (%cover)		Enter a percentage					
	31 Wetland in-water width (in feet, average)		Enter a percentage					
	32 Emergent vegetation erosion resistance		Enter valid choice					
	33 Shoreline erosion potential		Enter valid ch					
	34 Bank protection/upslope veg.		Enter valid choice					
	35 Rare Wildlife	N	N					
	36 Scarce/Rare/S1/S2 local community	N	N					
	37 Vegetation interspersion cover (see diagram 1)	N/A	N/A	N/A				
	38 Community interspersion (see diagram 2)	N/A	N/A	N/A			0	
	39 Wetland detritus	B	0.5					
	40 Wetland interspersion on landscape	B	0.5	0.5				
	41 Wildlife barriers	B	0.5					
	42 Amphibian breeding potential-hydroperiod	A	1					
	43 Amphibian breeding potential--fish presence	A	1					
	44 Amphibian & reptile overwintering habitat	N/A	0					
	45 Wildlife species (list)							
	46 Fish habitat quality	N/A	N/A					
	47 Fish species (list)							
	48 Unique/rare educ./cultural/rec.opportunity	N	N					
	49 Wetland visibility	C	0.1					
	50 Proximity to population	Y	1					
	51 Public ownership	C	0.1					
	52 Public access	N	er valid choice					
	53 Human influence on wetland	C	0.1					
	54 Human influence on viewshed	C	0.1					
	55 Spatial buffer	C	0.1					
	56 Recreational activity potential	C	0.1					
	57 Commercial crop--hydrologic impact	C	0.1					
	58 *GW - Wetland soils*	R	R or D	0.1				
	59 *GW - Subwatershed land use*	D	R or D	1				
	60 *GW - Wetland size and soil group*	R	R or D	0.1				
	61 GW - Wetland hydroperiod	R	R or D	0.1				
	62 GW - Inlet/Outlet configuration	R	R or D	0.1				
	63 GW - Surrounding upland topographic relief	D	R or D	1				
	64 Restoration potential w/o flooding	Y	Y or N	2.4				
	65 *Landowners affected by restoration*	1	*E a b c*	Enter valid choice				
Additional questions	66A *Existing wetland size (acres) [from #10]*	0.11						
	66B Total wetland restoration size (acres)	0.11	acres	0.1				
	66C (Calculated) Potential New Wetland Area [B-A]	0	acres	% effectively drained:	0%			
	67 Average width of naturalized upland buffer (potenti	125	feet	1	value:	0.1		
	68 Likelihood of restoration success	c	a b c	0.1				
	69 Hydrologic alteration type	Filling	Outlet, Tile, Ditch, GW pump, Wtrshd div., Filling					
	70 Potential wetland type (Circ. 39)	1, 2	5, 6, 7, 8					
	71 Wetland sensitivity to stormwater	C	E a b c					
	72 Additional stormwater treatment needs	A						

Highest-rated: 0.5

This comes in from Side 1 automatically using the weighted average. To use the highest rated veg. Community rating, please manually overwrite that value (shown to the right) into the field at E5.

Enter data starting here. Yellow boxes are used in calculations.

Scroll down to answer more questions and see formula calculations

Functional Rating Summaries	Function Name	Raw score	Final Rating	Rating Category	Formula shown to the right.
	Vegetative Diversity/Integrity		0.50	Med	
	Hydrology - Characteristic		0.30	Low	
	Flood Attenuation		0.62	Med	
	Water Quality--Downstream		0.64	Med	
	Water Quality--Wetland		0.47	Med	
	Shoreline Protection		N/A	N/A	
	Characteristic Wildlife Habitat Structure	0.45	0.45	Med	
	Maintenance of Characteristic Fish Habitat	#VALUE!	N/A	N/A	
	Maintenance of Characteristic Amphibian Habitat		0.22	Low	
	Aesthetics/Recreation/Education/Cultural	#VALUE!	#VALUE!	#VALUE!	
	Commercial use		0.10	Low	0.1
	Special Features listing:		-		

Groundwater Interaction: indeterminate GW source
Groundwater Functional Index: no spec al nd cators
Restoration Potential (draft formula): #VALUE! #VALUE!
Stormwater Sensitivity (not active)

These are supplemental Lookup Tables and Intermediary formulas:

Hydrogeology and Topography LookUp

I	Depressional/Isolated
FT	Depress't/Flow-through
Trib	Depress't/Tributary
R	Riverine
Lac	Lacustrine
Peat	Peatland
Flood	Floodplain
S	Slope
O	Other

Habitat n/a formulator

E49	1.00	"=IF(E49="n/a",1,0)"
E50	1.50	"=IF(E50="n/a",1.5,0)"
E51	0.00	"=IF(E51="n/a",2,0)"
Add	2.50	

Open Water Interspersion LookUp

CC	Rtg	Ltr
1	0.1	L
2	0.1	L
3	0.5	M
4	0.5	M
5	1	H
6	0.5	M
7	1	H
8	0.1	L
N/A	N/A	N/A
-	"Pick an example from the image"	

Community Interspersion LookUp

1	L	0.1
2	M	0.5
3	H	1
4	H	1
N/A	N/A	N/A
-	"Pick an example from the image"	

Vegetative formula
"=C4", the Weighted Average Option 4 from Veg. Worksheet

Characteristic Hydrology formula
"=(E17+E18+E19+F24)/4" F24 is the reverse rating

These are the formulas for the f inal functional ratings shown at the

Flood Attenuation Formula breakout (not linked to D72) (E16 is reverse rated)

n/a	formula is:	
none	0.616667	((E16+(F18+E23)/2+(E19+E22)/2+(E24+E25)/2+(F20+E21+E26)/3)/5)
flood outlet	0.645833	((F18+E23)/2+(E19+E22)/2+(E24+E25)/2+(F20+E21+E26)/3)/4
F-T	0.53	((E16+(F18+E23)/2+(E19+E22)/2+(E24+E25)/2+ E26)/5)
both	0.5375	((F18+E23)/2+(E19+E22)/2+(E24+E25)/2+ E26)/4

Water Quality--Wetland
"=(D6*2+E18+F24+(G27+G28+G34)/3+E22+E40)/7"

Shoreline Protection
"=IF(E41="y",((E42+E43+E44+E45+E46)/5),"N/A")"

N/A	H38	=	**Habitat formula breakout/lookup (E22 is RR) Special Features Bump is below.**
none	0	#VALUE!	(D6*2+E51+F49+F50+E52+E53+(I27+G28+G31)/3+E17+F24)/10
49	1	#VALUE!	(D6*2+E51+ F50+E52+E53+(I27+G28+G31)/3+E17+F24)/9
50	1.5	#VALUE!	(D6*2+E51+F49+ E52+E53+(I27+G28+G31)/3+E17+F24)/9
51	2	#VALUE!	(D6*2+ F49+F50+E52+E53+(I27+G28+G31)/3+E17+F24)/9
49&50	2.5	0.4525	(D6*2+E51+ E52+E53+(I27+G28+G31)/3+E17+F24)/8
49&51	3	#VALUE!	(D6*2+ F50+E52+E53+(I27+G28+G31)/3+E17+F24)/8
50&51	3.5	#VALUE!	(D6*2+ F49+ E52+E53+(I27+G28+G31)/3+E17+F24)/8
49&50&51	4.5	0.445714	(D6*2+ E52+E53+(I27+G28+G31)/3+E17+F24)/7

Characteristic Fish Habitat formula
"=IF(D41="Y",((E58*2+G28+E22+F24+E40+E43+E42+F45)/9),((E58*2+G28+E22+F24+E40)/6))"

Characteristic Amphibian Habitat formula (see Lookup breakout below)
E112=VLOOKUP(E54,T116:U117,2,FALSE)

Amphibian Habitat Formula Breakout

0	0.00	Amphibian breeding is controlling factor
1	0.22	"=((E55)*(E56+(I27*2)+E53+E18+F24)/6)"

Aesthetics/Rec/Ed/Cultural formula
"IF(E65=".1",(E62+E63+E64+2*E65+E66+E67+E68)/8,(E61+E62+E63+E64+E65+E66+E67+E68)/8)"

"=E69" **Commercial use** reflects just the rating for the question.

Special Features Bump-up reference table

a		Fish Habitat=E
b		Veg=E
c		Aesthetics=E
d	n	AND #5=Y, then Wildlife=E
g		Wildlife/Fish=E
h		Aesthetics=E
I		Veg=E
j	N	AND #35 =Y, Wildlife=E
q	nate G	GW=recharge, GW=E
r	nate G	Y and GW=recharge, GW=E
u		Aesthetics=E

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF
138																			**Recharge/Discharge Tendency**												
139																			R	0.1											
140																			D	1											
141																			-	Enter "R" or "D"											

	Date	Wetland name / ID: Ditch Wetland 2	Wetland name / ID	Wetland name / ID	Wetland name / ID
	Special Features (from list, p.2--enter letter/s)	-	-	-	-
#1	Community Number (circle each community which represents at least 10% of the wetland)	3A, 3B, 4A, 4B, 7A, 7B, 8A, 8B, 10A, 13A, 13B, 12B, 14A, 15A, 15B, 16A, 16B	3A, 3B, 4A, 4B, 7A, 7B, 8A, 8B, 10A, 13A, 13B, 12B, 14A, 15A, 15B, 16A, 16B	3A, 3B, 4A, 4B, 7A, 7B, 8A, 8B, 10A, 13A, 13B, 12B, 14A, 15A, 15B, 16A, 16B	3A, 3B, 4A, 4B, 7A, 7B, 8A, 8B, 10A, 13A, 13B, 12B, 14A, 15A, 15B, 16A, 16B
#2 & #3	~ Describe each community type individually below ~			~ Describe each community type individually below ~	
Plant Community #1	Community Type (wet meadow, marsh)	16B Seasonally Flooded Basin	- -	- -	- -
	Community Proportion (% of total)	100%			
	Dominant Vegetation / Cover Class	Phalaris arundinacea Spartina pectinata			
	Invasive/exotic Vegetation / Cover Class				
	Community Quality (E, H, M, L)	M 0.5	0	0	0
Plant Community #2	Community Type (wet meadow, marsh)	- -	- -	- -	- -
	Community Proportion (% of total)				
	Dominant Vegetation / Cover Class				
	Invasive/exotic Vegetation / Cover Class				
	Community Quality (E, H, M, L)	0	0	0	0
Plant Community #3	Community Type (wet meadow, marsh)	- -	- -	- -	- -
	Community Proportion (% of total)				
	Dominant Vegetation / Cover Class				
	Invasive/exotic Vegetation / Cover Class				
	Community Quality (E, H, M, L)	0	0	0	0
Plant Community #4*	Community Type (wet meadow, marsh)	- -	- -	- -	- -
	Community Proportion (% of total)				
	Dominant Vegetation / Cover Class				
	Invasive/exotic Vegetation / Cover Class				
	Community Quality (E, H, M, L)	- 0	0	0	0
	Circular 39 Types (primary <TAB> others)				
	Cowardin Types				
	Photo ID				
Highest rated community veg. div./integ:		0.5 Medium	0 -	0 -	0 -
Average vegetative diversity/integrity:		0.50 Medium	- -	- -	- -
Weighted Average veg. diversity/integrity:		0.50 Medium	0.00 -	0.00 -	### -
#4	Listed, rare, special plant species?	n Y N	Y N	Y N	Y N
#5	**Rare community or habitat?**	**n Y N**	**Y N**	**Y N**	**Y N**
#6	Pre-European-settlement conditions?	n Y N	Y N	Y N	Y N

Floodplain Forest [1A, 2A, 3A] * Hardwood Swamp [3B] * Coniferous Bog [2A, 4B] * Coniferous Swamp [4B] * Open Bog [1B, 5A, 5B, 6A, 7A, 9A, 10A] * Calcareous Fen [7B, 11B, 14A] * Shrub Swamp [6B] * Alder Thicket [8A] * Shrub-carr [8B] * Sedge Meadow [10B, 11A, 12A, 13A] * Shallow Marsh [13B] * Deep Marsh [12B] * Wet to Wet-Mesic Prairie [14B, 15A] * Fresh (Wet) Meadow [15B] * Shallow, Open Water [9B, 16A] * Seasonally Flooded Basin [16B]

*If there are more than four plant community types, use the next column over to enter the rest and do not rely on the automatic average calculations.

Cover Class	Class Range
1	0 - 3%
2	3 - 10%
3	10 - 25%
4	25 - 50%
5	50 - 75%
6	75 - 100%

MnRAM 3.2 Digital Worksheet, Side 2

	Question Description	User entry	Rating			
1	Veg. Table 2, Option 4		0.50			
	TOTAL VEG Rating	0.5	Medium			
4		n	next			
5		n	next			
6		n	next			
7	hydrogeo & topo		#N/A			
8	Water depth (inches)					
	Water depth (% inundation)					
9	Local watershed/immedita drainage (acres)					
10	Existing wetland size	0.07				
11	SOILS: Up/Wetland (survey classification + site)					
12	Outlet characteristics for flood retention	B	0.5			
13	Outlet characteristics for hydrologic regime	B	0.5			
14	Dominant upland land use (within 500 ft)	B	0.5	0.5		
15	Soil condition (wetland)	C	0.1			
16	Vegetation (% cover)	100%	H	1		
17	Emerg. veg. flood resistance	B	0.5			
18	Sediment delivery	B	0.5			
19	Upland soils (based on soil group)	C	1			
20	Stormwater runoff pretreatment & detention	A	1	0.1		
21	Subwatershed wetland density	A	1			
22	Channels/sheet flow	C	0.1			
23	Adjacent naturalized buffer average width (feet)	5	L	WQ	0.1 L	0.1
24	Adjacent Area Management: % Full	100%	1	1	**1**	
	adjacent area mgmt: % Manicured		0			
	adjacent area mgmt: % Bare	0%	0			
25	Adjacent Area Diversity & Structure: % Native		0	2	**0.46**	
	adjacent area diversity: % Mixed	90%	0.45			
	adjacent area diversity: % Sparse/Inv./Exotic	10%	0.01			
26	Adjacent Area Slope: % Gentle	100%	1	1	**1**	
	adjacent area slope: % Moderate		0			
	adjacent area slope: % Steep		0			
27	Downstream sensitivity/WQ protection	B	0.5			
28	Nutrient loading	B	0.5			
29	Shoreline wetland?	N	N			
30	Rooted shoreline vegetation (%cover)		Enter a percentage			
31	Wetland in-water width (in feet, average)		Enter a percentage			
32	Emergent vegetation erosion resistance		Enter valid choice			
33	Shoreline erosion potential		Enter valid ch			
34	Bank protection/upslope veg.		Enter valid choice			
35	Rare Wildlife	N	N			
36	Scarce/Rare/S1/S2 local community	N	N			
37	Vegetation interspersion cover (see diagram 1)	N/A	N/A	N/A		
38	Community interspersion (see diagram 2)	N/A	N/A	N/A		0
39	Wetland detritus	B	0.5			
40	Wetland interspersion on landscape	B	0.5	0.5		
41	Wildlife barriers	B	0.5			
42	Amphibian breeding potential-hydroperiod	A	1			
43	Amphibian breeding potential--fish presence	A	1			
44	Amphibian & reptile overwintering habitat	N/A	0			
45	Wildlife species (list)					
46	Fish habitat quality	N/A	N/A			
47	Fish species (list)					
48	Unique/rare educ./cultural/rec.opportunity	N	N			
49	Wetland visibility	C	0.1			
50	Proximity to population	Y	1			
51	Public ownership	C	0.1			
52	Public access	N	er valid choice			
53	Human influence on wetland	C	0.1			
54	Human influence on viewshed	C	0.1			
55	Spatial buffer	C	0.1			
56	Recreational activity potential	C	0.1			
57	Commercial crop--hydrologic impact	C	0.1			
58	*GW - Wetland soils*	R	R or D	0.1		
59	*GW - Subwatershed land use*	D	R or D	1		
60	*GW - Wetland size and soil group*	R	R or D	0.1		
61	GW - Wetland hydroperiod	R	R or D	0.1		
62	GW - Inlet/Outlet configuration	R	R or D	0.1		
63	GW - Surrounding upland topographic relief	D	R or D	1		
64	Restoration potential w/o flooding	Y	Y or N	2.4		
65	*Landowners affected by restoration*	1	*E a b c*	Enter valid choice		
66A	*Existing wetland size (acres) [from #10]*	0.07				
66B	Total wetland restoration size (acres)	0.07	__ acres	0.1		
66C	(Calculated) Potential New Wetland Area [B-A]	0	__ acres	% effectively drained:		0%
67	Average width of naturalized upland buffer (potenti	125	feet	1	value:	0.1
68	Likelihood of restoration success	c	a b c	0.1		
69	Hydrologic alteration type	Filling	Outlet, Tile, Ditch, GW pump, Wtrshd div., Filling			
70	Potential wetland type (Circ. 39)	1, 2	5, 6, 7, 8			
71	Wetland sensitivity to stormwater	C	E a b c			
72	Additional stormwater treatment needs	A				

Digital worksheet, section I

Digital worksheet, section II

Additional questions

This comes in from Side 1 automatically using the weighted average. To use the highest rated veg. Community rating, please manually overwrite that value (shown to the right) into the field at E5.

Highest-rated: 0.5

Enter data starting here. Yellow boxes are used in calculations.

Scroll down to answer more questions and see formula calculations

Functional Rating Summaries

Function Name	Raw score	Final Rating	Rating Category
Vegetative Diversity/Integrity		0.50	Med
Hydrology - Characteristic		0.30	Low
Flood Attenuation		0.62	Med
Water Quality--Downstream		0.64	Med
Water Quality--Wetland		0.47	Med
Shoreline Protection		N/A	N/A
Characteristic Wildlife Habitat Structure	0.45	0.45	Med
Maintenance of Characteristic Fish Habitat	#VALUE!	N/A	N/A
Maintenance of Characteristic Amphibian Habitat		0.22	Low
Aesthetics/Recreation/Education/Cultural	#VALUE!	#VALUE!	#VALUE!
Commercial use		0.10	Low
Special Features listing:		-	

Formula shown to the right.

Groundwater Interaction	indeterminate GW source	
Groundwater Functional Index	no spec al nd cators	
Restoration Potential (draft formula)	#VALUE!	#VALUE!
Stormwater Sensitivity (not active)		

These are the formulas for the f inal functional ratings shown at the

These are supplemental Lookup Tables and Intermediary formulas:

Hydrogeology and Topography LookUp

I	Depressional/Isolated
FT	Depress'l/Flow-through
Trib	Depress'l/Tributary
R	Riverine
Lac	Lacustrine
Peat	Peatland
Flood	Floodplain
S	Slope
O	Other

Habitat n/a formulator

E49	1.00	"=IF(E49="n/a",1,0)"
E50	1.50	"=IF(E50="n/a",1.5,0)"
E51	0.00	"=IF(E51="n/a",2,0)"
Add	2.50	

Open Water Interspersion LookUp

CC	Rtg	Ltr
1	0.1	L
2	0.1	L
3	0.5	M
4	0.5	M
5	1	H
6	0.5	M
7	1	H
8	0.1	L
N/A	N/A	N/A
-	"Pick an example from the image"	

Community Interspersion LookUp

1	L	0.1
2	M	0.5
3	H	1
4	H	1
N/A	N/A	N/A
-	"Pick an example from the image"	

Vegetative formula
"=C4", the Weighted Average Option 4 from Veg. Worksheet

Characteristic Hydrology formula
"=(E17+E18+E19+F24)/4" F24 is the reverse rating

Flood Attenuation Formula breakout (not linked to D72) (E16 is reverse rated)

n/a	formula is:	
none	0.616667	((E16+(F18+E23)/2+(E19+E22)/2+(E24+E25)/2+(F20+E21+E26)/3)/5)
flood outlet	0.645833	((F18+E23)/2+(E19+E22)/2+(E24+E25)/2+(F20+E21+E26)/3)/4
F-T	0.53	((E16+(F18+E23)/2+(E19+E22)/2+(E24+E25)/2+ E26)/5)
both	0.5375	((F18+E23)/2+(E19+E22)/2+(E24+E25)/2+ E26)/4

Water Quality--Wetland
"=(D6*2+E18+F24+(G27+G28+G34)/3+E22+E40)/7"

Shoreline Protection
"=IF(E41="y",((E42+E43+E44+E45+E46)/5),"N/A")"

N/A	H38	=	**Habitat formula breakout/lookup (E22 is RR) Special Features Bump is below.**
none	0	#VALUE!	(D6*2+E51+F49+F50+E52+E53+(I27+G28+G31)/3+E17+F24)/10
49	1	#VALUE!	(D6*2+E51+ F50+E52+E53+(I27+G28+G31)/3+E17+F24)/9
50	1.5	#VALUE!	(D6*2+E51+F49+ E52+E53+(I27+G28+G31)/3+E17+F24)/9
51	2	#VALUE!	(D6*2+ F49+F50+E52+E53+(I27+G28+G31)/3+E17+F24)/9
49&50	2.5	0.4525	(D6*2+E51+ E52+E53+(I27+G28+G31)/3+E17+F24)/8
49&51	3	#VALUE!	(D6*2+ F50+E52+E53+(I27+G28+G31)/3+E17+F24)/8
50&51	3.5	#VALUE!	(D6*2+ F49+ E52+E53+(I27+G28+G31)/3+E17+F24)/8
49&50&51	4.5	0.445714	(D6*2+ E52+E53+(I27+G28+G31)/3+E17+F24)/7

Characteristic Fish Habitat formula
"=IF(D41="Y",((E58*2+G28+E22+F24+E40+E43+E42+F45)/9),((E58*2+G28+E22+F24+E40)/6))"

Characteristic Amphibian Habitat formula (see Lookup breakout below)
E112=VLOOKUP(E54,T116:U117,2,FALSE)

Amphibian Habitat Formula Breakout

0	0.00	Amphibian breeding is controlling factor
1	0.22	"=((E55)*(E56+(I27*2)+E53+E18+F24)/6)"

Aesthetics/Rec/Ed/Cultural formula
"IF(E65=".1",(E62+E63+E64+2*E65+E66+E67+E68)/8,(E61+E62+E63+E64+E65+E66+E67+E68)/8)"

"=E69" **Commercial use** reflects just the rating for the question.

Special Features Bump-up reference table

a		Fish Habitat=E
b		Veg=E
c		Aesthetics=E
d	n	AND #5=Y, then Wildlife=E
g		Wildlife/Fish=E
h		Aesthetics=E
I		Veg=E
i	N	AND #35 =Y, Wildlife=E
q	nate G	GW=recharge, GW=E
r	nate G	Y and GW=recharge, GW=E
u		Aesthetics=E

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF
138																			**Recharge/Discharge Tendency**												
139																			R	0.1											
140																			D	1											
141																			-	Enter "R" or "D"											

	Date	Wetland name / ID Ditch Wetland 3	Wetland name / ID	Wetland name / ID	Wetland name / ID
	Special Features (from list, p.2--enter letter/s)	-	-	-	-
#1	Community Number (circle each community which represents at least 10% of the wetland)	3A, 3B, 4A, 4B, 7A, 7B, 8A, 8B, 10A, 13A, 13B, 12B, 14A, 15A, 15B, 16A, 16B	3A, 3B, 4A, 4B, 7A, 7B, 8A, 8B, 10A, 13A, 13B, 12B, 14A, 15A, 15B, 16A, 16B	3A, 3B, 4A, 4B, 7A, 7B, 8A, 8B, 10A, 13A, 13B, 12B, 14A, 15A, 15B, 16A, 16B	3A, 3B, 4A, 4B, 7A, 7B, 8A, 8B, 10A, 13A, 13B, 12B, 14A, 15A, 15B, 16A, 16B
#2 & #3	~ Describe each community type individually below ~			~ Describe each community type individually below ~	
Plant Community #1	Community Type (wet meadow, marsh)	16B Seasonally Flooded Basin	- -	- -	- -
	Community Proportion (% of total)	100%			
	Dominant Vegetation / Cover Class	Phalaris arundinacea Spartina pectinata			
	Invasive/exotic Vegetation / Cover Class				
	Community Quality (E, H, M, L)	M 0.5	0	0	0
Plant Community #2	Community Type (wet meadow, marsh)	- -	- -	- -	- -
	Community Proportion (% of total)				
	Dominant Vegetation / Cover Class				
	Invasive/exotic Vegetation / Cover Class				
	Community Quality (E, H, M, L)	0	0	0	0
Plant Community #3	Community Type (wet meadow, marsh)	- -	- -	- -	- -
	Community Proportion (% of total)				
	Dominant Vegetation / Cover Class				
	Invasive/exotic Vegetation / Cover Class				
	Community Quality (E, H, M, L)	0	0	0	0
Plant Community #4*	Community Type (wet meadow, marsh)	- -	- -	- -	- -
	Community Proportion (% of total)				
	Dominant Vegetation / Cover Class				
	Invasive/exotic Vegetation / Cover Class				
	Community Quality (E, H, M, L)	- 0	0	0	0
	Circular 39 Types (primary <TAB> others)				
	Cowardin Types				
	Photo ID				
Highest rated community veg. div./integ:		0.5 Medium	0 -	0 -	0 -
Average vegetative diversity/integrity:		0.50 Medium	- -	- -	- -
Weighted Average veg. diversity/integrity:		0.50 Medium	0.00 -	0.00 -	### -
#4	Listed, rare, special plant species?	n Y N	Y N	Y N	Y N
#5	**Rare community or habitat?**	**n Y N**	**Y N**	**Y N**	**Y N**
#6	Pre-European-settlement conditions?	n Y N	Y N	Y N	Y N

Floodplain Forest [1A, 2A, 3A] * Hardwood Swamp [3B] * Coniferous Bog [2A, 4B] * Coniferous Swamp [4B] * Open Bog [1B, 5A, 5B, 6A, 7A, 9A, 10A] * Calcareous Fen [7B, 11B, 14A] * Shrub Swamp [6B] * Alder Thicket [8A] * Shrub-carr [8B] * Sedge Meadow [10B, 11A, 12A, 13A] * Shallow Marsh [13B] * Deep Marsh [12B] * Wet to Wet-Mesic Prairie [14B, 15A] * Fresh (Wet) Meadow [15B] * Shallow, Open Water [9B, 16A] * Seasonally Flooded Basin [16B]

*If there are more than four plant community types, use the next column over to enter the rest and do not rely on the automatic average calculations.

Cover Class	Class Range
1	0 - 3%
2	3 - 10%
3	10 - 25%
4	25 - 50%
5	50 - 75%
6	75 - 100%

MnRAM 3.2 Digital Worksheet, Side 2

	Question Description	User entry	Rating				
	1 Veg. Table 2, Option 4		0.50				
	TOTAL VEG Rating	0.5	Medium				
	4	n	next				
	5	n	next				
	6	n	next				
	7 hydrogeo & topo		#N/A				
	8 Water depth (inches)						
	Water depth (% inundation)						
	9 Local watershed/immedita drainage (acres)						
	10 Existing wetland size	0.16					
	11 SOILS: Up/Wetland (survey classification + site)						
Digital worksheet, section I	12 Outlet characteristics for flood retention	B	0.5				
	13 Outlet characteristics for hydrologic regime	B	0.5				
	14 Dominant upland land use (within 500 ft)	B	0.5	0.5			
	15 Soil condition (wetland)	C	0.1				
	16 Vegetation (% cover)	100%	H	1			
	17 Emerg. veg. flood resistance	B	0.5				
	18 Sediment delivery	B	0.5				
	19 Upland soils (based on soil group)	C	1				
	20 Stormwater runoff pretreatment & detention	A	1	0.1			
	21 Subwatershed wetland density	A	1				
	22 Channels/sheet flow	C	0.1				
	23 Adjacent naturalized buffer average width (feet)	5	L	WQ	0.1	L	0.1
	24 Adjacent Area Management: % Full	100%	1	1	**1**		
	adjacent area mgmt: % Manicured		0				
	adjacent area mgmt: % Bare	0%	0				
	25 Adjacent Area Diversity & Structure: % Native	30%	0.3	3	**0.49**		
	adjacent area diversity: % Mixed	30%	0.15				
	adjacent area diversity: % Sparse/Inv./Exotic	40%	0.04				
	26 Adjacent Area Slope: % Gentle	100%	1	1	**1**		
	adjacent area slope: % Moderate		0				
	adjacent area slope: % Steep		0				
Digital worksheet, section II	27 Downstream sensitivity/WQ protection	B	0.5				
	28 Nutrient loading	B	0.5				
	29 Shoreline wetland?	N	N				
	30 Rooted shoreline vegetation (%cover)		Enter a percentage				
	31 Wetland in-water width (in feet, average)		Enter a percentage				
	32 Emergent vegetation erosion resistance		Enter valid choice				
	33 Shoreline erosion potential		Enter valid ch				
	34 Bank protection/upslope veg.		Enter valid choice				
	35 Rare Wildlife	N	N				
	36 Scarce/Rare/S1/S2 local community	N	N				
	37 Vegetation interspersion cover (see diagram 1)	n/a	N/A	N/A			
	38 Community interspersion (see diagram 2)	N/A	N/A	N/A			0
	39 Wetland detritus	B	0.5				
	40 Wetland interspersion on landscape	B	0.5	0.5			
	41 Wildlife barriers	B	0.5				
	42 Amphibian breeding potential-hydroperiod	A	1				
	43 Amphibian breeding potential--fish presence	A	1				
	44 Amphibian & reptile overwintering habitat	N/A	0				
	45 Wildlife species (list)						
	46 Fish habitat quality	N/A	N/A				
	47 Fish species (list)						
	48 Unique/rare educ./cultural/rec.opportunity	N	N				
	49 Wetland visibility	C	0.1				
	50 Proximity to population	Y	1				
	51 Public ownership	C	0.1				
	52 Public access	N	er valid choice				
	53 Human influence on wetland	C	0.1				
	54 Human influence on viewshed	C	0.1				
	55 Spatial buffer	C	0.1				
	56 Recreational activity potential	C	0.1				
	57 Commercial crop--hydrologic impact	C	0.1				
Additional questions	58 *GW - Wetland soils*	R	R or D	0.1			
	59 *GW - Subwatershed land use*	D	R or D	1			
	60 *GW - Wetland size and soil group*	R	R or D	0.1			
	61 GW - Wetland hydroperiod	R	R or D	0.1			
	62 GW - Inlet/Outlet configuration	R	R or D	0.1			
	63 GW - Surrounding upland topographic relief	D	R or D	1			
	64 Restoration potential w/o flooding	Y	Y or N	2.4			
	65 *Landowners affected by restoration*	1	*E a b c*	Enter valid choice			
	66A *Existing wetland size (acres) [from #10]*	0.16					
	66B Total wetland restoration size (acres)	0.16	acres	0.1			
	66C (Calculated) Potential New Wetland Area [B-A]	0	acres	% effectively drained:			0%
	67 Average width of naturalized upland buffer (potenti	125	feet	1	value:		0.1
	68 Likelihood of restoration success	c	a b c	0.1			
	69 Hydrologic alteration type	Filling	Outlet, Tile, Ditch, GW pump, Wtrshd div., Filling				
	70 Potential wetland type (Circ. 39)	1, 2	5, 6, 7, 8				
	71 Wetland sensitivity to stormwater	C	E a b c				
	72 Additional stormwater treatment needs	A					

This comes in from Side 1 automatically using the weighted average. To use the highest rated veg. Community rating, please manually overwrite that value (shown to the right) into the field at E5.

Highest-rated: 0.5

Enter data starting here. Yellow boxes are used in calculations.

Scroll down to answer more questions and see formula calculations

These are supplemental Lookup Tables and Intermediary formulas:

Hydrogeology and Topography LookUp

I	Depressional/Isolated
FT	Depress't/Flow-through
Trib	Depress't/Tributary
R	Riverine
Lac	Lacustrine
Peat	Peatland
Flood	Floodplain
S	Slope
O	Other

Habitat n/a formulator

E49	1.00	"=IF(E49="n/a",1,0)"
E50	1.50	"=IF(E50="n/a",1.5,0)"
E51	0.00	"=IF(E51="n/a",2,0)"
Add	2.50	

Open Water Interspersion LookUp

CC	Rtg	Ltr
1	0.1	L
2	0.1	L
3	0.5	M
4	0.5	M
5	1	H
6	0.5	M
7	1	H
8	0.1	L
N/A	N/A	N/A
-	"Pick an example from the image"	

Community Interspersion LookUp

1	L	0.1
2	M	0.5
3	H	1
4	H	1
N/A	N/A	N/A
-	"Pick an example from the image"	

Vegetative formula
"=C4", the Weighted Average Option 4 from Veg. Worksheet

Characteristic Hydrology formula
"=(E17+E18+E19+F24)/4" F24 is the reverse rating

Flood Attenuation Formula breakout (not linked to D72) (E16 is reverse rated)

n/a		formula is:
none	0.616667	((E16+(F18+E23)/2+(E19+E22)/2+(E24+E25)/2+(F20+E21+E26)/3)/5)
flood outlet	0.645833	((F18+E23)/2+(E19+E22)/2+(E24+E25)/2+(F20+E21+E26)/3)/4
F-T	0.53	((E16+(F18+E23)/2+(E19+E22)/2+(E24+E25)/2+ E26)/5)
both	0.5375	((F18+E23)/2+(E19+E22)/2+(E24+E25)/2+ E26)/4

These are the formulas for the f inal functional ratings shown at the

Function Name	Raw score	Final Rating	Rating Category	Formula shown to the right.
Vegetative Diversity/Integrity		0.50	Med	
Hydrology - Characteristic		0.30	Low	
Flood Attenuation		0.62	Med	
Water Quality--Downstream		0.64	Med	
Water Quality--Wetland		0.47	Med	
Shoreline Protection		N/A	N/A	
Characteristic Wildlife Habitat Structure	0.45	0.45	Med	
Maintenance of Characteristic Fish Habitat	#VALUE!	N/A	N/A	
Maintenance of Characteristic Amphibian Habitat		0.22	Low	
Aesthetics/Recreation/Education/Cultural	#VALUE!	#VALUE!	#VALUE!	
Commercial use		0.10	Low	0.1
Special Features listing:		-		
Groundwater Interaction		indeterminate GW source		
Groundwater Functional Index		no spec al nd cators		
Restoration Potential (draft formula)		#VALUE!	#VALUE!	
Stormwater Sensitivity (not active)				

Water Quality--Wetland
"=(D6*2+E18+F24+(G27+G28+G34)/3+E22+E40)/7"

Shoreline Protection
"=IF(E41="y",((E42+E43+E44+E45+E46)/5),"N/A")"

N/A	H38	=	**Habitat formula breakout/lookup (E22 is RR) Special Features Bump is below.**
none	0	#VALUE!	(D6*2+E51+F49+F50+E52+E53+(I27+G28+G31)/3+E17+F24)/10
49	1	#VALUE!	(D6*2+E51+ F50+E52+E53+(I27+G28+G31)/3+E17+F24)/9
50	1.5	#VALUE!	(D6*2+E51+F49+ E52+E53+(I27+G28+G31)/3+E17+F24)/9
51	2	#VALUE!	(D6*2+ F49+F50+E52+E53+(I27+G28+G31)/3+E17+F24)/9
49&50	2.5	0.45375	(D6*2+E51+ E52+E53+(I27+G28+G31)/3+E17+F24)/8
49&51	3	#VALUE!	(D6*2+ F50+E52+E53+(I27+G28+G31)/3+E17+F24)/8
50&51	3.5	#VALUE!	(D6*2+ F49+ E52+E53+(I27+G28+G31)/3+E17+F24)/8
49&50&51	4.5	0.447143	(D6*2+ E52+E53+(I27+G28+G31)/3+E17+F24)/7

Characteristic Fish Habitat formula
"=IF(D41="Y",((E58*2+G28+E22+F24+E40+E43+E42+F45)/9),((E58*2+G28+E22+F24+E40)/6))"

Characteristic Amphibian Habitat formula (see Lookup breakout below)
E112=VLOOKUP(E54,T116:U117,2,FALSE)

Amphibian Habitat Formula Breakout

0	0.00	Amphibian breeding is controlling factor
1	0.22	"=((E55)*(E56+(I27*2)+E53+E18+F24)/6)"

Aesthetics/Rec/Ed/Cultural formula
"IF(E65=".1",(E62+E63+E64+2*E65+E66+E67+E68)/8,(E61+E62+E63+E64+E65+E66+E67+E68)/8)"

"=E69" **Commercial use** reflects just the rating for the question.

Special Features Bump-up reference table

a		Fish Habitat=E
b		Veg=E
c		Aesthetics=E
d	n	AND #5=Y, then Wildlife=E
g		Wildlife/Fish=E
h		Aesthetics=E
I		Veg=E
i	N	AND #35 =Y, Wildlife=E
q	nate G	GW=recharge, GW=E
r	nate G	Y and GW=recharge, GW=E
u		Aesthetics=E

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF
138																			**Recharge/Discharge Tendency**												
139																			R	0.1											
140																			D	1											
141																			-	Enter "R" or "D"											

	Date	Wetland name / ID Ditch Wetland 4	Wetland name / ID	Wetland name / ID	Wetland name / ID
	Special Features (from list, p.2--enter letter/s)	-	-	-	-
#1	Community Number (circle each community which represents at least 10% of the wetland)	3A, 3B, 4A, 4B, 7A, 7B, 8A, 8B, 10A, 13A, 13B, 12B, 14A, 15A, 15B, 16A, 16B	3A, 3B, 4A, 4B, 7A, 7B, 8A, 8B, 10A, 13A, 13B, 12B, 14A, 15A, 15B, 16A, 16B	3A, 3B, 4A, 4B, 7A, 7B, 8A, 8B, 10A, 13A, 13B, 12B, 14A, 15A, 15B, 16A, 16B	3A, 3B, 4A, 4B, 7A, 7B, 8A, 8B, 10A, 13A, 13B, 12B, 14A, 15A, 15B, 16A, 16B
#2 & #3	~ Describe each community type individually below ~			~ Describe each community type individually below ~	
Plant Community #1	Community Type (wet meadow, marsh)	16B Seasonally Flooded Basin	-	-	-
	Community Proportion (% of total)	100%			
	Dominant Vegetation / Cover Class	Phalaris arundinacea Typha latifolia Juncus balticus			
	Invasive/exotic Vegetation / Cover Class				
	Community Quality (E, H, M, L)	M 0.5	0	0	0
Plant Community #2	Community Type (wet meadow, marsh)	- -			
	Community Proportion (% of total)				
	Dominant Vegetation / Cover Class				
	Invasive/exotic Vegetation / Cover Class				
	Community Quality (E, H, M, L)	0	0	0	0
Plant Community #3	Community Type (wet meadow, marsh)	- -	- -	- -	- -
	Community Proportion (% of total)				
	Dominant Vegetation / Cover Class				
	Invasive/exotic Vegetation / Cover Class				
	Community Quality (E, H, M, L)	0	0	0	0
Plant Community #4*	Community Type (wet meadow, marsh)	- -			
	Community Proportion (% of total)				
	Dominant Vegetation / Cover Class				
	Invasive/exotic Vegetation / Cover Class				
	Community Quality (E, H, M, L)	- 0	0	0	0
	Circular 39 Types (primary <TAB> others)				
	Cowardin Types				
	Photo ID				
Highest rated community veg. div./integ:		0.5 Medium	0 -	0 -	0 -
Average vegetative diversity/integrity:		0.50 Medium	- -	- -	- -
Weighted Average veg. diversity/integrity:		0.50 Medium	0.00 -	0.00 -	### -
#4	Listed, rare, special plant species?	n Y N	Y N	Y N	Y N
#5	**Rare community or habitat?**	**n Y N**	**Y N**	**Y N**	**Y N**
#6	Pre-European-settlement conditions?	n Y N	Y N	Y N	Y N

Floodplain Forest [1A, 2A, 3A] * Hardwood Swamp [3B] * Coniferous Bog [2A, 4B] * Coniferous Swamp [4B] * Open Bog [1B, 5A, 5B, 6A, 7A, 9A, 10A] * Calcareous Fen [7B, 11B, 14A] * Shrub Swamp [6B] * Alder Thicket [8A] * Shrub-carr [8B] * Sedge Meadow [10B, 11A, 12A, 13A] * Shallow Marsh [13B] * Deep Marsh [12B] * Wet to Wet-Mesic Prairie [14B, 15A] * Fresh (Wet) Meadow [15B] * Shallow, Open Water [9B, 16A] * Seasonally Flooded Basin [16B]

*If there are more than four plant community types, use the next column over to enter the rest and do not rely on the automatic average calculations.

MnRAM 3.2 Digital Worksheet, Side 2

Highest-rated: 0.5

This comes in from Side 1 automatically using the weighted average. To use the highest rated veg. Community rating, please manually overwrite that

Enter data starting here. Yellow boxes are used in calculations.

Scroll down to answer more questions and see formula calculations

Digital worksheet, section I

	Question Description	User entry	Rating			
1	Veg. Table 2, Option 4		0.50			
	TOTAL VEG Rating	0.5	Medium			
4		n	next			
5		n	next			
6		n	next			
7	hydrogeo & topo		#N/A			
8	Water depth (inches)					
	Water depth (% inundation)					
9	Local watershed/immedita drainage (acres)					
10	Existing wetland size	0.72				
11	SOILS: Up/Wetland (survey classification + site)					
12	Outlet characteristics for flood retention	C	0.1			
13	Outlet characteristics for hydrologic regime	B	0.5			
14	Dominant upland land use (within 500 ft)	B	0.5	0.5		
15	Soil condition (wetland)	C	0.1			
16	Vegetation (% cover)	100%	H	1		
17	Emerg. veg. flood resistance	B	0.5			
18	Sediment delivery	B	0.5			
19	Upland soils (based on soil group)	C	1			
20	Stormwater runoff pretreatment & detention	A	1	0.1		
21	Subwatershed wetland density	A	1			
22	Channels/sheet flow	C	0.1			
23	Adjacent naturalized buffer average width (feet)	5	L	WQ	0.1 L	0.1
24	Adjacent Area Management: % Full	100%	1	1	**1**	
	adjacent area mgmt: % Manicured		0			
	adjacent area mgmt: % Bare	0%	0			
25	Adjacent Area Diversity & Structure: % Native	50%	0.5	2	**0.55**	
	adjacent area diversity: % Mixed	0%	0			
	adjacent area diversity: % Sparse/Inv./Exotic	50%	0.05			
26	Adjacent Area Slope: % Gentle	100%	1	1	**1**	
	adjacent area slope: % Moderate		0			
	adjacent area slope: % Steep		0			

Digital worksheet, section II

27	Downstream sensitivity/WQ protection	B	0.5		
28	Nutrient loading	B	0.5		
29	Shoreline wetland?	N	N		
30	Rooted shoreline vegetation (%cover)		Enter a percentage		
31	Wetland in-water width (in feet, average)		Enter a percentage		
32	Emergent vegetation erosion resistance		Enter valid choice		
33	Shoreline erosion potential		Enter valid ch		
34	Bank protection/upslope veg.		Enter valid choice		
35	Rare Wildlife	N	N		
36	Scarce/Rare/S1/S2 local community	N	N		
37	Vegetation interspersion cover (see diagram 1)	C	n/a	#N/A	
38	Community interspersion (see diagram 2)	N/A	N/A	N/A	0
39	Wetland detritus	B	0.5		
40	Wetland interspersion on landscape	B	0.5	0.5	
41	Wildlife barriers	B	0.5		
42	Amphibian breeding potential-hydroperiod	A	1		
43	Amphibian breeding potential--fish presence	A	1		
44	Amphibian & reptile overwintering habitat	N/A	0		
45	Wildlife species (list)				
46	Fish habitat quality	N/A	N/A		
47	Fish species (list)				
48	Unique/rare educ./cultural/rec.opportunity	N	N		
49	Wetland visibility	C	0.1		
50	Proximity to population	Y	1		
51	Public ownership	C	0.1		
52	Public access	N	er valid choice		
53	Human influence on wetland	C	0.1		
54	Human influence on viewshed	C	0.1		
55	Spatial buffer	C	0.1		
56	Recreational activity potential	C	0.1		
57	Commercial crop--hydrologic impact	C	0.1		

Additional questions

58	*GW - Wetland soils*	R	R or D	0.1
59	*GW - Subwatershed land use*	D	R or D	1
60	*GW - Wetland size and soil group*	R	R or D	0.1
61	GW - Wetland hydroperiod	R	R or D	0.1
62	GW - Inlet/Outlet configuration	R	R or D	0.1
63	GW - Surrounding upland topographic relief	D	R or D	1
64	Restoration potential w/o flooding	Y	Y or N	2.4
65	*Landowners affected by restoration*	1	*E a b c*	Enter valid choice
66A	*Existing wetland size (acres) [from #10]*	0.72		
66B	Total wetland restoration size (acres)	0.72	acres	0.1
66C	(Calculated) Potential New Wetland Area [B-A]	0	acres	% effectively drained: 0%
67	Average width of naturalized upland buffer (potenti	10	feet	0.1 value: 0.1
68	Likelihood of restoration success	c	a b c	0.1
69	Hydrologic alteration type	Filling	Outlet, Tile, Ditch, GW pump, Wtrshd div., Filling	
70	Potential wetland type (Circ. 39)	1, 2	5, 6, 7, 8	
71	Wetland sensitivity to stormwater	C	E a b c	
72	Additional stormwater treatment needs	B		

Functional Rating Summaries

Function Name	Raw score	Final Rating	Rating Category
Vegetative Diversity/Integrity		0.50	Med
Hydrology - Characteristic		0.30	Low
Flood Attenuation		0.54	Med
Water Quality--Downstream		0.58	Med
Water Quality--Wetland		0.47	Med
Shoreline Protection		N/A	N/A
Characteristic Wildlife Habitat Structure	0.46	0.46	Med
Maintenance of Characteristic Fish Habitat	#VALUE!	N/A	N/A
Maintenance of Characteristic Amphibian Habitat		0.22	Low
Aesthetics/Recreation/Education/Cultural	#VALUE!	#VALUE!	#VALUE!
Commercial use		0.10	Low
Special Features listing:		-	

Formula shown to the right.

Groundwater Interaction	indeterminate GW source
Groundwater Functional Index	no spec al nd cators
Restoration Potential (draft formula)	#VALUE! #VALUE!
Stormwater Sensitivity (not active)	

These are the formulas for the f inal functional ratings shown at the

These are supplemental Lookup Tables and Intermediary formulas:

Hydrogeology and Topography LookUp

I	Depressional/Isolated
FT	Depress't/Flow-through
Trib	Depress't/Tributary
R	Riverine
Lac	Lacustrine
Peat	Peatland
Flood	Floodplain
S	Slope
O	Other

Habitat n/a formulator

E49	1.00	"=IF(E49="n/a",1,0)"
E50	1.50	"=IF(E50="n/a",1.5,0)"
E51	0.00	"=IF(E51="n/a",2,0)"
Add	2.50	

Open Water Interspersion LookUp

CC	Rtg	Ltr
1	0.1	L
2	0.1	L
3	0.5	M
4	0.5	M
5	1	H
6	0.5	M
7	1	H
8	0.1	L
N/A	N/A	N/A
-	"Pick an example from the image"	

Community Interspersion LookUp

1	L	0.1
2	M	0.5
3	H	1
4	H	1
N/A	N/A	N/A
-	"Pick an example from the image"	

Vegetative formula
"=C4", the Weighted Average Option 4 from Veg. Worksheet

Characteristic Hydrology formula
"=(E17+E18+E19+F24)/4" F24 is the reverse rating

Flood Attenuation Formula breakout (not linked to D72) (E16 is reverse rated)

n/a	formula is:
none 0.536667	((E16+(F18+E23)/2+(E19+E22)/2+(E24+E25)/2+(F20+E21+E26)/3)/5)
flood outlet 0.645833	((F18+E23)/2+(E19+E22)/2+(E24+E25)/2+(F20+E21+E26)/3)/4
F-T 0.45	((E16+(F18+E23)/2+(E19+E22)/2+(E24+E25)/2+ E26)/5)
both 0.5375	((F18+E23)/2+(E19+E22)/2+(E24+E25)/2+ E26)/4

Water Quality--Wetland
"=(D6*2+E18+F24+(G27+G28+G34)/3+E22+E40)/7"

Shoreline Protection
"=IF(E41="y",((E42+E43+E44+E45+E46)/5),"N/A")"

N/A	H38	=	**Habitat formula breakout/lookup (E22 is RR) Special Features Bump is below.**
none	0	#N/A	(D6*2+E51+F49+F50+E52+E53+(I27+G28+G31)/3+E17+F24)/10
	49	1 #VALUE!	(D6*2+E51+ F50+E52+E53+(I27+G28+G31)/3+E17+F24)/9
	50	1.5 #N/A	(D6*2+E51+F49+ E52+E53+(I27+G28+G31)/3+E17+F24)/9
	51	2 #N/A	(D6*2+ F49+F50+E52+E53+(I27+G28+G31)/3+E17+F24)/9
	49&50	2.5 0.45625	(D6*2+E51+ E52+E53+(I27+G28+G31)/3+E17+F24)/8
	49&51	3 #VALUE!	(D6*2+ F50+E52+E53+(I27+G28+G31)/3+E17+F24)/8
	50&51	3.5 #N/A	(D6*2+ F49+ E52+E53+(I27+G28+G31)/3+E17+F24)/8
49&50&51		4.5 0.45	(D6*2+ E52+E53+(I27+G28+G31)/3+E17+F24)/7

Characteristic Fish Habitat formula
"=IF(D41="Y",((E58*2+G28+E22+F24+E40+E43+E42+F45)/9),((E58*2+G28+E22+F24+E40)/6))"

Characteristic Amphibian Habitat formula (see Lookup breakout below)
E112=VLOOKUP(E54,T116:U117,2,FALSE)

Amphibian Habitat Formula Breakout

0	0.00	Amphibian breeding is controlling factor
1	0.22	"=((E55)*(E56+(I27*2)+E53+E18+F24)/6)"

Aesthetics/Rec/Ed/Cultural formula
"IF(E65=".1",(E62+E63+E64+2*E65+E66+E67+E68)/8,(E61+E62+E63+E64+E65+E66+E67+E68)/8)"

"=E69" **Commercial use** reflects just the rating for the question.

Special Features Bump-up reference table

a		Fish Habitat=E
b		Veg=E
c		Aesthetics=E
d	n	AND #5=Y, then Wildlife=E
g		Wildlife/Fish=E
h		Aesthetics=E
I		Veg=E
i	N	AND #35 =Y, Wildlife=E
q	nate G	GW=recharge, GW=E
r	nate G	Y and GW=recharge, GW=E
u		Aesthetics=E

	T	U	V
138	**Recharge/Discharge Tendency**		
139	R	0.1	
140	D	1	
141	-	Enter "R" or "D"	

	Date	Wetland name / ID Wetland 1	Wetland name / ID	Wetland name / ID	Wetland name / ID
	Special Features (from list, p.2--enter letter/s)	-	-	-	-
#1	Community Number (circle each community which represents at least 10% of the wetland)	3A, 3B, 4A, 4B, 7A, 7B, 8A, 8B, 10A, 13A, 13B, 12B, 14A, 15A, 15B, 16A, 16B	3A, 3B, 4A, 4B, 7A, 7B, 8A, 8B, 10A, 13A, 13B, 12B, 14A, 15A, 15B, 16A, 16B	3A, 3B, 4A, 4B, 7A, 7B, 8A, 8B, 10A, 13A, 13B, 12B, 14A, 15A, 15B, 16A, 16B	3A, 3B, 4A, 4B, 7A, 7B, 8A, 8B, 10A, 13A, 13B, 12B, 14A, 15A, 15B, 16A, 16B
#2 & #3	~ Describe each community type individually below ~		~ Describe each community type individually below ~		
Plant Community #1	Community Type (wet meadow, marsh)	16B Seasonally Flooded Basin	- -	- -	- -
	Community Proportion (% of total)	100%			
	Dominant Vegetation / Cover Class				
	Invasive/exotic Vegetation / Cover Class				
	Community Quality (E, H, M, L)	L 0.1	0	0	0
Plant Community #2	Community Type (wet meadow, marsh)	- -	- -	- -	- -
	Community Proportion (% of total)				
	Dominant Vegetation / Cover Class				
	Invasive/exotic Vegetation / Cover Class				
	Community Quality (E, H, M, L)	0	0	0	0
Plant Community #3	Community Type (wet meadow, marsh)	- -	- -	- -	- -
	Community Proportion (% of total)				
	Dominant Vegetation / Cover Class				
	Invasive/exotic Vegetation / Cover Class				
	Community Quality (E, H, M, L)	0	0	0	0
Plant Community #4*	Community Type (wet meadow, marsh)	- -	- -	- -	- -
	Community Proportion (% of total)				
	Dominant Vegetation / Cover Class				
	Invasive/exotic Vegetation / Cover Class				
	Community Quality (E, H, M, L)	- 0	0	0	0
	Circular 39 Types (primary <TAB> others)				
	Cowardin Types				
	Photo ID				
Highest rated community veg. div./integ:		0.1 Low	0 -	0 -	0 -
Average vegetative diversity/integrity:		0.10 Low	- -	- -	- -
Weighted Average veg. diversity/integrity:		0.10 Low	0.00 -	0.00 -	### -
#4	Listed, rare, special plant species?	n Y N	Y N	Y N	Y N
#5	**Rare community or habitat?**	**n Y N**	**Y N**	**Y N**	**Y N**
#6	Pre-European-settlement conditions?	n Y N	Y N	Y N	Y N

Floodplain Forest [1A, 2A, 3A] * Hardwood Swamp [3B] * Coniferous Bog [2A, 4B] * Coniferous Swamp [4B] * Open Bog [1B, 5A, 5B, 6A, 7A, 9A, 10A] * Calcareous Fen [7B, 11B, 14A] * Shrub Swamp [6B] * Alder Thicket [8A] * Shrub-carr [8B] * Sedge Meadow [10B, 11A, 12A, 13A] * Shallow Marsh [13B] * Deep Marsh [12B] * Wet to Wet-Mesic Prairie [14B, 15A] * Fresh (Wet) Meadow [15B] * Shallow, Open Water [9B, 16A] * Seasonally Flooded Basin [16B]

*If there are more than four plant community types, use the next column over to enter the rest and do not rely on the automatic average calculations.

Cover Class	Class Range
1	0 - 3%
2	3 - 10%
3	10 - 25%
4	25 - 50%
5	50 - 75%
6	75 - 100%

MnRAM 3.2 Digital Worksheet, Side 2

Digital worksheet, section I

	Question Description	User entry	Rating
1	Veg, Table 2, Option 4		0.10
	TOTAL VEG Rating	0.1	L
4	Listed, rare, special plant species?	n	next
5	Rare community or habitat?	n	next
6	Pre-European-settlement conditions?	n	next
7	hydrogeo & topo		#N/A
8	Water depth (inches)		
	Water depth (% inundation)		
9	Local watershed/immediate drainage (acres)		
10	Existing wetland size	0.34	
11	SOILS: Up/Wetland (survey classification + site)		
12	Outlet characteristics for flood retention	A	1
13	Outlet characteristics for hydrologic regime	A	1
14	Dominant upland land use (within 500 ft)	B	0.5
15	Soil condition (wetland)	C	0.1
16	Vegetation (% cover)	1%	L
17	Emerg. veg. flood resistance	C	0.1
18	Sediment delivery	A	1
19	Upland soils (based on soil group)	C	1
20	Stormwater runoff pretreatment & detention	A	1
21	Subwatershed wetland density	A	1
22	Channels/sheet flow	B	0.5
23	Adjacent naturalized buffer average width (feet)	1	L
24	Adjacent Area Management: % Full		0
	adjacent area mgmt: % Manicured		0
	adjacent area mgmt: % Bare	100%	0.1
25	Adjacent Area Diversity & Structure: % Native		0
	adjacent area diversity: % Mixed		0
	adjacent area diversity: % Sparse/Inv./Exotic	100%	0.1
26	Adjacent Area Slope: % Gentle	100%	1
	adjacent area slope: % Moderate		0
	adjacent area slope: % Steep		0

This comes in from Side 1 automatically using the weighted average. To use the highest rated veg. Community rating, please manually overwrite that value (shown to the right) into the field at E5.

Highest-rated: 0.1

Enter data starting here. Yellow boxes are used in calculations.

	0.5		
	0.1		
	0.1		
	1		
	1		
	0.1		
	0.5		
WQ	0.1	L	0.1
1	**0.1**		
1	**0.1**		
1	**1**		

Scroll down to answer more questions and see formula calculations

Digital worksheet, section II

27	Downstream sensitivity/WQ protection	B	0.5		
28	Nutrient loading	B	0.5		
29	Shoreline wetland?	N	N		
30	Rooted shoreline vegetation (%cover)		Enter a percentage		
31	Wetland in-water width (in feet, average)		Enter a percentage		
32	Emergent vegetation erosion resistance		Enter valid choice		
33	Shoreline erosion potential		Enter valid cho		
34	Bank protection/upslope veg.		Enter valid choice		
35	Rare Wildlife	N	N		
36	Scarce/Rare/S1/S2 local community	N	N		
37	Vegetation interspersion cover (see diagram 1)	N/A	N/A	N/A	
38	Community interspersion (see diagram 2)	N/A	N/A	N/A	0
39	Wetland detritus	C	0.1		
40	Wetland interspersion on landscape	B	0.5	0.1	
41	Wildlife barriers	B	0.5		
42	Amphibian breeding potential-hydroperiod	A	1		
43	Amphibian breeding potential--fish presence	A	1		
44	Amphibian & reptile overwintering habitat	N/A	0		
45	Wildlife species (list)				
46	Fish habitat quality	N/A	N/A		
47	Fish species (list)				
48	Unique/rare educ./cultural/rec.opportunity	N	N		
49	Wetland visibility	C	0.1		
50	Proximity to population	Y	1		
51	Public ownership	C	0.1		
52	Public access	N	ter valid choice		
53	Human influence on wetland	C	0.1		
54	Human influence on viewshed	C	0.1		
55	Spatial buffer	C	0.1		
56	Recreational activity potential	C	0.1		
57	Commercial crop--hydrologic impact	C	0.1		

Additional questions

58	*GW - Wetland soils*	R	R or D	0.1	
59	*GW - Subwatershed land use*	D	R or D	1	
	GW - Wetland size and soil group	R	R or D	0.1	
61	GW - Wetland hydroperiod	R	R or D	0.1	
62	GW - Inlet/Outlet configuration	R	R or D	0.1	
63	GW - Surrounding upland topographic relief	D	R or D	1	
64	Restoration potential w/o flooding	Y	Y or N	2.4	
65	*Landowners affected by restoration*	1	*E a b c*	Enter valid choice	
66A	*Existing wetland size (acres) [from #10]*	0.34			
66B	Total wetland restoration size (acres)	0.34	acres	0.1	
66C	(Calculated) Potential New Wetland Area [B-A]	0	acres	% effectively drained:	0%
67	Average width of naturalized upland buffer (potent	125	feet	1 value:	0.1
68	Likelihood of restoration success	c	a b c	0.1	
69	Hydrologic alteration type	Filling	Outlet, Tile, Ditch, GW pump, Wtrshd div., Filling		
70	Potential wetland type (Circ. 39)	1, 2	5, 6, 7, 8		
71	Wetland sensitivity to stormwater	C	E a b c		
72	Additional stormwater treatment needs	A			

Functional Rating Summaries

Function Name	Raw score	Final Rating	Rating Category
Vegetative Diversity/Integrity		0.10	L
Hydrology - Characteristic		0.43	Med
Flood Attenuation		0.71	High
Water Quality--Downstream		0.64	Med
Water Quality--Wetland		0.39	Med
Shoreline Protection		N/A	N/A
Characteristic Wildlife Habitat Structure	0.31	0.31	Low
Maintenance of Characteristic Fish Habitat	########	N/A	N/A
Maintenance of Characteristic Amphibian Habitat		0.22	Low
Aesthetics/Recreation/Education/Cultural	########	#VALUE!	#VALUE!
Commercial use		0.10	Low

Formula shown to the right.

Special Features listing: -

Groundwater Interaction	indeterminate GW source	
Groundwater Functional Index	no spec a nd cators	
Restoration Potential (draft formula)	#VALUE!	#VALUE!
Stormwater Sensitivity (not active)		

These are supplemental Lookup Tables and Intermediary formulas:

Hydrogeology and Topography LookUp

I	Depressional/Isolated
FT	Depress't/Flow-through
Trib	Depress't/Tributary
R	Riverine
Lac	Lacustrine
Peat	Peatland
Flood	Floodplain
S	Slope
O	Other

Habitat n/a formulator

E49	1.00	"=IF(E49="n/a",1,0)"
E50	1.50	"=IF(E50="n/a",1.5,0)"
E51	0.00	"=IF(E51="n/a",2,0)"
Add	2.50	

Open Water Interspersion LookUp

CC	Rtg	Ltr
1	0.1	L
2	0.1	L
3	0.5	M
4	0.5	M
5	1	H
6	0.5	M
7	1	H
8	0.1	L
N/A	N/A	N/A
-	"Pick an example from the image"	

Community Interspersion LookUp

1	L	0.1
2	M	0.5
3	H	1
4	H	1
N/A	N/A	N/A
-	"Pick an example from the image"	

Vegetative formula
"=C4", the Weighted Average Option 4 from Veg. Worksheet

Characteristic Hydrology formula
"=(E17+E18+E19+F24)/4" F24 is the reverse rating

Flood Attenuation Formula breakout (not linked to D72) (E16 is reverse rated)

n/a		formula is:
none	0.706667	((E16+(F18+E23)/2+(E19+E22)/2+(E24+E25)/2+(F20+E21+E26)/3)/5)
flood outlet	0.633333	((F18+E23)/2+(E19+E22)/2+(E24+E25)/2+(F20+E21+E26)/3)/4
F-T	0.76	((E16+(F18+E23)/2+(E19+E22)/2+(E24+E25)/2+ E26)/5)
both	0.7	((F18+E23)/2+(E19+E22)/2+(E24+E25)/2+ E26)/4

These are the formulas for the final functional ratings shown at the

Water Quality--Wetland
"=(D6*2+E18+F24+(G27+G28+G34)/3+E22+E40)/7"

Shoreline Protection
"=IF(E41="y",((E42+E43+E44+E45+E46)/5),"N/A")"

Habitat formula breakout/lookup (E22 is RR) Special Features Bump is below.

N/A	H38	=	
none	0	#VALUE!	(D6*2+E51+F49+F50+E52+E53+(I27+G28+G31)/3+E17+F24)/10
	49	1	#VALUE! (D6*2+E51+ F50+E52+E53+(I27+G28+G31)/3+E17+F24)/9
	50	1.5	#VALUE! (D6*2+E51+F49+ E52+E53+(I27+G28+G31)/3+E17+F24)/9
	51	2	#VALUE! (D6*2+ F49+F50+E52+E53+(I27+G28+G31)/3+E17+F24)/9
	49&50	2.5	0.3125 (D6*2+E51+ E52+E53+(I27+G28+G31)/3+E17+F24)/8
	49&51	3	#VALUE! (D6*2+ F50+E52+E53+(I27+G28+G31)/3+E17+F24)/8
	50&51	3.5	#VALUE! (D6*2+ F49+ E52+E53+(I27+G28+G31)/3+E17+F24)/8
	49&50&51	4.5	0.342857 (D6*2+ E52+E53+(I27+G28+G31)/3+E17+F24)/7

Characteristic Fish Habitat formula
"=IF(D41="Y",((E58*2+G28+E22+F24+E40+E43+E42+F45)/9),((
E58*2+G28+E22+F24+E40)/6))"

Characteristic Amphibian Habitat formula (see Lookup breakout below)
E112=VLOOKUP(E54,T116:U117,2,FALSE)

Amphibian Habitat Formula Breakout

0	0.00	Amphibian breeding is controlling factor
1	0.22	"=((E55)*(E56+(I27*2)+E53+E18+F24)/6)"

Aesthetics/Rec/Ed/Cultural formula
"IF(E65=".1",(E62+E63+E64+2*E65+E66+E67+E68)/8,(E61+E62
+E63+E64+E65+E66+E67+E68)/8)"

"=E69" **Commercial use** reflects just the rating for the question.

Special Features Bump-up reference table

a		Fish Habitat=E
b		Veg=E
c		Aesthetics=E
d	n	AND #5=Y, then Wildlife=E
q		Wildlife/Fish=E
h		Aesthetics=E
l		Veg=E
j	N	AND #35 =Y, Wildlife=E
g		nate G GW=recharge, GW=E

	T	U	V
135	r		nate G Y and GW=recharge, GW=E
136	u		Aesthetics=E
137			
138	**Recharge/Discharge Tendency**		
139	R	0.1	
140	D	1	
141	-		Enter "R" or "D"

	Date	Wetland name / ID: Wetland 2	Wetland name / ID	Wetland name / ID	Wetland name / ID
	Special Features (from list, p.2--enter letter/s)	-	-	-	-
#1	Community Number (circle each community which represents at least 10% of the wetland)	3A, 3B, 4A, 4B, 7A, 7B, 8A, 8B, 10A, 13A, 13B, 12B, 14A, 15A, 15B, 16A, 16B	3A, 3B, 4A, 4B, 7A, 7B, 8A, 8B, 10A, 13A, 13B, 12B, 14A, 15A, 15B, 16A, 16B	3A, 3B, 4A, 4B, 7A, 7B, 8A, 8B, 10A, 13A, 13B, 12B, 14A, 15A, 15B, 16A, 16B	3A, 3B, 4A, 4B, 7A, 7B, 8A, 8B, 10A, 13A, 13B, 12B, 14A, 15A, 15B, 16A, 16B
#2 & #3	~ Describe each community type individually below ~			~ Describe each community type individually below ~	
Plant Community #1	Community Type (wet meadow, marsh)	16B Seasonally Flooded Basin	- -	- -	- -
	Community Proportion (% of total)	100%			
	Dominant Vegetation / Cover Class				
	Invasive/exotic Vegetation / Cover Class				
	Community Quality (E, H, M, L)	L 0.1	0	0	0
Plant Community #2	Community Type (wet meadow, marsh)	- -	- -	- -	- -
	Community Proportion (% of total)				
	Dominant Vegetation / Cover Class				
	Invasive/exotic Vegetation / Cover Class				
	Community Quality (E, H, M, L)	0	0	0	0
Plant Community #3	Community Type (wet meadow, marsh)	- -	- -	- -	- -
	Community Proportion (% of total)				
	Dominant Vegetation / Cover Class				
	Invasive/exotic Vegetation / Cover Class				
	Community Quality (E, H, M, L)	0	0	0	0
Plant Community #4*	Community Type (wet meadow, marsh)	- -	- -	- -	- -
	Community Proportion (% of total)				
	Dominant Vegetation / Cover Class				
	Invasive/exotic Vegetation / Cover Class				
	Community Quality (E, H, M, L)	- 0	0	0	0
	Circular 39 Types (primary <TAB> others)				
	Cowardin Types				
	Photo ID				
Highest rated community veg. div./integ:		0.1 Low	0 -	0 -	0 -
Average vegetative diversity/integrity:		0.10 Low	- -	- -	- -
Weighted Average veg. diversity/integrity:		0.10 Low	0.00 -	0.00 -	### -
#4	Listed, rare, special plant species?	n Y N	Y N	Y N	Y N
#5	**Rare community or habitat?**	**n Y N**	**Y N**	**Y N**	**Y N**
#6	Pre-European-settlement conditions?	n Y N	Y N	Y N	Y N

Floodplain Forest [1A, 2A, 3A] * Hardwood Swamp [3B] * Coniferous Bog [2A, 4B] * Coniferous Swamp [4B] * Open Bog [1B, 5A, 5B, 6A, 7A, 9A, 10A] * Calcareous Fen [7B, 11B, 14A] * Shrub Swamp [6B] * Alder Thicket [8A] * Shrub-carr [8B] * Sedge Meadow [10B, 11A, 12A, 13A] * Shallow Marsh [13B] * Deep Marsh [12B] * Wet to Wet-Mesic Prairie [14B, 15A] * Fresh (Wet) Meadow [15B] * Shallow, Open Water [9B, 16A] * Seasonally Flooded Basin [16B]

*If there are more than four plant community types, use the next column over to enter the rest and do not rely on the automatic average calculations.

Cover Class	Class Range
1	0 - 3%
2	3 - 10%
3	10 - 25%
4	25 - 50%
5	50 - 75%
6	75 - 100%

MnRAM 3.2 Digital Worksheet, Side 2

Digital worksheet, section I

	Question Description	User entry	Rating
1	Veg, Table 2, Option 4		0.10
	TOTAL VEG Rating	0.1	L
4	Listed, rare, special plant species?	n	next
5	Rare community or habitat?	n	next
6	Pre-European-settlement conditions?	n	next
7	hydrogeo & topo		#N/A
8	Water depth (inches)		
	Water depth (% inundation)		
9	Local watershed/immediate drainage (acres)		
10	Existing wetland size	0.08	
11	SOILS: Up/Wetland (survey classification + site)		
12	Outlet characteristics for flood retention	A	1
13	Outlet characteristics for hydrologic regime	A	1
14	Dominant upland land use (within 500 ft)	B	0.5
15	Soil condition (wetland)	C	0.1
16	Vegetation (% cover)	1%	L
17	Emerg. veg. flood resistance	C	0.1
18	Sediment delivery	A	1
19	Upland soils (based on soil group)	C	1
20	Stormwater runoff pretreatment & detention	A	1
21	Subwatershed wetland density	A	1
22	Channels/sheet flow	A	1
23	Adjacent naturalized buffer average width (feet)	1	L
24	Adjacent Area Management: % Full		0
	adjacent area mgmt: % Manicured		0
	adjacent area mgmt: % Bare	100%	0.1
25	Adjacent Area Diversity & Structure: % Native		0
	adjacent area diversity: % Mixed		0
	adjacent area diversity: % Sparse/Inv./Exotic	100%	0.1
26	Adjacent Area Slope: % Gentle	100%	1
	adjacent area slope: % Moderate		0
	adjacent area slope: % Steep		0

This comes in from Side 1 automatically using the weighted average. To use the highest rated veg. Community rating, please manually overwrite that value (shown to the right) into the field at E5.

Highest-rated: 0.1

Enter data starting here. Yellow boxes are used in calculations.

					WQ	0.1	L	0.1
				1		**0.1**		
				1		**0.1**		
				1				

Digital worksheet, section II

27	Downstream sensitivity/WQ protection	B	0.5					
28	Nutrient loading	B	0.5					
29	Shoreline wetland?	N	N					
30	Rooted shoreline vegetation (%cover)		Enter a percentage					
31	Wetland in-water width (in feet, average)		Enter a percentage					
32	Emergent vegetation erosion resistance		Enter valid choice					
33	Shoreline erosion potential		Enter valid cho					
34	Bank protection/upslope veg.		Enter valid choice					
35	Rare Wildlife	N	N					
36	Scarce/Rare/S1/S2 local community	N	N					
37	Vegetation interspersion cover (see diagram 1)	N/A	N/A	N/A				
38	Community interspersion (see diagram 2)	N/A	N/A	N/A				0
39	Wetland detritus	C	0.1					
40	Wetland interspersion on landscape	B	0.5			0.1		
41	Wildlife barriers	B	0.5					
42	Amphibian breeding potential-hydroperiod	A	1					
43	Amphibian breeding potential--fish presence	A	1					
44	Amphibian & reptile overwintering habitat	N/A	0					
45	Wildlife species (list)							
46	Fish habitat quality	N/A	N/A					
47	Fish species (list)							
48	Unique/rare educ./cultural/rec.opportunity	N	N					
49	Wetland visibility	C	0.1					
50	Proximity to population	Y	1					
51	Public ownership	C	0.1					
52	Public access	N	er valid choice					
53	Human influence on wetland	C	0.1					
54	Human influence on viewshed	C	0.1					
55	Spatial buffer	C	0.1					
56	Recreational activity potential	C	0.1					
57	Commercial crop--hydrologic impact	C	0.1					

Scroll down to answer more questions and see formula calculations

Additional questions

58	*GW - Wetland soils*	R	R or D		0.1	
59	*GW - Subwatershed land use*	D	R or D		1	
	GW - Wetland size and soil group	R	R or D		0.1	
61	GW - Wetland hydroperiod	R	R or D		0.1	
62	GW - Inlet/Outlet configuration	R	R or D		0.1	
63	GW - Surrounding upland topographic relief	D	R or D		1	
64	Restoration potential w/o flooding	Y	Y or N		2.4	
65	*Landowners affected by restoration*	1	*E a b c*	Enter valid choice		
66A	*Existing wetland size (acres) [from #10]*	0.08				
66B	Total wetland restoration size (acres)	0.08	acres		0.1	
66C	(Calculated) Potential New Wetland Area [B-A]	0	acres	% effectively drained:	0%	
67	Average width of naturalized upland buffer (potent	125	feet	1 value:	0.1	
68	Likelihood of restoration success	c	a b c		0.1	
69	Hydrologic alteration type	Filling	Outlet, Tile, Ditch, GW pump, Wtrshd div., Filling			
70	Potential wetland type (Circ. 39)	1, 2	5, 6, 7, 8			
71	Wetland sensitivity to stormwater	C	E a b c			
72	Additional stormwater treatment needs	A				

Functional Rating Summaries

Function Name	Raw score	Final Rating	Rating Category
Vegetative Diversity/Integrity		0.10	L
Hydrology - Characteristic		0.43	Med
Flood Attenuation		0.74	High
Water Quality--Downstream		0.64	Med
Water Quality--Wetland		0.39	Med
Shoreline Protection		N/A	N/A
Characteristic Wildlife Habitat Structure	0.31	0.31	Low
Maintenance of Characteristic Fish Habitat	########	N/A	N/A
Maintenance of Characteristic Amphibian Habitat		0.22	Low
Aesthetics/Recreation/Education/Cultural	########	#VALUE!	#VALUE!
Commercial use		0.10	Low
Special Features listing:		-	

Formula shown to the right. 0.1

Groundwater Interaction — indeterminate GW source
Groundwater Functional Index — no spec a nd cators

Restoration Potential (draft formula) — #VALUE! #VALUE!
Stormwater Sensitivity (not active)

These are supplemental Lookup Tables and Intermediary formulas:

Hydrogeology and Topography LookUp

I	Depressional/Isolated
FT	Depress't/Flow-through
Trib	Depress't/Tributary
R	Riverine
Lac	Lacustrine
Peat	Peatland
Flood	Floodplain
S	Slope
O	Other

Habitat n/a formulator

E49	1.00	"=IF(E49="n/a",1,0)"
E50	1.50	"=IF(E50="n/a",1.5,0)"
E51	0.00	"=IF(E51="n/a",2,0)"
Add	2.50	

Open Water Interspersion LookUp

CC	Rtg	Ltr
1	0.1	L
2	0.1	L
3	0.5	M
4	0.5	M
5	1	H
6	0.5	M
7	1	H
8	0.1	L
N/A	N/A	N/A
-	"Pick an example from the image"	

Community Interspersion LookUp

1	L	0.1
2	M	0.5
3	H	1
4	H	1
N/A	N/A	N/A
-	"Pick an example from the image"	

Vegetative formula
"=C4", the Weighted Average Option 4 from Veg. Worksheet

Characteristic Hydrology formula
"=(E17+E18+E19+F24)/4" F24 is the reverse rating

Flood Attenuation Formula breakout (not linked to D72) (E16 is reverse rated)

n/a		formula is:
none	0.74	((E16+(F18+E23)/2+(E19+E22)/2+(E24+E25)/2+(F20+E21+E26)/3)/5)
flood outlet	0.675	((F18+E23)/2+(E19+E22)/2+(E24+E25)/2+(F20+E21+E26)/3)/4
F-T	0.86	((E16+(F18+E23)/2+(E19+E22)/2+(E24+E25)/2+ E26)/5)
both	0.825	((F18+E23)/2+(E19+E22)/2+(E24+E25)/2+ E26)/4

These are the formulas for the f inal functional ratings shown at the

Water Quality--Wetland
"=(D6*2+E18+F24+(G27+G28+G34)/3+E22+E40)/7"

Shoreline Protection
"=IF(E41="y",((E42+E43+E44+E45+E46)/5),"N/A")"

N/A	H38	=	**Habitat formula breakout/lookup (E22 is RR) Special Features Bump is below.**
none	0	#VALUE!	(D6*2+E51+F49+F50+E52+E53+(I27+G28+G31)/3+E17+F24)/10
49	1	#VALUE!	(D6*2+E51+ F50+E52+E53+(I27+G28+G31)/3+E17+F24)/9
50	1.5	#VALUE!	(D6*2+E51+F49+ E52+E53+(I27+G28+G31)/3+E17+F24)/9
51	2	#VALUE!	(D6*2+ F49+F50+E52+E53+(I27+G28+G31)/3+E17+F24)/9
49&50	2.5	0.3125	(D6*2+E51+ E52+E53+(I27+G28+G31)/3+E17+F24)/8
49&51	3	#VALUE!	(D6*2+ F50+E52+E53+(I27+G28+G31)/3+E17+F24)/8
50&51	3.5	#VALUE!	(D6*2+ F49+ E52+E53+(I27+G28+G31)/3+E17+F24)/8
49&50&51	4.5	0.342857	(D6*2+ E52+E53+(I27+G28+G31)/3+E17+F24)/7

Characteristic Fish Habitat formula
"=IF(D41="Y",((E58*2+G28+E22+F24+E40+E43+E42+F45)/9),((
E58*2+G28+E22+F24+E40)/6))"

Characteristic Amphibian Habitat formula (see Lookup breakout below)
E112=VLOOKUP(E54,T116:U117,2,FALSE)

Amphibian Habitat Formula Breakout

0	0.00	Amphibian breeding is controlling factor
1	0.22	"=((E55)*(E56+(I27*2)+E53+E18+F24)/6)"

Aesthetics/Rec/Ed/Cultural formula
"IF(E65=".1",(E62+E63+E64+2*E65+E66+E67+E68)/8,(E61+E62
+E63+E64+E65+E66+E67+E68)/8)"

"=E69" **Commercial use** reflects just the rating for the question.

Special Features Bump-up reference table

a		Fish Habitat=E
b		Veg=E
c		Aesthetics=E
d	n	AND #5=Y, then Wildlife=E
q		Wildlife/Fish=E
h		Aesthetics=E
l		Veg=E
j	N	AND #35 =Y, Wildlife=E
g		nate G GW=recharge, GW=E

	T	U	V
135	r		nate G Y and GW=recharge, GW=E
136	u		Aesthetics=E
137			
138	**Recharge/Discharge Tendency**		
139	R	0.1	
140	D	1	
141	-		Enter "R" or "D"

WENCK

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DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, ST. PAUL DISTRICT
180 FIFTH STREET EAST, SUITE 700
ST. PAUL, MN 55101-1678

October 5, 2020

Regulatory File No. MVP-2020-01394-LSP

Epitome Energy
Dennis Egan
1651 Old Highway 19
Eagan, Minnesota 55066

Dear Mr. Egan:

We are responding to your request, submitted by Wenck Associates, Inc. on your behalf, for Corps of Engineers (Corps) concurrence with the delineation of aquatic resources completed on the Epitome Energy Site in Crookston, Minnesota. The project site is in Section 01, Township 149 North, Range 47 East, Polk County, Minnesota.

We have reviewed the delineation report dated July 1, 2020 and concur that Figure 6 depicts a reasonable approximation of the location and boundaries of aquatic resources on the property. This delineation can be used for planning, and will generally be sufficient for permitting purposes. It may be necessary to review this determination in response to changing site conditions or new information.

Additional Information regarding Jurisdiction and Permitting:

No jurisdictional determination was prepared for this project, nor is one required to support a permit application. If you submit a permit application, we will assist you in identifying aquatic resources that are not subject to Corps regulation to exclude those resources from the permit evaluation. A permit application should include this delineation, any subsequent revisions, and any state or local delineation approvals. You are advised that a permit or exemption from a state or local agency does not satisfy the requirement to obtain a Corps permit where one is needed.

Please note that the Corps has issued Nationwide General Permits and Regional General Permits that provide authorization for many minor activities. Many of those general permits require a pre-construction notification and Corps verification prior to starting work. However, several general permits also have “self-certifying” provisions that eliminate the need to provide notice to the Corps, provided the permittee complies with the terms and conditions of the general permit. Current general permit terms and conditions can be found at: https://www.mvp.usace.army.mil/Missions/Regulatory/Permitting-Process-Procedures/.

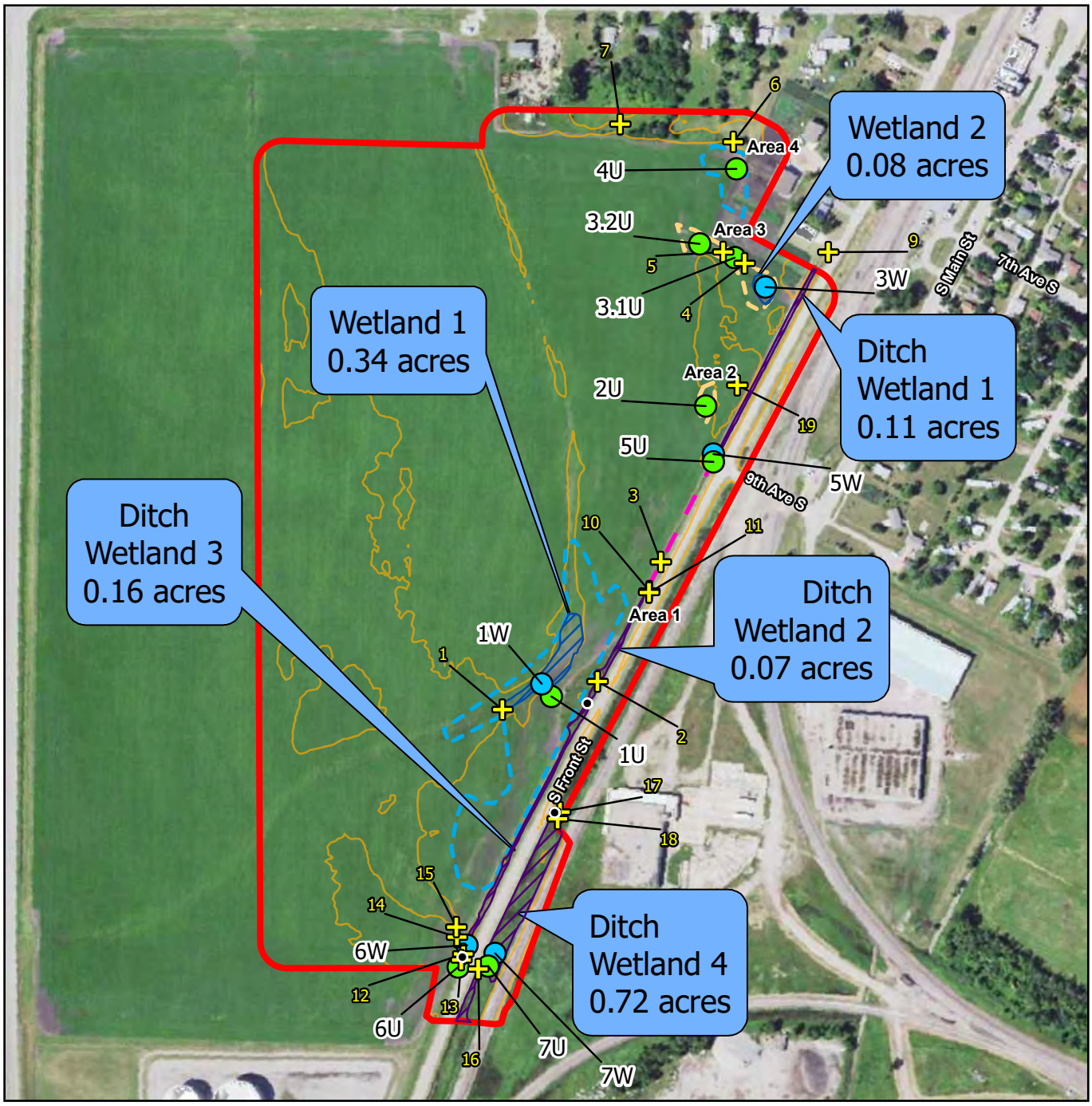
If you have any questions, please contact me in our Bemidji office at (651) 290-5339 or Lawrence.S.Puchalski@usace.army.mil. In any correspondence or inquiries, please refer to the Regulatory file number shown above.

Sincerely,

Lawrence S Puchalski

Lawrence Puchalski
Project Manager, Regulatory North Branch
Corps of Engineers

cc:
Aaron Habermehl, Polk West SWCD
Matt Retka, Wenck Associates Inc.



Legend

2017 Aerial Photograph (Source: MnGEO WMS)
2' Contours (Source: MN DNR)

- Project Area
- Photo Points

Field Inspection Data

Wetland Type
- Wetland
- Ditch Wetland
- Upland Ditch
- Culvert

Sample Type
- Upland
- Wetland

Offsite Review Areas
- Less than 50% Hydrology Indication
- Greater than 50% Hydrology Indication
- 2' Contours

300 150 0 300
Feet

N

Path: L:\1837\20-500\Pro\Wetland_Delineation\Wetland_Delineation.aprx
7/23/2020 10:58 AM BarZJ1192 Layout: Delineated Wetland Features

SUNDE ENGINEERING, PLLC

Delineated Wetland Features

WENCK
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JUL 2020

Figure 6

Attachment 4

Minnesota Unique Well Number

132722

County Polk
Quad Crookston
Quad ID 366D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 10/22/2001
Update Date 02/05/2020
Received Date

Well Name	Township	Range	Dir	Section	Subsection
RICORD, GARY	149	46	W	6	BBBCAC

Elevation 885 ft. **Elev. Method** LiDAR 1m DEM (MNDNR)

Address

C/W MCKINLY CROOKSTON MN

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
BLACK DIRT	0	3		
CLAY	3	165	BLU/GRY	SOFT
SAND	165	170	GRAY	SOFT
CLAY & ROCKS	170	172	GRAY	HARD
GRAVEL	172	181	WHITE	

Remarks

Well Depth 181 ft. **Depth Completed** 181 ft. **Date Well Completed** 07/15/1978

Drill Method Non-specified Rotary **Drill Fluid**

Use domestic **Status** Active

Well Hydrofractured? Yes ☐ No ☐ **From** **To**

Casing Type Single casing **Joint** Threaded

Drive Shoe? Yes ☐ No ☒ **Above/Below** 1 ft.

Casing Diameter		Weight	
4	in. To 173 ft.	11	lbs./ft.

Open Hole From ft. To ft.

Screen? ☒ **Type** stainless **Make** JOHNSON

Diameter	Slot/Gauze	Length	Set	
2 in.	12	8 ft.	173 ft.	181 ft.

Static Water Level

22 ft. land surface Measure 07/15/1978

Pumping Level (below land surface)

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☐ 12 in. above grade

☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount		From	To
bentonite	2	Cubic yards	0 ft.	20 ft.

Nearest Known Source of Contamination

90 feet West Direction Septic tank/drain field Type

Well disinfected upon completion? ☒ Yes ☐ No

Pump ☒ Not Installed Date Installed

Manufacturer's name

Model Number HP Volt

Length of drop pipe ft Capacity g.p. Typ

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☐ No

Miscellaneous

First Bedrock Aquifer

Last Strat Depth to Bedrock ft

Located by Minnesota Geological Survey

Locate Method GPS SA Off (averaged) (15 meters)

System UTM - NAD83, Zone 15, Meters X 229492 Y 5295854

Unique Number Verification Address verification Input Date 02/05/2020

Angled Drill Hole

Well Contractor

Jim's Well Co.	60312	LOSHE, J.
Licensee Business	Lic. or Reg. No.	Name of Driller

Minnesota Unique Well Number

221051

County Polk
Quad Crookston
Quad ID 366A

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 04/17/1988
Update Date 02/06/2020
Received Date

Well Name	Township	Range	Dir	Section	Subsection
GREAT	150	47	W	36	DCCCDA

Elevation 883 ft. **Elev. Method** 7.5 minute topographic map (+/- 5 feet)

Address

C/W CROOKSTON MN

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
SOIL	0	2		
CLAY	2	14	YELLOW	
CLAY	14	94	BLUE	SOFT
HARDER CLAY &	94	113	BLUE	
CLAY	113	121	BLUE	HARD
CLAY WITH SOME	121	154	BLUE	HARD
LOOSE FINE SAND	154	156		
CLAY WITH SOME	156	161	BLUE	HARD
LOOSE FINE SAND	161	176		
CLAY	176	180	BLUE	V.HARD
CLAY WITH SOME	180	195		

Remarks

SHUTTER TYPE SCREEN

Well Depth 195 ft. **Depth Completed** 195 ft. **Date Well Completed** 04/00/1942

Drill Method **Drill Fluid**

Use commercial **Status** Active

Well Hydrofractured? **Yes** ☐ **No** ☐ **From** **To**

Casing Type **Joint**
Drive Shoe? **Yes** ☐ **No** ☐ **Above/Below**

Casing Diameter	Weight	Hole Diameter
12 in. To 177 ft.	lbs./ft.	17 in. To 195 ft.

Open Hole From ft. To ft.

Screen? ☒ **Type** **Make**

Diameter	Slot/Gauze	Length	Set
8 in.	5	15 ft.	180 ft. 195 ft.

Static Water Level

25 ft. land surface Measure 04/00/1942

Pumping Level (below land surface)

30 ft. hrs. Pumping at 50 g.p.m.

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☐ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☐ Yes ☐ No ☐ Not Specified

Nearest Known Source of Contamination

feet Direction Type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed

Manufacturer's name

Model Number HP Volt

Length of drop pipe ft Capacity g.p. Typ

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☐ No

Miscellaneous

First Bedrock Aquifer Quat. buried
Last Strat pebbly sand/silt/clay Depth to Bedrock ft
Located by Minnesota Geological Survey
Locate Method Digitized - scale 1:24,000 or larger (Digitizing Table)
System UTM - NAD83, Zone 15, Meters X 228770 Y 5296071
Unique Number Verification Site Plan Input Date 01/01/1990

Angled Drill Hole

Well Contractor

Layne-western, Div. Of 1579 GREAT NO. RY.
Licensee Business Lic. or Reg. No. Name of Driller

Minnesota Unique Well Number

221634

County Polk
Quad Crookston
Quad ID 366D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 04/17/1988
Update Date 01/07/2020
Received Date

Well Name	Township	Range	Dir	Section	Subsection
HUTCHINS,	149	47	W	1	BAABDB

Elevation 880 ft. **Elev. Method** 7.5 minute topographic map (+/- 5 feet)

Address

Well 1702 INGENSALL AV CROOKSTON MN

Contact 1713 MAIN ST S CROOKSTON MN

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
DIRT	0	2	BLACK	
CLAY	2	16		
CLAY	16	132	BLUE	
COARSE GRAVEL	132	147		
HARDPAN	147	179		
LEGITIMATE COAL	179	181	BLACK	
SAND	181	183	WHITE	

Remarks

WELL FOR TRAILER COURT.

Well Depth 183 ft. **Depth Completed** 183 ft. **Date Well Completed** 00/00/1950

Drill Method **Drill Fluid**

Use domestic **Status** Active

Well Hydrofractured? **Yes** ☐ **No** ☐ **From** **To**

Casing Type Single casing **Joint**

Drive Shoe? **Yes** ☐ **No** ☐ **Above/Below** 0 ft.

Casing Diameter **Weight**

2 in. To 183 ft. lbs./ft.

Open Hole From ft. To ft.

Screen? ☐ **Type** **Make**

Static Water Level

9 ft. land surface Measure 00/00/1950

Pumping Level (below land surface)

17 ft. hrs. Pumping at 10 g.p.m.

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☐ 12 in. above grade

☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☐ Yes ☐ No ☒ Not Specified

Nearest Known Source of Contamination

feet Direction Type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed

Manufacturer's name

Model Number HP 0 Volt

Length of drop pipe ft Capacity g.p. Typ

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☐ No

Miscellaneous

First Bedrock Cretaceous undiff. Aquifer Quat. buried

Last Strat Cretaceous undiff. Depth to Bedrock 181 ft

Located by Minnesota Geological Survey

Locate Method Digitized - scale 1:24,000 or larger (Digitizing Table)

System UTM - NAD83, Zone 15, Meters X 228497 Y 5295964

Unique Number Verification Information from Input Date 01/01/1990

Angled Drill Hole

Well Contractor

PREBULA, J.

Licensee Business Lic. or Reg. No. Name of Driller

Minnesota Unique Well Number

221635

County Polk
Quad Girard
Quad ID 336B

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 04/17/1988
Update Date 01/07/2020
Received Date

Well Name	Township	Range	Dir	Section	Subsection
ARMOUR	149	47	W	1	CCBDDD

Elevation 876 ft. **Elev. Method** 7.5 minute topographic map (+/- 5 feet)

Address

C/W CROOKSTON MN

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
TOP SOIL	0	2	BLACK	
CLAY	2	14	BLUE	
SHALE	14	99	BLUE	SOFT
SANDY CLAY	99	115	BLUE	HARD
SAND	115	118	GRAY	
SANDY CLAY	118	150	BLUE	HARD
SANDY CLAY MIXED	150	161	BLUE	SOFT
SANDY CLAY WITH	161	203	BLUE	HARD
SAND	203	207		
SANDY CLAY	207	212	BLUE	SOFT
SAND	212	214		
SANDY CLAY	214	215	BLUE	HARD
GRANITE	215	216	GREEN	

Remarks

Well Depth 216 ft. **Depth Completed** 216 ft. **Date Well Completed** 11/24/1962

Drill Method **Drill Fluid**

Use commercial **Status** Active

Well Hydrofractured? Yes ☐ No ☐ **From** **To**

Casing Type Single casing **Joint**
Drive Shoe? Yes ☐ No ☐ **Above/Below** 0 ft.

Casing Diameter	Weight
4 in. To 207 ft.	lbs./ft.

Open Hole From ft. To ft.

Screen? ☒ **Type** other **Make** JOHNSON

Diameter	Slot/Gauze	Length	Set	
4 in.	12	4 ft.	203 ft.	207 ft.

Static Water Level
6 ft. land surface Measure 11/24/1962

Pumping Level (below land surface)
170 ft. hrs. Pumping at 25 g.p.m.

Wellhead Completion
Pitless adapter manufacturer Model
☐ Casing Protection ☐ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☐ Yes ☐ No ☐ Not Specified

Nearest Known Source of Contamination
feet Direction Type
Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed
Manufacturer's name BERKELEY
Model Number 4DM8 HP 1 Volt 230
Length of drop pipe 180 ft Capacity g.p. Typ Submersible

Abandoned
Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance
Was a variance granted from the MDH for this well? ☐ Yes ☐ No

Miscellaneous
First Bedrock weathering residuum unc. Aquifer Quat. buried
Last Strat weathering residuum unc. Depth to Bedrock 215 ft
Located by Minnesota Geological Survey
Locate Method Digitized - scale 1:24,000 or larger (Digitizing Table)
System UTM - NAD83, Zone 15, Meters X 227911 Y 5294600
Unique Number Verification Information from Input Date 01/01/1990

Angled Drill Hole

Well Contractor

Licensee Business	Lic. or Reg. No.	Name of Driller
Ltp Enterprises	91353	ASLESON, A.

Minnesota Unique Well Number

221636

County Polk
Quad Girard
Quad ID 336B

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 04/17/1988
Update Date 01/07/2020
Received Date

Well Name	Township	Range	Dir	Section	Subsection
RED RIVER	149	47	W	1	CCBAAC

Elevation 874 ft. **Elev. Method** 7.5 minute topographic map (+/- 5 feet)

Address

C/W CROOKSTON MN

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
TOP SOIL	0	2	BLACK	
CLAY	2	16	BLUE	
SHALE	16	98	BLUE	SOFT
SANDY CLAY	98	113	BLUE	HARD
SAND	113	116	GRAY	
SANDY CLAY	116	165	BLUE	HARD
SANDY CLAY	165	176	BLUE	SOFT
SANDY CLAY	176	201	BLUE	HARD
SAND	201	205	GRAY	

Remarks

WELL FITTINGS FROM REPAIR ORDER FORM IN 3-11-76, BY DRILLER.

Well Depth 205 ft. **Depth Completed** 205 ft. **Date Well Completed** 00/00/1963

Drill Method **Drill Fluid**

Use commercial **Status** Active

Well Hydrofractured? Yes ☐ No ☐ **From** **To**

Casing Type Single casing **Joint**

Drive Shoe? Yes ☐ No ☐ **Above/Below** 0 ft.

Casing Diameter		Weight
4	in. To 202 ft.	lbs./ft.

Open Hole From ft. To ft.

Screen? ☒ **Type** stainless **Make**

Diameter	Slot/Gauze	Length	Set	
4 in.	25	3 ft.	202 ft.	205 ft.

Static Water Level

Pumping Level (below land surface)

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☐ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☐ Yes ☐ No ☒ Not Specified

Nearest Known Source of Contamination

feet Direction Type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed

Manufacturer's name BERKELEY

Model Number 4BL21 HP 1.5 Volt 230

Length of drop pipe 188 ft Capacity g.p. Typ Submersible

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☐ No

Miscellaneous

First Bedrock Aquifer Quat. buried

Last Strat sand-gray Depth to Bedrock ft

Located by Minnesota Geological Survey

Locate Method Digitized - scale 1:24,000 or larger (Digitizing Table)

System UTM - NAD83, Zone 15, Meters X 227952 Y 5294794

Unique Number Verification Information from Input Date 01/01/1990

Angled Drill Hole

Well Contractor

Licensee Business	Lic. or Reg. No.	Name of Driller
Ltp Enterprises	91353	FLOYD

Minnesota Well Index Report | **221636** | Printed on 02/23/2021 HE-01205-15

DEPARTMENT OF NATURAL RESOURCES

Minnesota Department of Natural Resources
Division of Ecological & Water Resources
500 Lafayette Road, Box 25
St. Paul, MN 55155-4025

April 17, 2020
Correspondence # ERDB 20200247

Ms. Cassandra Borden
Sunde Engineering, PLLC
10830 Nesbitt Avenue South
Bloomington, MN 55437

RE: Natural Heritage Review of the proposed Epitome Energy Soybean Biodiesel Facility,
T149N R47W Section 1; Polk County

Dear Ms. Borden,

As requested, the Minnesota Natural Heritage Information System has been queried to determine if any rare species or other significant natural features are known to occur within an approximate one-mile radius of the proposed project. Based on this query, rare features have been documented within the search area (for details, please visit the Rare Species Guide Website for more information on the biology, habitat use, and conservation measures of these rare species). Please note that the following rare features may be adversely affected by the proposed project:

- Fluted shell (*Lasmigona costata*), a state-listed threatened mussel species, along with other state-listed mussels, fish, and amphibians, have been documented in the Red Lake River in the vicinity of the proposed project. Mussels and other aquatic species may be negatively affected by riverbed disturbance, changes in water flow, and deterioration in water quality including sedimentation/siltation, nutrient loading, and possibly temperature alterations. Minnesota's Endangered Species Statute (Minnesota Statutes, section 84.0895) and associated Rules (Minnesota Rules, part 6212.1800 to 6212.2300 and 6134) prohibit the take of threatened or endangered species without a permit. If the project will be impacting the Red Lake River, please contact me as further action may be needed.

- The Environmental Assessment Worksheet should address whether the proposed project has the potential to adversely affect the above rare features and, if so, it should identify specific measures that will be taken to avoid or minimize disturbance. Sufficient information should be provided so the DNR can determine whether a takings permit will be needed for any of the above protected species.

- Please include a copy of this letter in any state or local license or permit application. Please note that measures to avoid or minimize disturbance to the above rare features may be included as restrictions or conditions in any required permits or licenses.

The Natural Heritage Information System (NHIS), a collection of databases that contains information about Minnesota's rare natural features, is maintained by the Division of Ecological and Water Resources, Department of Natural Resources. The NHIS is continually updated as new information becomes available, and is the most complete source of data on Minnesota's rare or otherwise significant species, native plant communities, and other natural features. However, the NHIS is not an exhaustive inventory and thus does not represent all of the occurrences of rare features within the state. Therefore, ecologically significant features for which we have no records may exist within the project area. If additional information becomes available regarding rare features in the vicinity of the project, further review may be necessary.

For environmental review purposes, the results of this Natural Heritage Review are valid for one year; the results are only valid for the project location (noted above) and the project description provided on the NHIS Data Request Form. Please contact me if project details change or for an updated review if construction has not occurred within one year.

The Natural Heritage Review does not constitute review or approval by the Department of Natural Resources as a whole. Instead, it identifies issues regarding known occurrences of rare features and potential effects to these rare features. If needed, please contact your DNR Regional Environmental Assessment Ecologist to determine whether there are other natural resource concerns associated with the proposed project. Please be aware that additional site assessments or review may be required.

Thank you for consulting us on this matter, and for your interest in preserving Minnesota's rare natural resources. An invoice will be mailed to you under separate cover.

Sincerely,

Samantha Bump

Samantha Bump
Natural Heritage Review Specialist
Samantha.Bump@state.mn.us

Links: Rare Species Guide
http://www.dnr.state.mn.us/rsg/index.html
DNR Regional Environmental Assessment Ecologist Contact Info
http://www.dnr.state.mn.us/eco/ereview/erp_regioncontacts.html

Cc: Jaimie Thibodeaux

Kirsten Pauly

From: MN_MNIT_Data Request SHPO <DataRequestSHPO@state.mn.us>
Sent: Friday, January 3, 2020 10:26 AM
To: Cassandra Borden
Subject: RE: Data Request for Polk County Site
Attachments: Historic.xls

Hello Cassandra,

Your requested historic report is attached. Our database has no archaeologic records for the given area.

Jim

SHPO Data Requests
Minnesota State Historic Preservation Office
50 Sherburne Avenue, Suite 203
Saint Paul, MN 55155
(651) 201-3299
datarequestshpo@state.mn.us

Notice: This email message simply reports the results of the cultural resources database search you requested. The database search is only for previously known archaeological sites and historic properties. **IN NO CASE DOES THIS DATABASE SEARCH OR EMAIL MESSAGE CONSTITUTE A PROJECT REVIEW UNDER STATE OR FEDERAL PRESERVATION LAWS –** please see our website at https://mn.gov/admin/shpo/protection/ for further information regarding our Environmental Review Process.
Because the majority of archaeological sites in the state and many historic/architectural properties have not been recorded, important sites or properties may exist within the search area and may be affected by development projects within that area. Additional research, including field surveys, may be necessary to adequately assess the area's potential to contain historic properties or archaeological sites.
Properties that are listed in the National Register of Historic Places (NRHP) or have been determined eligible for listing in the NRHP are indicated on the reports you have received, if any. The following codes may be on those reports:
NR – National Register listed. The properties may be individually listed or may be within the boundaries of a National Register District.
CEF – Considered Eligible Findings are made when a federal agency has recommended that a property is eligible for listing in the National Register and MN SHPO has accepted the recommendation for the purposes of the Environmental Review Process. These properties need to be further assessed before they are officially listed in the National Register.
SEF – Staff eligible Findings are those properties the MN SHPO staff considers eligible for listing in the National Register, in circumstances other than the Environmental Review Process.
DOE – Determination of Eligibility is made by the National Park Service and are those properties that are eligible for listing in the National Register, but have not been officially listed.
CNEF – Considered Not Eligible Findings are made during the course of the Environmental Review Process. For the purposes of the review a property is considered not eligible for listing in the National Register. These properties may need to be reassessed for eligibility under additional or alternate contexts.
Properties without NR, CEF, SEF, DOE, or CNEF designations in the reports may not have been evaluated and therefore no assumption to their eligibility can be made. Integrity and contexts change over time, therefore any eligibility determination made ten (10) or more years from the date of the current survey are considered out of date and the property will need to be reassessed.
If you require a comprehensive assessment of a project's potential to impact archaeological sites or historic/architectural properties, you may need to hire a qualified archaeologist and/or historian. If you need assistance with a project review, please contact Kelly Gragg-Johnson, Environmental Review Specialist @ 651-201-3285 or by email at kelly.graggjohnson@state.mn.us.

The Minnesota SHPO Archaeology and Historic/Architectural Survey Manuals can be found at https://mn.gov/admin/shpo/identification-evaluation/.
MN SHPO research hours are **8:30 AM – 4:00 PM Tuesday-Friday**.

PLEASE NOTE: We strongly encourage you to email datarequestshpo@state.mn.us or call ahead at 651-201-3299 or 651-201-3287 to schedule the time you wish to visit our office. Starting Tuesday, September 24th, 2019, our building security protocol will change so that you will be required to check in at the building lobby security desk to receive a temporary pass to our office if you have scheduled your visit ahead of time. If you have not scheduled your visit ahead of time a SHPO staff member will have to escort you to and from our office which, of course, will be more inconvenient for everyone. Thank you.

SHPO needs your input! Help create Minnesota's next statewide preservation plan by *taking a brief survey.*

Planning a visit to access SHPO's files? Learn about security changes and *how to arrange a visit.*

From: Cassandra Borden <cborden@sundecivil.com>
Sent: Monday, December 30, 2019 1:21 PM
To: MN_MNIT_Data Request SHPO <DataRequestSHPO@state.mn.us>
Subject: Data Request for Polk County Site

Hello,

Please see the attached document for township and section information regarding the site of which data is being requested.

Kind Regards,
Cassandra Borden
SUNDE ENGINEERING, PLLC.
10830 Nesbitt Avenue South
Bloomington, MN 55437
Phone (952) 881-3344
Fax (952) 881-1913
www.sundecivil.com

ENVIRONMENTAL ASSESSMENT WORKSHEET
Epitome Energy, LLC
Section 16 – Air Assesment Additional Information, Air Dispersion Modeling
May 2022

This document describes the methodologies and results of an air dispersion modeling analysis performed for the Epitome Energy LLC (Epitome) facility in Crookston, Minnesota in support of an Air Emissions Risks Analysis (AERA) for an Environmental Assessment Worksheet (EAW).

Epitome is proposing to construct a soybean oil extraction and refining facility, located in Crookston, Minnesota. The facility is based on a design capacity of 120,000 bushels per day (3,600 tons per day) and will be permitted as a major source under federal New Source Review (NSR) Prevention of Significant Deterioration (PSD) regulations. Emissions from the facility include primarily particulate matter (PM), particulate matter less than or equal to 10 microns (PM_{10}), and particulate matter less than or equal to 2.5 microns ($PM_{2.5}$), Volatile Organic Compounds (VOC), and the hazardous air pollutant (HAP) n-hexane. In addition, emissions from combustion sources also include nitrogen oxides (NO_x), sulfur dioxide (SO_2), carbon monoxide (CO), other HAPs, and greenhouse gases (GHG) expressed as carbon dioxide equivalents (CO_2e).

Potential emissions were evaluated against the National Ambient Air Quality Standards (NAAQS), the Minnesota Ambient Air Quality Standards (MAAQS), and PSD increments. AERMOD version 21112 was used to determine the effects of potential criteria pollutant emissions from all stationary sources at the proposed project. Maximum expected impacts of the proposed project were compared to the Significant Impact Levels (SILs). These pollutants include CO, NO_2, SO_2, PM_{10}, and $PM_{2.5}$. Table 1 shows a summary results of the proposed project's screening analysis for the NAAQS and MAAQS pollutants.

Table 1. SIL Model Results

Pollutant	Averaging Period	SIL (µg/m^3)	Modeled Impact, H1H (µg/m^3)	Percent of SIL (%)	Exceed SIL?	Radius of Impact
CO	1-hour	2000	12.77	0.64%	No	N/A – Results do not Exceed SIL
	8-hour	500	9.21	1.84%	No	
NO_2	1-hour	7.52	4.35	57.88%	No	
	Annual	1	0.12	12.48%	No	
SO_2	1-hour	7.83	0.09	1.12%	No	
	3-hour	25	0.08	0.32%	No	
	24-hour	5	0.04	0.72%	No	
	Annual	1	0.002	0.25%	No	
PM_{10}	24-hour	5	24.16	483.23%	Yes	~ 1 km
	Annual	1	3.42	342.34%	Yes	
$PM_{2.5}$	24-hour	1.2	8.98	748.43%	Yes	~ 2 km
	Annual	0.3	1.29	428.34%	Yes	~ 1 km

MPCA's Environmental Review Unit (ERU) Environmental Assessment Worksheet Air Assessment Practices guidance states that refined air dispersion modeling is required for any pollutant where maximum impacts exceed the SIL. The modeling must consider the impacts of the total facility (including the proposed project), nearby sources, and a representative ambient air background concentration. Project emissions exceed the SIL for all averaging periods for PM_{10} and $PM_{2.5}$. Therefore, refined modeling is required to show impacts will not exceed the NAAQS. Impacts were less than the applicable SIL for all other pollutants. Point sources representing well-defined stacks, volume sources representing the bean pile, fugitive leaks/venting, and paved roads, and area sources representing the cooling towers at the facility were explicitly modeled. The submitted and approved AQDM-02 form describes all sources explicitly modeled for Epitome.

The representative PM_{10} and $PM_{2.5}$ background concentrations were obtained from MPCA's 2021 "Annual Air Monitoring Network Plan for Minnesota" using the Blaine monitor for PM_{10} and the Detroit Lakes

monitor for $PM_{2.5}$. MPCA provides a GIS-based tool for use in dispersion modeling analyses that allow users to look up relevant nearby sources based on 2014-2016 emissions inventories within a 50-kilometer radius of the facility. The tool was used for Epitome; and American Crystal Sugar – Crookston (ASCS), Sun Opta Grains & Foods Inc (SunOpta), and CHS Inc dba Mid-Valley Coop – Crookston (CHS) were included as nearby sources for this analysis. In addition to the sources listed within MPCA's nearby source tool, there is one additional source that is planned for future operation. Ag Innovation Campus (AIC) has proposed to build a research and innovation facility in Crookston, MN and will operate under an Option D Registration Permit. Final site design of the facility is not complete, however per MPCA's request, AIC was also included as a nearby source for this analysis.

As shown in Table 2 and Table 3 below, refined cumulative modeling of PM_{10} and $PM_{2.5}$ for the proposed project, nearby sources, and background concentrations using AERMOD resulted in concentrations less than NAAQS/MAAQS and PSD increment standards. All electronic modeling files from the screening and refined analysis were included as an attachment to the air dispersion modeling report. Further description regarding model setup is also described in the approved air dispersion modeling report.

Table 2. NAAQS/MAAQS Model Results

Pollutant	Averaging Period	NAAQS Standard (µg/m^3)	MAAQS Standard (µg/m^3)	Receptor Grid #1 Modeled Concentration (includes background) (µg/m^3) [1]	Receptor Grid #2 Modeled Concentration (includes background) (µg/m^3) [1]	Receptor Grid #3 Modeled Concentration (includes background) (µg/m^3) [1]	Maximum Modeled Concentration (includes background) (µg/m^3)	Percent of Standard (%)	
								NAAQS	MAAQS
PM_{10}	24-hr	150	150	56.52	63.61	83.19	83.19	55.46%	55.46%
$PM_{2.5}$	24-hr	35	35	22.67	28.82	30.69	30.69	87.67%	87.67%
	Annual	12	12	6.47	8.69	10.28	10.28	85.69%	85.69%

1. Three receptor grids were used to account for American Crystal Sugar (ACS), Ag Innovation Campus (AIC), and Epitome impacts. The first receptor grid includes receptors on ACS property only and models all sources except ACS. The second receptor grid includes receptors only on AIC property and models all sources except AIC. The third receptor grid excludes receptors ACS, AIC, and Epitome property and models all sources.

Table 3. Increment Model Results

Pollutant	Averaging Period	Class II Increment Standard (µg/m^3)	Receptor Grid #1 Modeled Concentration (µg/m^3) [1]	Receptor Grid #2 Modeled Concentration (µg/m^3) [1]	Receptor Grid #3 Modeled Concentration (µg/m^3) [1]	Maximum Modeled Concentration (µg/m^3)	Percent of Standard (%)
PM_{10}	24-hr	30	19.61	8.02	N/A	19.61	65.36%
	Annual	17	1.07	1.24	N/A	1.24	7.27%
$PM_{2.5}$ [2]	24-hr	9	8.83		N/A	8.83	98.09%
	Annual	4	1.51		N/A	1.51	37.87%

Results based on preliminary modeling submitted to MPCA December 2021. Results are currently in the process of being updated.
1. Two receptor grids were used to account for American Crystal Sugar (ACS) impacts. The first receptor grid excludes receptors on ACS property and models all sources. The second receptor grid includes receptors only on ASC property and models all sources except ACS.
2. Note that Epitome is setting the baseline date for Polk County for PM2.5. All other sources would be considered part of the baseline so that two-receptor grid approach was not modeled for PM2.5 increment.

ENVIRONMENTAL ASSESMENT WORKSHEET
Epitome Energy, LLC
Section 16 – Air Assesment Additional Information, Air Emissions Risk Analysis (AERA)
May 2022

This document describes the methodologies and results of an Air Emissions Risk Analysis (AERA) performed for the Epitome Energy LLC (Epitome) facility in Crookston, Minnesota in support of an Environmental Assessment Worksheet (EAW). Epitome will be a new soybean oil extraction and refining facility permitted as a major source under federal New Source Review (NSR) Prevention of Significant Deterioration (PSD) regulations. The facility is based on a design capacity of 120,000 bushels per day (3,600 tons per day).

Emissions from the facility include primarily particulate matter (PM), particulate matter less than or equal to 10 microns (PM_{10}), and particulate matter less than or equal to 2.5 microns ($PM_{2.5}$), Volatile Organic Compounds (VOC), and the hazardous air pollutant (HAP) n-hexane. In addition, emissions from combustion sources also include nitrogen oxides (NO_x), sulfur dioxide (SO_2), carbon monoxide (CO), other HAPs, and greenhouse gases (GHG) expressed as carbon dioxide equivalents (CO_2e).

The AERA was prepared in accordance with the Minnesota Pollution Control Agency (MPCA) AERA Guidance, updated April 27, 2015. The guidance includes the use of the MPCA Risk Assessment Screening Spreadsheet (RASS) for quantitative analysis. The guidance also outlines requirements for qualitative analysis. The most recent version of the RASS was used for this analysis.

The AERA analyzes the impact of the proposed facility, describing air toxics emissions from the proposed emission units. The RASS quantitatively assesses the potential human health impacts from the DT/DC Decks (originally identified as STRU19; STRU66 in draft permit), mineral oil system (originally identified as STRU20; STRU67 in draft permit), fugitive extraction leaks (originally identified as FUGI1; FUGI11 in draft permit), and the natural gas boilers (originally identified as STRU25, STRU26 and STRU27; STRU72, STRU73 and STRU74 in draft permit) as described in Table 1 below. The AERA assesses both the short-term acute inhalation hazard and the long-term chronic acute inhalation cumulative excess cancer risk and hazard. Quantitative estimations of indirect pathway screening hazard indices and cancer risks and total multi-pathway screening hazard indices and cancer risks are included in this report.

Table 1. Description of Emission Units Evaluated in AERA.

Source	Source Description	IP / MRE	Control	Control Description	Stack
EQUI24	DT/DC - Dryer Deck 1	Cyclone	--	--	STRU19 (STRU66 in draft permit)
EQUI25	DT/DC - Dryer Deck 2	Cyclone	--	--	
EQUI26	DT/DC - Dryer Deck 3	Cyclone	--	--	
EQUI27	DT/DC - Dryer Deck 4	Cyclone	--	--	
EQUI28	DT/DC - Cooler Deck 1	Cyclone	--	--	
EQUI29	Mineral Oil System Vent Fan	Mineral Oil Absorber	--	--	STRU20 (STRU67 in draft permit)
FUGI1 (FUGI11 in draft permit)	Extraction Leaks	--	--	--	--
EQUI39	Boiler 1	Low NOx Burner	TREA16	Boiler 1 Flue Gas Recirculation	STRU25 (STRU72 in draft permit)
EQUI40	Boiler 2	Low NOx Burner	TREA17	Boiler 2 Flue Gas Recirculation	STRU26 (STRU73 in draft permit)
EQUI41	Deodorizer Boiler 3	Low NOx Burner	--	--	STRU27 (STRU74 in draft permit)

EQUI = Equipment (emission unit); FUGI = Fugitive source; IP / MRE = Inherent Process / Material Recovery Equipment; TREA = Treat (add-on control equipment); STRU = Structure (stack/vent)

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The air permitting analysis for this facility required site-specific evaluation of potential criteria pollutant impacts and air dispersion modeling for PM_{10} and $PM_{2.5}$ (see the Air Dispersion Modeling section of the EAW for additional detail). The RASS was not used to calculate the criteria pollutant impacts with regards to the National Ambient Air Quality Standards (NAAQS) but was used to assess human health effects of potential emissions of criteria pollutants with health benchmarks.

The chemicals assessed in the AERA are described in Table 2 below. These include the criteria pollutants with inhalation benchmarks and pollutants emitted from the combustion of natural gas. As described on the AERA-05 form, the majority of emission factors are obtained from the U.S. Environmental Protection Agency's (EPA) Compilation of Air Emission Factors: AP-42. N-Hexane losses from Extraction processes were based on a solvent loss limit that will be incorporated into the Air Permit.

Table 2. Summary of Total Facility Emission Rates Evaluated in the AERA.

Pollutant	Proposed (lb/hr)	Proposed (tons/yr)
Arsenic	3.71E-05	1.62E-04
Benzene	3.89E-04	1.70E-03
Beryllium	2.22E-06	9.74E-06
Cadmium	2.04E-04	8.93E-04
Carbon Monoxide	15.56	68.17
Chromium	2.59E-04	1.14E-03
Cobalt	1.56E-05	6.82E-05
Dichlorobenzene(p), 1,4-	2.22E-04	9.74E-04
Formaldehyde	1.39E-02	6.09E-02
Hexane	75.18	329.28
Lead	9.26E-05	4.06E-04
Manganese	7.04E-05	3.08E-04
Mercury (elemental)	4.82E-05	2.11E-04
Naphthalene	1.13E-04	4.95E-04
Nickel	3.89E-04	1.70E-03
Nitrogen dioxide (NO2)	6.09	26.67
Polycyclic Organic Matter (POM)	1.63E-05	7.16E-05
Selenium	4.45E-06	1.95E-05
Sulfur dioxide	1.11E-01	4.87E-01
Toluene	6.30E-04	2.76E-03

As a high-end estimate of the effects of nitrogen dioxide (NO_2) emitted from the proposed facility, all NOx emissions are assumed to be NO_2 for the purposes of the evaluation of acute inhalation hazards in the RASS. Criteria pollutant evaluation for NO_x was conducted to assess the short- and long-term effects relative to the NAAQS.

Particulate matter is not quantitatively assessed in the RASS as no combustion units use fuel oil or diesel. Emissions from traffic at the site are not evaluated separately, as emissions from traffic are an insignificant activity; trucks do not idle at the site for more than one hour per day.

Emissions were calculated for both a short-term acute emission scenario and for a long-term chronic emission scenario. The acute emissions are calculated as 1-hour maximum concentrations and the chronic emissions are calculated as annual emissions. High end assumptions are included in the calculations for potential to emit rates. Hexane emissions are based on the proposed permit limit.

The AP-42 emission factor sources for natural gas combustion provide values for chromium total but do not speciate for hexavalent and trivalent chromium. These two chromium species are very different toxicologically. The majority of chromium emissions from the natural gas sources of the proposed project are expected to be trivalent chromium. There is no data supporting a quantitative speciation of chromium. Therefore, as a conservative, high-end estimate, all chromium emissions are assumed to be hexavalent chromium. This is the default setting of the RASS.

The stack dispersion characteristics, based on height and distance to the nearest receptor provided in the RASS DispTables tab shown below in Figure 1, overestimate the effect of the stack emissions. Since air dispersion modeling was performed for the project in AERMOD, the stack dispersion values in units of (µg/m3)/(g/s) from AERMOD were used in the RASS for all stack dispersion parameters: 1-hour, 3-hour, 8-hour, 24-hour, monthly, and annual values. Details of the AERMOD input parameters are provided in the air dispersion modeling protocol and the air dispersion modeling report.

Figure 1. RASS DispTables Tab

RASS version: 2020-08

*Inputs should be made in yellow cells

*You may run AERMOD or other refined dispersion modeling to replace the default screening values. Values are unit dispersion: 1 ug/m3 per 1 g/s emissions.

	Notes	STRU19 DT/DC Decks	STRU20 Mineral Oil System	FUGI1 Extraction Leaks	STRU25 Boiler 1	STRU26 Boiler 2	STRU27 Boiler 3
Stack height (meters)	required for lookup (1-99 m)	33.53	36.58	24.384	30.48	30.48	22.86
Distance to property line or receptor (meters)	required for lookup (10-10,000m)						
1-hr dispersion value	auto-lookup or manual entry	9.2347	78.4504	282.7858	6.33353	6.83823	26.74438
24-hr dispersion value	auto-lookup or manual entry	4.48863	8.95987	33.55568	2.40344	3.23409	4.52973
Monthly dispersion value	auto-lookup or manual entry	0.70893	1.66689	7.9217	0.36115	0.40838	0.83713
Annual dispersion value	auto-lookup or manual entry	0.40254	0.79895	3.8400	0.16589	0.18048	0.44525

The RASS inputs and outputs are submitted electronically. Figure 2 below describes the RASS output summary. The calculated cumulative excess cancer risks and hazards are below the Minnesota Department of Health (MDH) risk management levels. These calculations are based on high-end assumptions for emissions, operating time, and AERMOD dispersion values for the facility. The facility-specific results were added to the rural background risk and hazard values provided by MPCA. The facility does not significantly change the rural risk and hazard levels. The acute inhalation hazard was calculated using conservative high-end emission inputs and exposure parameters and was less than 1.0. The chronic multi-pathway hazard analysis was also less than 1.0. The chronic lifetime excess cancer risk estimate was less than the MDH threshold of 10E-5, or one in 100,000. The quantified maximum impacts would occur in non-residential areas. The analysis within the RASS calculations and AERA forms and figures support a conclusion that the construction and operation of the Epitome facility will not adversely affect human health.

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Figure 2. RASS Output Summary

RASS version: 2020-08
No inputs on this page

Air Toxics Screening

Total Inhalation Risks				Total Indirect Pathway Risks						Total Multi-pathway Risks						
Acute	Subchronic Noncancer	Chronic Noncancer	Cancer Index (1 = 1E-05)	Farmer Noncancer	Farmer Cancer Index	Urban Gardener Noncancer	Urban Gardener Cancer Index	Resident Noncancer	Resident Cancer Index	Farmer Noncancer	Farmer Cancer Index	Urban Gardener Noncancer	Urban Gardener Cancer Index	Resident Noncancer	Resident Cancer Index	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<-- Rounded value for reporting
1	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**<-- Guidance level**
OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	<-- OK or REFINE?
0.02	0.02	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.02	0.03	0.02	0.03	0.02	<-- Calculated value for further calculation and transparency

Air Toxics Endpoint Refinement

Total Inhalation Hazard Indices

	1.0	**1.0**	**1.0**	**<-- Guidance level**
	OK	OK	OK	<-- OK or REFINE?
Endpoint*	**Acute**	**Subchronic Noncancer**	**Chronic Noncancer**	
Auditory	0.00	0.00	0.00	
Blood / Hematological	0.00	0.00	0.00	
Bone / Teeth	0.00	0.00	0.00	
Cardiovascular	0.00	0.00	0.00	
Digestive	0.00	0.00	0.00	
Eyes	0.00	0.00	0.00	
Kidney	0.00	0.00	0.00	
Liver	0.00	0.00	0.00	
Neurological	0.00	0.02	0.03	
Reproductive / Developm	0.00	0.00	0.00	
Respiratory	0.02	0.00	0.03	
Skin	0.00	0.00	0.00	

*Some pollutants have more than one endpoint and are included in multiple endpoint totals.

Ceiling Value Exceeded?		
Arsenic	7440-38-2	NO
Benzene	71-43-2	NO
Bromopropane,	106-94-5	NO
Butadiene, 1,3-	106-99-0	NO
Carbon disulfide	75-15-0	NO
Carbon tetrachl	56-23-5	NO
Cellosolve Acet	111-15-9	NO
Chloroform	67-66-3	NO
Ethoxyethanol,	110-80-5	NO
Ethyl benzene	100-41-4	NO
Ethyl chloride (C	75-00-3	NO
Mercury	7439-97-6	NO
Methoxyethanol	109-86-4	NO
Propylene oxide	75-56-9	NO

Attachment 9

CONSTRUCTION EMISSIONS CALCULATION WORKSHEET

Source Type	emission source/vehicle type	estimated vehicle year	fuel type	estimated number of vehicles	Days of operation per year (1)	hours of operation per day	hours of operation per year (2)	mpg (3)(4)	miles/day	hp if applicable (12)	hp-h per year applicable (5) if	Construction Period (years)
Scope 1 - Construction	gasoline- mobile passanger cars and light duty trucks	2012	gasoline	50	306	10	3060	29.7	15	n/a	n/a	1
Scope 1 - Construction	diesel mobile sources - Off Road construction equipment (11)	n/a	diesel	15	306	10	3060	n/a	n/a	100	4,590,000	1
Scope 1 - Construction	diesel mobile sources -med-heavy duty trucks	2007-2018	diesel	10	306	10	3060	14	10	n/a	n/a	1
Scope 1 - Construction	diesel mobile sources-light duty trucks	2012	diesel	10	306	10	3060	15	10	n/a	n/a	1

Source Type	emission source	vehicle miles traveled over construction period		fuel amount over construction period		CO2 emission factors (7)		CH4 emission factors		N2O emission factors	
Scope 1 - Construction	gasoline- mobile passanger cars and light duty trucks	229,500	miles	7,727.27	gallons	8.78	kg CO2/gallon	0.0071	g CH4/mile (8)	0.0046	g N2O/mile (8)
Scope 1 - Construction	diesel mobile sources - Off Road construction equipment (11)	n/a	miles	258,417.00	gallons (6)	10.21	kg CO2/gallon	0.94	g CH4/gallon (9)	0.87	g N2O/gallon (9)
Scope 1 - Construction	diesel mobile sources -med-heavy duty trucks	30,600	miles	2,185.71	gallons	10.21	kg CO2/gallon	0.0095	g CH4/mile (10)	0.0431	g N2O/mile (10)
Scope 1 - Construction	diesel mobile sources-light duty trucks	30,600	miles	2,040.00	gallons	10.21	kg CO2/gallon	0.029	g CH4/mile (10)	0.0214	g N2O/mile (10)

Source Type	emission source	CO2 short ton/construction period	CO2 GWP	CO2e of CO2 short tons/ construction period	CH4 short tons/ construction period	CH4 GWP	CO2e of CH4 short tons/construction period	N2O short tons/ construction period	N2O GWP	CO2e of N2O short tons / construction period	TOTAL CO2e short tons/construction period	Life of Facility (Years)	Construction Emissions CO2e short tons/year annualized over life if facility	Construction Emissions CO2e metric tons/year annualized over life if facility
Scope 1 - Construction	gasoline- mobile passanger cars and light duty trucks	74.7867	1	74.787	0.00180	25	0.0449	0.001164	298	0.3468	75.18	50	1.50	1.36
Scope 1 - Construction	construction - diesel mobile sources - Off Road (11)	2908.3761	1	2908.376	0.26776	25	6.6941	0.247825	298	73.8517	2988.92	50	59.78	54.23
Scope 1 - Construction	diesel mobile sources -med-heavy duty trucks	24.5993	1	24.599	0.00032	25	0.0080	0.000146	298	0.0436	24.65	50	0.49	0.45
Scope 1 - Construction	diesel mobile sources-light duty trucks	22.9594	1	22.959	0.00098	25	0.0245	0.000073	298	0.0217	23.01	50	0.46	0.42
												TOTAL	**62.24**	**56.46**

NOTES AND FORMULAS

Life of Project = 50 Years

Construction Period = 1 year

Fuel Amount (On-Road) = Number of units * vehicle miles per day * (1/mpg) * days of operation * construction period

Fuel Amount (Off-Road) = hp-hr * (0.05 gallons per hp-hr)(7) * construction period

Vehicle Miles Traveled = number of units * days of operation per year * miles per day per vehicle* construction period

CO2 short ton/yr = fuel amount (gallons) * CO2 emission factor (kg CO2 / gallon) * (1.10E-03 short ton/kg) / life of project (year)

CH4 short ton/yr = Vehicle Miles Traveled (miles) * CH4 emission factor (g CH4 / gallon or mile) * (1.10E-06 short tons/g) / life of project (year)

N2O short ton/yr = vehicle miles traveled (miles) * N2O emission factor (g N20 / gallon or mile) * (1.10E-06 short tons/g) / life of project (year)

CO2e short tons/yr = (CO2*GWP)+(CH4*GWP)+(N2O*GWP)

CONVERSIONS		
1 short ton =	0.907185	metric ton
1 gram =	1.10231E-06	short ton
1kg =	1.10231E-03	short ton
1 short ton =	907.185	kg
1 short ton=	907185	grams
(GWP)	25	CH4
(GWP)	298	N2O
(GWP)	1	CO2

(1) Days of operation per year based on 6 days per week, [51 weeks oer year: 6 days per week*51 weeks per year = 306 days of operation per year]

(2) Hours of operation per year based on 10 hrs/day, 306 days/year: [10 hours/day*306 days year = 3,060 hours of operation per year]

(3) mpg for passanger cars based on average value mpg for passesger cars year 2012 https://www.energy.gov/eere/vehicles/fact-624-may-24-2010-corporate-average-fuel-economy-standards-model-years-2012-2016

(4) mpg for medium-heavy & light duty pick-up trucks https://www.consumerreports.org/pickup-trucks/heavy-duty-pickup-truck-fuel-economy/

(5) hp-hr/yr = number of units * hours of operation per year * hp [15 units*3060 hours/year*100 hp-hrs = 4,590,000 hp-hrs/yr}

(6) fuel amount is calculated based on fuel useage estimates per horsepower-hour (diesel fuel consumption rate of 5.63 gallons per 100 hp-hr from https://barringtondieselclub.co.za/technical/fuel-consumption.html#content.

(7) Table 2, Mobile Combustion CO2. Emission Factors for Greenhouse Gas Inventories, EPA CCCL. April, 2021. https://www.epa.gov/climateleadership/ghg-emission-factors-hub

(8) Table 3, Mobile Combustion CH4 and N2O for On-Road Gasoline Vehicles. Emission Factors for Greenhouse Gas Inventories, EPA CCCL. April, 2021. https://www.epa.gov/climateleadership/ghg-emission-factors-hub

(9) Table 5, Mobile Combustion CH4 and N2O for Off-Road Vehicles. Emission Factors for Greenhouse Gas Inventories, EPA CCCL. April, 2021. https://www.epa.gov/climateleadership/ghg-emission-factors-hub

(10) Table 4, Mobile Combustion CH4 and N2O for On-Road Diesel and Alternative Fuel Vehicles. Emission Factors for Greenhouse Gas Inventories, EPA CCCL. April, 2021. https://www.epa.gov/climateleadership/ghg-emission-factors-hub

(11) Includes equipment, such as cranes, dumpers, and excavators, as well as fuel consumption from trucks that are used off-road in construction.

(12) from May 18, 2021 Barr Engineering Technical Memorandum to Dennis Wilson Director Environmental Review Program - MN Environmental Quality Board (EQB) Attachment B Industrial , Commercial, and Institutional Failities Analysis available on line at https://www.eqb.state.mn.us/sites/default/files/documents/Technical%20Assessment%20Memorandum.pdf

Stationary Combustion Sources: Boiler 1, Boiler 2, and Boiler 3

Description	Boiler 1		Boiler 2		Boiler 3	
Maximum Rated Boiler Capacity	90.0	MMBtu/hr	90.0	MMBtu/hr	9.0	MMBtu/hr
Maximum Fuel Consumption Rate	0.088	MMcf/hr	0.088	MMcf/hr	0.009	MMcf/hr
Maximum Fuel Consumption Rate	531.09	MMcf/yr	531.088	MMcf/yr	53.11	MMcf/yr

6,019 hours/year plant operation (calculations based on estimated actual emissions from air model results)
1 short ton = 0.90718 metric ton

Boiler 1							
GHG Pollutant	**Emission Factor [1] kg/MMBtu**	**Emission Factor [2] lb/MMBtu**	**Emission Factor [3] lb/MMscf**	**Emission Rate [4] short tons/yr**	**GWP [5]**	**Emission CO2e short tons/yr**	**Emission CO2e metric tons/yr**
CO_2	53.06000	116.98	119,316	31,684	1	31,683.56	28,742.69
CH_4	0.00100	0.00220	2.25	0.60	25	14.93	13.54
N_2O	0.00010	0.000220	0.22	0.060	298	17.79	16.14
CO_2e	-	-	-	-	**TOTAL**	**31,716.28**	**28,772.37**

Boiler 2							
GHG Pollutant	**Emission Factor [1] kg/MMBtu**	**Emission Factor [2] lb/MMBtu**	**Emission Factor [3] lb/MMscf**	**Emission Rate [4] short tons/yr**	**GWP**	**Emission CO2e short tons/yr**	**Emission CO2e metric tons/yr**
CO2	53.06000	116.98	119,316	31,684	1	31,683.56	28,742.69
CH4	0.00100	0.00220	2.25	0.6	25	14.93	13.54
N2O	0.00010	0.00022	0.22	0.06	298	17.79	16.14
CO2e	-	-	-	-	**TOTAL**	**31,716.28**	**28,772.37**

Boiler 3							
GHG Pollutant	**Emission Factor [1] kg/MMBtu**	**Emission Factor [2] lb/MMBtu**	**Emission Factor [3] lb/MMscf**	**Emission Rate [4] short tons/yr**	**GWP**	**Emission CO2e short tons/yr**	**Emission CO2e metric tons/yr**
CO2	53.06000	116.98	119,316	3,168	1	3,168.36	2,874.27
CH4	0.00100	0.0022	2	0.060	25	1.49	1.35
N2O	0.00010	0.0002	0	0.0060	298	1.78	1.61
CO2e	-	-	-	-	**TOTAL**	**3,171.63**	**2,877.24**

[1]Emission factors from 40 CFR Part 98, Subpart C. Table C-1 and Table C-2 CO2e
[2] 1 kg = 2.2046 lbs
[3] Natural Gas Heat Value = 1020 Btu/cf
[4] Emission Rate tons/yr = Emission Factor lb/MMscf * fuel consumption rate MMscf/yr * 1 ton/2000 lbs
[5] GWP = Global Warming Potential from EPA's Emission Factors for Greenhouse Gas Inventories last modified April 1, 2022

Stationary Combustion Sources: Emergency Fire Pump 1 Emergency Generator

Emergency Fire Pump 1

Rated Mechanical Output	600 HP	
Fuel Type	Diesel (Ultra low sulfur)	
Fuel Consumption Rate	7,000 Btu/hp-hr	AP-42 Ch.3.3/3.4 ave. AP-42 Ch.3.3/3.4 ave. brake-specific fuel consumption
Rated capacity	4.2 MMBtu/hr	*(Mechanical output * Fuel Consumption Rate)*
Heat Value	137,000 Btu/gal	

Emergency Equipment operates 24 hours/year
1 short ton = 2000 lbs
1metric ton = 2.206.6 lbs
1kg = 2.2046 lbs

Emergency Fire Pump						
GHG Pollutant	**Emission Factor [1] kg/MMBtu**	**Emission Factor [2] lb/MMBtu**	**Emission Rate [3] short tons/yr**	**GWP [4]**	**Emission CO2e short tons/yr**	**Emission CO2e metric tons/yr**
CO_2	73.96000	163.05	8.22	1	8.22	7.46
CH_4	0.00300	0.00661	0.00033	25	0.01	0.01
N_2O	0.00060	0.00132	0.000067	298	0.02	0.02
CO_2e		-		**TOTAL**	**8.25**	**7.48**

Emergency Generator

Rated Mechanical Output	600 HP	
Fuel Type	Diesel (Ultra low sulfur)	
Fuel Consumption Rate	7,000 Btu/hp-hr	AP-42 Ch.3.3/3.4 ave. AP-42 Ch.3.3/3.4 ave. brake-specific fuel consumption
Rated capacity	4.2 MMBtu/hr	*(Mechanical output * Fuel Consumption Rate)*
Heat Value	137,000 Btu/gal	

Emergency Equipment operates 24 hours/year
1 short ton = 2000 lbs
1metric ton = 2.206.6 lbs
1kg = 2.2046 lbs

Emergency Generator						
GHG Pollutant	**Emission Factor [1] kg/MMBtu**	**Emission Factor [2] lb/MMBtu**	**Emission Rate [3] short tons/yr**	**GWP [4]**	**Emission CO2e short tons/yr**	**Emission CO2e metric tons/yr**
CO_2	73.96000	163.05	8.22	1	8.22	7.46
CH_4	0.00300	0.00661	0.00033	25	0.01	0.01
N_2O	0.00060	0.00132	0.000067	298	0.02	0.02
CO_2e				**TOTAL**	**8.25**	**7.48**

[1] Emission factors from 40 CFR Part 98, Subpart C. Table C-1 and Table C-2
[2] 1 kg = 2.2046 lbs
[3] Emission Rate tons/yr = Emission Factor lb/MMscf * rated capacity MMBtu/hr*hours of operation/yr* 1 ton/2000 lbs
[4] GWP = Global Warmiong Potential from EPA's Emission Factors for Greenhouse Gas Inventories last modified April 1, 2022

EPA CENTER FOR CORPORATE CLIMATE LEADERSHIP
U.S. Environmental Protection Agency

Scope 1 Emissions from Mobile Sources

Guidance

(A) Enter annual data for each vehicle or group of vehicles (grouped by vehicle type, vehicle year, and fuel type) in ORANGE cells in **Table 1**. Example entry is shown in first row (GREEN *Italics*). Only enter vehicles owned or leased by your organization on this sheet. All other vehicle use such as employee commuting or business travel is considered a scope 3 emissions source and should be reported in the corresponding scope 3 sheets.

- Select "On-Road" or "Non-Road" from drop down box to determine the Vehicle Types available.
- Select "Vehicle Type" from drop down box (closest type available).
- Enter "Fuel Usage" in appropriate units (units appear when vehicle type is selected).
- If mileage or fuel usage is unknown, estimate using approximate fuel economy values (see **Reference Table** below).
- Vehicle year and Miles traveled are not necessary for non-road equiment.

(B) When using biofuels, typically the biofuel (biodiesel or ethanol) is mixed with a petroleum fuel (diesel or gasoline) for use in vehicles. Enter the biodiesel and ethanol percentages of the fuel if known, or leave default values.

Biodiesel Percent:	20	%
Ethanol Percent:	80	%

(C) Biomass CO_2 emissions from biodiesel and ethanol are not reported in the total emissions, but are reported separately at the bottom of the sheet.

Table 1. Mobile Source Fuel Combustion and Miles Travelec

Source ID	Source Description	On-Road or Non-Road?	Vehicle Type	Vehicle Year	Fuel Usage	Units	Miles Traveled
Fleet-012	*HQ Fleet*	*NonRoad*	*Ships and Boats - Diesel*	*1990*	*500*	*gal*	*3,670*
		NonRoad	Industrial/Commercial Equipment - Diesel	2022	1,000	gal	

Reference Table: Average Fuel Economy by Vehicle Type

Vehicle Type	Average Fuel Economy (mpg)
Passenger Cars	24.1
Motorcycles	44.0
Diesel Buses (Diesel Heavy-Duty Vehicles)	7.3
Other 2-axle, 4-Tire Vehicles	17.6
Single unit 2-Axle 6-Tire or More Trucks	7.5
Combination Trucks	6.1

GHG Emissions

Total Organization-Wide Mobile Source Fuel Usage and CC_2 Emissions (On-Road and Off-Road Vehicles)

Fuel Type	Fuel Usage	Units	CO_2 (kg)	
Motor Gasoline	0	gallons	0.0	
Diesel Fuel	1,000	gallons	10,210.0	
Residual Fuel Oil	0	gallons	0.0	
Aviation Gasoline	0	gallons	0.0	
Kerosene-Type Jet Fuel	0	gallons	0.0	
Liquefied Petroleum Gas (LPG)	0	gallons	0.0	
Ethanol	0	gallons	0.0	*Note: emissions here are only for the g*
Biodiesel	0	gallons	0.0	*Note: emissions here are only for the d*
Liquefied Natural Gas (LNG)	0	gallons	0.0	
Compressed Natural Gas (CNG)	0	scf	0.0	

Total Organization-Wide On-Road Gasoline Mobile Source Mileage and CH_4/N_2O Emissions

Vehicle Type	Vehicle Year	Mileage (miles)	CH_4 (g)	N_2O (g)
Passenger Cars - Gasoline	1984-93	0	0.0	0.0
	1994	0	0.0	0.0
	1995	0	0.0	0.0
	1996	0	0.0	0.0
	1997	0	0.0	0.0
	1998	0	0.0	0.0
	1999	0	0.0	0.0
	2000	0	0.0	0.0
	2001	0	0.0	0.0
	2002	0	0.0	0.0
	2003	0	0.0	0.0
	2004	0	0.0	0.0
	2005	0	0.0	0.0
	2006	0	0.0	0.0
	2007	0	0.0	0.0
	2008	0	0.0	0.0
	2009	0	0.0	0.0
	2010	0	0.0	0.0
	2011	0	0.0	0.0
	2012	0	0.0	0.0
	2013	0	0.0	0.0
	2014	0	0.0	0.0
	2015	0	0.0	0.0
	2016	0	0.0	0.0
	2017	0	0.0	0.0
	2018	0	0.0	0.0
Light-Duty Trucks - Gasoline	1987-93	0	0.0	0.0
(Vans, Pickup Trucks, SUVs)	1994	0	0.0	0.0
	1995	0	0.0	0.0
	1996	0	0.0	0.0
	1997	0	0.0	0.0
	1998	0	0.0	0.0
	1999	0	0.0	0.0
	2000	0	0.0	0.0
	2001	0	0.0	0.0
	2002	0	0.0	0.0
	2003	0	0.0	0.0
	2004	0	0.0	0.0
	2005	0	0.0	0.0
	2006	0	0.0	0.0
	2007	0	0.0	0.0
	2008	0	0.0	0.0
	2009	0	0.0	0.0
	2010	0	0.0	0.0
	2011	0	0.0	0.0
	2012	0	0.0	0.0
	2013	0	0.0	0.0
	2014	0	0.0	0.0
	2015	0	0.0	0.0
	2016	0	0.0	0.0
	2017	0	0.0	0.0
	2018	0	0.0	0.0
Heavy-Duty Vehicles - Gasoline	1985-86	0	0.0	0.0
	1987	0	0.0	0.0
	1988-1989	0	0.0	0.0
	1990-1995	0	0.0	0.0
	1996	0	0.0	0.0
	1997	0	0.0	0.0
	1998	0	0.0	0.0
	1999	0	0.0	0.0
	2000	0	0.0	0.0
	2001	0	0.0	0.0
	2002	0	0.0	0.0
	2003	0	0.0	0.0
	2004	0	0.0	0.0
	2005	0	0.0	0.0
	2006	0	0.0	0.0
	2007	0	0.0	0.0
	2008	0	0.0	0.0
	2009	0	0.0	0.0
	2010	0	0.0	0.0
	2011	0	0.0	0.0
	2012	0	0.0	0.0
	2013	0	0.0	0.0
	2014	0	0.0	0.0
	2015	0	0.0	0.0
	2016	0	0.0	0.0
	2017	0	0.0	0.0
	2018	0	0.0	0.0
Motorcycles - Gasoline	1960-1995	0	0.0	0.0
	1996-present	0	0.0	0.0

Total Organization-Wide On-Road Non-Gasoline Mobile Source Mileage and CH_4/N_2O Emissions

Vehicle Type	Fuel Type	Vehicle Year	Mileage (miles)	CH_4 (g)	N_2O (g)
Passenger Cars - Diesel	Diesel	1960-1982	0	0.0	0.0
		1983-1995	0	0.0	0.0
		1996-2006	0	0.0	0.0
		2007-2018	0	0.0	0.0
Light-Duty Trucks - Diesel	Diesel	1960-1982	0	0.0	0.0
		1983-1995	0	0.0	0.0

Light-Duty Trucks - Diesel	Diesel	1996-2006	0	0.0	0.0
		2007-2018	0	0.0	0.0
Medium- and Heavy-Duty Vehicles -	Diesel	1960-2006	0	0.0	0.0
		2007-2018	0	0.0	0.0
Light-Duty Cars	Methanol		0	0.0	0.0
	Ethanol		0	0.0	0.0
	CNG		0	0.0	0.0
	LPG		0	0.0	0.0
	Biodiesel		0	0.0	0.0
Light-Duty Trucks	Ethanol		0	0.0	0.0
	CNG		0	0.0	0.0
	LPG		0	0.0	0.0
	LNG		0	0.0	0.0
	Biodiesel		0	0.0	0.0
Medium-Duty Trucks	CNG		0	0.0	0.0
	LPG		0	0.0	0.0
	LNG		0	0.0	0.0
	Biodiesel		0	0.0	0.0
Heavy-Duty Trucks	Methanol		0	0.0	0.0
	Ethanol		0	0.0	0.0
	CNG		0	0.0	0.0
	LPG		0	0.0	0.0
	LNG		0	0.0	0.0
	Biodiesel		0	0.0	0.0
Buses	Methanol		0	0.0	0.0
	Ethanol		0	0.0	0.0
	CNG		0	0.0	0.0
	LPG		0	0.0	0.0
	LNG		0	0.0	0.0
	Biodiesel		0	0.0	0.0

Total Organization-Wide Non-Road Mobile Source Fuel Usage and CH_4/N_2O Emissions

Vehicle Type	Fuel Type	Fuel Usage (gallons)	CH_4 (g)	N_2O (g)
Ships and Boats	Residual Fuel Oil	-	-	-
	Gasoline (2 stroke)	-	-	-
	Gasoline (4 stroke)	-	-	-
	Diesel	-	-	-
Locomotives	Diesel	-	-	-
Aircraft	Jet Fuel	-	-	-
	Aviation Gasoline	-	-	-
Agricultural Equipment	Gasoline (2 stroke)	-	-	-
	Gasoline (4 stroke)	-	-	-
	Diesel	-	-	-
	LPG	-	-	-
Agricultural Offroad Trucks	Gasoline	-	-	-
	Diesel	-	-	-
Construction/Mining Equipment	Gasoline (2 stroke)	-	-	-
	Gasoline (4 stroke)	-	-	-
	Diesel	-	-	-
	LPG	-	-	-
Construction/Mining Offroad Trucks	Gasoline	-	-	-
	Diesel	-	-	-
Lawn and Garden Equipment	Gasoline (2 stroke)	-	-	-
	Gasoline (4 stroke)	-	-	-
	Diesel	-	-	-
	LPG	-	-	-
Airport Equipment	Gasoline	-	-	-
	Diesel	-	-	-
	LPG	-	-	-
Industrial/Commercial Equipment	Gasoline (2 stroke)	-	-	-
	Gasoline (4 stroke)	-	-	-
	Diesel	1,000	230	470
	LPG	-	-	-
Logging Equipment	Gasoline (2 stroke)	-	-	-
	Gasoline (4 stroke)	-	-	-
	Diesel	-	-	-
Railroad Equipment	Gasoline	-	-	-
	Diesel	-	-	-
	LPG	-	-	-
Recreational Equipment	Gasoline (2 stroke)	-	-	-
	Gasoline (4 stroke)	-	-	-
	Diesel	-	-	-
	LPG	-	-	-

Total CO_2 Equivalent Emissions (metric tons) - Mobile Sources	**10.4**
Total Biomass CO_2 Equivalent Emissions (metric tons) - Mobile Sources	**0.0**

Notes:

1. Average mpg values from the U.S. Department of Transportation, Federal Highway Administration, Highway Statistics 2019 (Nov 2020), Table VM-1.

TOTAL CO2 Equivalent Emissions (short tons) - Mobile sources 11.42

AC and Refrigeration Emissions (Screening Method)
1 AC unit for admin bldg.

Equations [3]
Operating Emissions: Capacity (kg)* leak rate/year (%) = Emissions (kg/year)
Disposal Emissions: Capacity of disposal unit (kg) * refrigerant remaining at time of disposal (%)* refrigerant recoverd (%) = Emission per disposal unit (kg)

conversion
2000 lbs = 1 short ton
2.204 lbs = 1 kg
1 short ton = 0.90718 metric tons

Installation Emissions [1]	assumes unit comes fully charged and no refrigerant added at installation, therefore no installation emissions

Operation Emissions [3]	Gas Type	Capacity (kg) [4]	Annual leak rate (%) [4]	R-410A Emissions (kg) [3]	R-410A Emissions (lbs)	R-410A Emissions (short tons)	Total Operating Units	Total R-410A Emissions	R-410A Global Warming Potential [2]	CO2e short tons/yr	CO2e metric tons/yr
	R-410A	100	10	10.00	22.04	0.0110	1	0.011	2088	**23.01**	**20.87**

Disposal Emissions [3][5]	Gas Type	Capacity (kg) [4]	Refrigerant remaining at time of disposal (%) [4]	Refrigerant recovered at disposal (%) [4]	R-410A Emissions (kg) per unit	R-410A Emissions (lbs) per unit	R-410A Emissions (short tons) per unit	Number of Units Disposed (over 50 years) [5]	R-410A Global Warming Potential [2]	CO2e (short tons/unit disposed)	Total CO2e (short tons for all units disposed)	Life of Project (years)	CO2e (short tons/yr over life of project)	CO2e (metric tons/yr over life of project)
	R-410A	100	80	80	16.00	35.26	0.0176	3	2088	36.82	92.04	50	**1.84**	**1.67**

Total CO2e (short tons/year)	**Total CO2e (metric tons/yr)**
24.85	**22.54**

[1] Installation Emissions are assumed to be Zero and that new units will be pre-charged from the supplier.
[2] Table 12 Global Warming Potentials (GWPs) https://www.epa.gov/system/files/documents/2022-04/ghg_emission_factors_hub.pdf
[3] Equations from Section 2.1 EPA Fugitive Emissions Guidance https://www.epa.gov/sites/default/files/2015-07/documents/fugitiveemissions.pdf
[4] Values from Table 3 Default Emission Factors for Refrigeration/Air Conditioning Equipment of EPA Fugitive Emissions Guidance https://www.epa.gov/sites/default/files/2015-07/documents/fugitiveemissions.pdf
[5] Disposal Emissions assumes each unit has a 20 yr life, therefore disosal of 2.5 units/50 yr life of project

Table 3 from Default Emission Factors for Refrigeration/Air Conditioning Equipment of EPA Fugitive Emissions Guidance https://www.epa.gov/sites/default/files/2015-07/documents/fugitiveemissions.pdf

Table 3: Default Emission Factors for Refrigeration/Air Conditioning Equipment

Type of Equipment	**Capacity** (kg)	**Installation Emission Factor k** (% of capacity)	**Operating Emissions x** (% of capacity/yr.)	**Refrigerant Remaining at Disposal y** (% of capacity)	**Recovery Efficiency z** (% of remaining)
Domestic Refrigeration	0.05–0.5	1	0.5	80	70
Stand-alone Commercial Applications	0.2–6	3	15	80	70
Medium & Large Commercial Refrigeration	50–2,000	3	35	100	70
Transport Refrigeration	3–8	1	50	50	70
Industrial Refrigeration including Food Processing and Cold Storage	10–10,000	3	25	100	90
Chillers	10–2,000	1	15	100	95
Residential and Commercial A/C including Heat Pumps	0.5–100	1	10	80	80
Mobile Air Conditioning	0.5–1.5	0.5	20	50	50

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories

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U.S. Environmental Protection Agency

Scope 1 Emissions from Fire Suppression Equipment

Guidance

(A) HFC, PFC, and CO_2 fire suppressants are required to be included in the GHG inventory. Other fire suppressants such as Halon compounds, HCFCs, aqueous solutions, or inert gases are typically excluded from a GHG inventory.

(B) Select ONE of the three options from which to estimate emissions. Options range from most preferred method (Option 1) to least preferred method (Option 3). If option 3, screening method, is used and emissions are determined to be significant when compared to other emission sources, then one of the other methods should be applied to calculate emissions more accurately.

(C) Enter annual data in ORANGE cells as appropriate for the selected option.

Option 1. Material Balance Method: Enter organization-wide fire suppression gases stored and transferred (by gas) in Table 1.

- Inventory Change = difference of gas stored in inventory from beginning to end of reporting period. (Includes only gas stored on-site (i.e. cylinders) and not gas contained within equipment).
- Transferred Amount = gas purchased minus gas sold/disposed during reporting period.
  -- Gas purchased includes: Purchases for inventory, as part of equipment servicing (not from inventory) within purchased equipment and gas returned to the site after off-site recycling.
  -- Gas sold/disposed includes: Returns to supplier, sales or disposals (including within equipment), and gas sent off-site for recycling, reclamation, or destruction.
- Capacity Change = capacity of all units at beginning minus capacity of all units at end of reporting period. (can be assumed to be capacity of new units minus capacity of retired units).

Table 1. Organization-Wide Fire Suppression Gas CO_2 Equivalent Emissions - Material Balance

Gas	Gas GWP	Inventory Change (lb)	Transferred Amount (lb)	Capacity Change (lb)	CO_2 Equivalent Emissions (lb)
CO_2	1				
HFC-23	14,800				
HFC-125	3,500				
HFC-134a	1,430				
HFC-227ea	3,220				
HFC-236fa	9,810				
CF_4	7,390				
C_4F_{10}	8,860				

Option 2. Material Balance Method (Simplified): Enter organization-wide fire suppression gas in units (by gas) in Table 2.

- New units are those installed during reporting period (do not include any data for new units pre-charged by supplier), disposed units were disposed of during the reporting period, and existing units are all others.
- Charge/Recharge = gas added to units by organization or a contractor (do not include pre-charge by manufacturer).
- Capacity = sum of the full capacity for all units (do not include new units pre-charged by manufacturer).
- Amount recovered = total gas recovered from all retired units.

Table 2. Organization-Wide Fire Suppression Gas CO_2 Equivalent Emissions - Simplified Material Balance

Gas	Gas GWP	New Units		Existing Units	Disposed Units		CO_2 Equivalent Emissions (lb)
		Charge (lb)	Capacity (lb)	Recharge (lb)	Capacity (lb)	Recovered (lb)	
CO_2	1						
HFC-23	14,800						
HFC-125	3,500						
HFC-134a	1,430						
HFC-227ea	3,220						
HFC-236fa	9,810						
CF_4	7,390						
C_4F_{10}	8,860						

Option 3. Screening Method: Enter fire suppression gas information for each unit or group of units (by gas) in **Table 3.**

- Enter "Type of Equipment" (Fixed or Portable) and select "Gas Type" from the drop down box.
- Enter capacity (by gas type) for all units that operated during reporting period.
  -- For each unit added or removed during reporting period, multiply its capacity by a usage factor (0.0 to 1.0).
  -- If data entered for multiple units, sum the capacities for all units.
- See example entry in first row (*Green Italics*).

Table 3. Source Level Fire Suppression Gas CO_2 Equivalent Emissions - Screening Method

Source ID	Type of Equipment (Fixed/Portable)	Gas Type	Gas GWP	Unit Capacity (kg)	CO_2 Equivalent Emissions (kg)
Bldg-012	*Fixed*	*HFC-134a*	*1,430*	*1.3*	*65.1*
	Portable	CO2	1	6.8	0.1
	Portable	CO2	1	6.8	0.1
	Portable	CO2	1	6.8	0.1
	Portable	CO2	1	6.8	0.1
	Portable	CO2	1	6.8	0.1
	Portable	CO2	1	6.8	0.1
	Portable	CO2	1	6.8	0.1
	Portable	CO2	1	6.8	0.1
	Portable	CO2	1	6.8	0.1
	Portable	CO2	1	6.8	0.1

GHG Emissions

Total CO_2 Equivalent Emissions (metric tons) - Fire Suppression Equipment	**0.0014**

Notes:

1. Leak rates of fire extinguishers from Page A-28, *US EPA (2021) - Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 - 2018.*
2. GWPs are from *Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (2007).*

Total CO2 Equivalent Emissions (short tons) - Fire Suppression Equipment	0.0015

Location Based Electricity Emissions (MRO West)

Estimated Facility Total Electrical Use = $4,500,000 per year /$0.0456 per kWh= 98,684,210 kWh/yr
98,684,210.53 kWh per year
1 short ton = 2000 lbs
1 short ton = 0.90718 metric tons

GHG Pollutant	Emission Factor (lb/kWh) [1]	Electricity (kWh/yr)	Emission Rate (short tons/year) [2]	GWP [3]	CO2e (short tons/yr)	CO2e (metric tons/yr)
CO2	0.9795	98,684,211	48,330.59	1	48,330.59	43,844.55
CH4	0.000104	98,684,211	5.13	25	128.29	116.38
N2O	0.000015	98,684,211	0.74	298	220.56	200.09
CO2e				**TOTAL**	**48,679.44**	**44,161.02**

[1] from Table 6 of Emission Factors for Greenhouse Gas Inventories April 2022 retrived on line at https://www.epa.gov/climateleadership/ghg-emission-factors-hub. Total output Emission Factors MROW (MRO West)
[2] Emission rate short tons/year = Electricity (kWh/yr) * Emission Factor (lb/kWh) * 1 short ton/2000 lbs
[3] GWP = Global Warming Potential. From Emission Factors for Greenhouse Gas Inventories April 2022 retrived on line at https://www.epa.gov/climateleadership/ghg-emission-factors-hub

Red text indicates an update from the 2021 version of this document.

Emission Factors for Greenhouse Gas Inventories
Last Modified: 01 April 2022

Table 6 Electricity

eGRID Subregion	Total Output Emission Factors			Non-Baseload Emission Factors		
	CO_2 Factor (lb / MWh)	CH_4 Factor (lb / MWh)	N_2O Factor (lb / MWh)	CO_2 Factor (lb / MWh)	CH_4 Factor (lb / MWh)	N_2O Factor (lb / MWh)
AKGD (ASCC Alaska Grid)	1,097.6	0.100	0.014	1,315.1	0.126	0.017
AKMS (ASCC Miscellaneous)	534.1	0.027	0.005	1,517.7	0.066	0.012
AZNM (WECC Southwest)	846.6	0.054	0.007	1,368.6	0.090	0.013
CAMX (WECC California)	513.5	0.032	0.004	1,006.5	0.053	0.007
ERCT (ERCOT All)	818.6	0.052	0.007	1,296.6	0.086	0.012
FRCC (FRCC All)	835.1	0.049	0.006	1,011.0	0.052	0.007
HIMS (HICC Miscellaneous)	1,143.2	0.110	0.017	1,542.1	0.134	0.022
HIOA (HICC Oahu)	1,653.0	0.178	0.027	1,753.5	0.175	0.027
MROE (MRO East)	1,526.4	0.139	0.020	1,628.9	0.143	0.021
MROW (MRO West)	979.5	0.104	0.015	1,810.0	0.185	0.027
NEWE (NPCC New England)	528.2	0.074	0.010	882.5	0.070	0.009