

# Anonymous Anonymous

Comments on the study that forms the basis for IM 23:

1. Fuels are complex molecular mixtures of thousands of individual compounds comprising various hydrocarbons, small amounts of other compounds such as nitrogen and sulfur, and additives. Although, fuels can generally be described as mixtures of various ranges of hydrocarbons (i.e. gasoline can generally be described as a mixture of C4 to C12 hydrocarbons and diesel can generally be described as a mixture of C10 to C22 hydrocarbons) the actual chemical composition of various gasoline and diesel products can vary widely between brands and grades, and even within brands and grades, based on the source of the crude oil used in the refining process. In the study (Ecology 2018) that formed the basis for the petroleum hydrocarbon surface water protective values (cleanup standards) listed in Implementation Memorandum No. 23 (IM 23), laboratory standards (unleaded gasoline composite standard and Diesel Fuel #2 Composite Standard) sourced from RESTEK were used to "spike" surface water at various concentrations during the whole effluent toxicity (WET) testing experiment; both standards also contained additional chemicals methanol and methylene chloride, respectively. The composite standards contain fuels from three separate sources, and RESTEK acknowledges on their website that their gasoline and diesel composite standards exhibit lot-to-lot variability. This supports the point that fuels exhibit a high degree of variability with thousands of compounds and the composition of the laboratory fuel standards used in the study may not be chemically or toxicologically similar to fuels that have been or will be released into the environment. Therefore results of the study cannot reliably be extrapolated to understand the toxicity of fuels in the environment.

Additionally, fuels begin to undergo a weathering process immediately upon contact with the environment. Weathering occurs through volatilization, UV degradation, abiotic chemical reactions, and biologically mediated chemical reactions via microbes in soil, groundwater, sediment, and surface water. Importantly, the weathering process causes chemical changes in which hydrocarbons are converted to polar organic and other compounds. Expected polar organic compounds resulting from biodegradation of hydrocarbons fall into various families of compounds (e.g. alcohols, phenols, acids and esters, ketones, and aldehydes) but nearly all of these compounds have lower toxicity than the parent hydrocarbons. The weathering process is also unpredictable both in terms of speed and the resulting mixture of compounds that will be generated. These chemical changes add to the potential variability that may be encountered in a fuel after it is released to the environment.

Because of the high degree of variability in fuels, one study cannot reliably predict the aquatic toxicity of all gasoline and diesel products on the market and most certainly cannot predict the aquatic toxicity of products that have been released to the environment and have undergone weathering processes.

2. The toxicity study (Ecology 2018) that forms the basis for the petroleum hydrocarbon surface water protective values (cleanup standards) has not been published in a peer reviewed journal, nor has it been independently repeated. In short, it has not been subjected to the strict review standards by which research is evaluated by the scientific community. Ecology also did not solicit comment or outside review of a work plan or quality assurance project plan prior to or after conducting the study, nor does it even appear to have gone through the appropriate evaluation required by the Model Toxics Control Act (MTCA) [WAC 173-304-702(15)&(16)]. It is inappropriate for Ecology to implement a new cleanup standard (even as guidance) for petroleum hydrocarbons based on one

study alone; it is even more inappropriate for Ecology to implement a cleanup standard based on a study that has not undergone peer review and has not been validated by the scientific community.

Toxicity assessments are typically conducted by compiling and reviewing numerous relevant studies from the scientific literature. The body of scientific evidence is reviewed by experts and a consensus on relative toxicity is reached. In this case there is only one study and the products in question are inherently variable both in their unaltered and weathered forms; it is scientifically inappropriate to derive toxicity and cleanup standards from a single study.

Comments on Implementation Memorandum No. 23:

1. IM 23 amounts to de facto rulemaking and Ecology has not gone through the appropriate evaluation required by MTCA regulation [WAC 173-304-702(15) & (16)], which requires the department to consult with the science advisory board, the department of health, and the United States Environmental Protection Agency when considering new scientific information in the establishment of cleanup levels. Ecology is not authorized to promulgate cleanup levels in the manner it is attempting in IM 23.

Of particular concern is Ecology's intent to promulgate a surface water cleanup level for an extremely complex mixture of compounds based on a single study that tested only one mixture of each fuel when there are thousands of variations and mixtures that could produce different results. Additionally, while indicating that the study was done with "fresh-spiked" total petroleum hydrocarbons (TPH), IM 23 does not acknowledge the absence of weathered TPH testing. Ecology's means and methods in this case are ill-conceived and have not been scientifically vetted and validated.

Although the scientific literature using similar methods for testing toxicity of petroleum hydrocarbon mixtures is limited, it does exist. IM 23 does not acknowledge or discuss the results of other scientific studies on this subject, many of which are highly variable and determined NOEC and LOEC values for aquatic organisms that are considerably higher than the values being proposed by Ecology. At a minimum, Ecology should compile and provide an evaluation of related existing research.

2. Because Ecology's methodology behind the cleanup standards does not meet scientific rigor, there is a significant risk that the standards will be subject to litigation that will require use of taxpayer dollars to defend. It is inappropriate of Ecology to "set up" the tax payers of Washington for expensive litigation when those dollars could be better utilized to facilitate site cleanup.

3. Of additional concern is Ecology's intent to apply these standard universally to petroleum release sites regardless of the age of the fuel release. Weathered fuel products may exhibit significantly lower toxicity than fresh fuel products and there is no defensible way to extrapolate the concentrations in IM 23 to weathered fuel products. Without a comparable and comprehensive study with fuels that have undergone varying degrees of weathering, Ecology has not adequately shown the range of possible environmental effects that may or may not be observed at similar dosages. If Ecology moves forward with promulgating surface water cleanup levels for TPH in IM 23 (not recommended), the memorandum should acknowledge these facts and provide a caveat that the concentrations provided apply only to fresh fuel releases.

4. In IM 23, Ecology offers an alternate means to demonstrate toxicity using Whole Effluent Toxicity (WET) testing. However, this method is extremely expensive and collecting the necessary

sample volumes, at the required frequency, from representative locations can range from cumbersome to impossible. In short, WET testing (as the only viable alternative to accepting Ecology's test values – including essentially non-detect values for diesel – see #5 below) can be impractical to impossible at many sites. It also has the potential to add significant time and cost to remedial investigations, the ultimate effect of which will be to further delay cleanups.

5. The accepted practical quantitation limit (PQL) for diesel range organics in water with standard laboratory techniques is 250 micrograms per liter ( $\mu\text{g/L}$ ). Both the fresh and marine water protective values listed in IM 23 are less than the PQL. Ecology should acknowledge this fact and indicate that adjustment upward to the PQL (250  $\mu\text{g/L}$  at the time of publication of the memo) is acceptable.

6. Ecology has recently taken a (legally questionable) position at many sites that if surface water is a potential pathway at a cleanup site, groundwater cleanup levels must be equal to the surface water cleanup levels. Under this policy position, the surface water cleanup levels for TPH will become de facto groundwater cleanup levels. Ecology will be asking PLPs to clean up groundwater to non-detect concentrations of petroleum hydrocarbons (when accounting for the PQL). Ecology also does not currently allow the use of silica gel cleanup with the NWTPH methods, so measurements include naturally occurring organic compounds. Ecology will conceivably be asking potentially liable parties (PLPs) to clean up naturally occurring organic compounds in groundwater and surface water to non-detect concentrations, a requirement that is neither reasonable nor feasible.

Promulgation of the protective values as cleanup levels will add excessive time and cost (in the range of years to decades of time and tens of thousands to millions of dollars in cost) to remediate petroleum hydrocarbon contaminated sites, without a clear environmental benefit. The effect will be to slow down or stall the remediation of many petroleum hydrocarbon contaminated sites. In many cases the cleanup levels may be unachievable in groundwater within any reasonable restoration timeframe and/or lead to many feasibility study/disproportionate cost analysis results concluding that any active cleanup of TPH sites would disproportionately cost (especially for diesel sites with non-detect cleanup levels).

7. Ecology's desire to protect aquatic organisms is understandable. However, Ecology must first undertake a rigorous evaluation of available scientific research; fill any gaps in the scientific research (such as evaluating multiple fresh and weathered product formulations); summarize and present that research to the public; and consult with the science advisory board, the department of health, and the United States Environmental Protection Agency as required under MTCA [WAC 173-340-702 (15)] before establishing cleanup levels.