

**ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF SPILL PREVENTION AND RESPONSE
CONTAMINATED SITES REMEDIATION PROGRAM**

Technical Memorandum

April 2017

**GUIDELINES FOR
TREATMENT OF NON-DETECT VALUES, DATA REDUCTION FOR MULTIPLE-
DETECTIONS AND COMPARISON OF QUANTITATION LIMITS TO CLEANUP
VALUES**

BACKGROUND:

The Alaska Department of Environmental Conservation (DEC) has developed regulations for establishing cleanup levels for oil and hazardous substances under the site cleanup rules, 18 AAC 75 Article 3. In accordance with 18 AAC 75.340, DEC may develop or approve alternative soil cleanup levels on a site-specific basis.

In accordance with 18 AAC 75.355, DEC may determine a responsible person to have attained the cleanup level when a non-detected hazardous substance's practical quantitation limit (PQL) is greater than the cleanup level for that substance if the following conditions are met:

- The practical quantitation limit is no greater than 10 times the method detection limit for all hazardous substances other than polychlorinated biphenyls where the PQL is no greater than five times the method detection limit; or
- The practical quantitation limit is no greater than the PQL established in EPA's *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846) Third Edition, including Final Update IV (2009), adopted by reference.

Since the promulgation of 18 AAC 75.355, the standards and nomenclature for laboratory quantitation limits have changed. For the purposes of this technical memo, DEC considers PQL's and the limit of quantitation (LOQ) as synonyms. The LOQ, the limit of detection (LOD), and the detection limit (DL) are referenced in this memo. Definitions for these terms can be found in the most recent version of the *Department of Defense Quality Systems Manual for Environmental Laboratories*. This document can be found online at the following location: <http://www.denix.osd.mil/>. This memo applies to site investigation, characterization, and remediation work performed under the above referenced regulations.

PURPOSE:

This memo provides clarification on the following issues related to evaluating risk to human health and the environment associated with non-detect or multi-detect analytical results:

- Data reduction associated with multiple results for the same analyte in the same sample
- Data reduction from field duplicate samples
- Handling of non-detects in the calculation of exposure point concentrations
- Handling of non-detects in calculating TAH and TAqH
- Comparison of laboratory quantitation limits (LOD and LOQ) to site cleanup levels

DATA REDUCTION ISSUES:

1. Reporting of multiple results for the same constituent in the same sample

In the event that more than one contaminant result is reported due to multiple analyses by a single method, the highest detected value will be used.

If more than one result is reported from alternate analytical methods for a single contaminant, the highest detected value or the result from the confirmatory method shall be used. This determination is made on a compound specific basis. Any method-specific reporting requirements should also be adhered to.

If results are reported as non-detect by multiple analyses or methods, the undetected result with the lowest LOQ or LOD may be selected for reporting.

2. Data reduction from field duplicate samples

ADEC regulates based on the maximum result or statistically valid mean concentration at the 95% upper confidence limit (UCL) per 18 AAC 75.380(c)(1). Therefore, ADEC requires that the most conservative (maximum) detectable sample result of the primary and duplicate results be used for management decision making purposes. Primary and duplicate results shall not be averaged.

If the primary and duplicate results are both reported as non-detect (ND), the minimum LOD or LOQ should be presented with the data qualification flag denoting the result as ND (U-qualified). If one of the results is reported as non-detect and the other is a detectable concentration, the detected value should be used.

HANDLING OF NON-DETECTS (ND) FOR CALCULATING EXPOSURE POINT CONCENTRATIONS:

Until recently, the one-half of the detection limit (DL/2) substitution method has been the most commonly used method to compute the various statistics of interest for data sets with non-detect (ND) results. The primary reason for the common use of this method has been the lack of the availability of other defensible methods and associated programs that can be used to estimate the various environmental parameters of interest. Today, several other methods (e.g., Kaplan Meyer (KM) method, bootstrap methods) with better performance are available to compute the various upper limits of interest. Some of these parametric and nonparametric methods are available in ProUCL 5.1. ADEC recommends the use of this EPA sponsored software application and the ProUCL 5.1 recommended method of evaluating NDs. The use of one-half the detection limit substitution (DL/2) method is not recommended as the default approach in statistical procedures that may be used in decision-making processes.

Pro UCL 5.1 information can be found online at the following EPA website:

<https://www.epa.gov/land-research/proucl-software>

Finally, it should be noted that the 95% UCL calculation for exposure point concentrations is only applicable to soil. The use of a 95% UCL for groundwater is not acceptable.

HANDLING OF NON-DETECTS IN THE SUMMATION OF TOTAL AROMATIC HYDROCARBONS (TAH) AND TOTAL AQUEOUS HYDROCARBONS (TAQH) WATER QUALITY STANDARDS:

DEC recommends the following revised requirements for calculating TAH and TAqH for contaminated sites management. For DEC projects where these water quality parameters will be reported, all laboratory data reports must include reporting to the LOQ or LOD for each compound analyzed (BTEX and PAHs). TAH and TAqH summations should be calculated using the LOD values for non-detects. If the laboratory data does not report a LOD, two times (2x) the DL should be used for ND results. If a compound is reported as estimated, e.g. J-flagged, the estimated value should be used to calculate and report TAH and TAqH, instead of the LOD. If the laboratory data only reports a LOQ, then one-half the LOQ level should continue to be substituted for NDs for summation calculations of TAH and TAqH.

COMPARISON OF QUANTITATION LIMITS TO CLEANUP LEVELS FOR NON-DETECTED RESULTS:

DEC recommends that as an initial first step for determining compliance with cleanup levels for ND results, the LOQ of a ND result be compared to the approved cleanup level. If the LOQ of a ND result exceeds the approved cleanup level, then DEC recommends the LOD be compared to the cleanup level. If the laboratory data does not report a LOD, two times (2x) the DL should be used to estimate the LOD for comparison to the cleanup level. If the LOD exceeds the approved cleanup level, then DEC recommends that an alternative method that would provide lower LOD or LOQ be evaluated. If an alternative method is not available to provide lower quantitation limits, then DEC will evaluate if a ND result meets the requirements of 18 AAC 75.355 for attainment of the cleanup level.