KITSAP COUNTY DEPARTMENT OF PUBLIC WORKS
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August 4, 2016

Mr. David L. South, Senior Engineer
Washington State Department of Ecology
3190 160th Avenue SE
Bellevue, WA 98008

**Subject:** Groundwater Data Review – Hansville Landfill Cleanup Site, FSID 2605, CSID 695

Dear Mr. South:

Kitsap County (County) and Waste Management of Washington, Inc. (WMW), the Potentially Liable Persons (PLPs), and SCS Engineers (SCS) received the draft Memorandum from the State of Washington Department of Ecology (Ecology) concerning the groundwater data review at the above-referenced site (the Memorandum). The Memorandum presents an evaluation of groundwater monitoring data as part of a Five-Year Periodic Review to be completed in 2016. At your request, edits and comments were inserted directly into the draft Memorandum. This letter provides a summary of our comments and concerns.

The Hansville facility (site) is a closed landfill under the 2011 Amended Consent Decree 95-2-03005-1 governing groundwater cleanup actions at the site. The selected remedy is natural attenuation with Enhanced Monitoring and Institutional Controls on landfill property and the adjacent Tribal lands.

**Generalized Observations**

We appreciate the thorough review of the groundwater monitoring data completed by Ecology and the recommendations provided based upon that review. The purpose of the evaluation was to assess water quality trends and determine if predictions can be made with sufficient certainty that site cleanup levels will be achieved within the restoration time frame ending August 5, 2034. As noted by Ecology, projecting water quality conditions this far into the future entails a great deal of uncertainty. Nonetheless, the exercise can be useful for helping to establish a baseline from the initial Five-Year Periodic Review, and for helping to establish procedures that can be used in future periodic reviews.

The data evaluation performed by Ecology included:

- Mann-Kendall and Sen's Trend Analysis;
- Statistical Curve Fitting on individual data points; and
- Assessment of 95% Upper Confidence Limit (95% UCL) Convergence.

The assessment focused on the two contaminants of concern (COCs), vinyl chloride and arsenic, which remain out of compliance with regard to the established cleanup levels. As noted, vinyl chloride continues to be out of compliance at wells MW-6, MW-12I, and MW-14, while arsenic remains out of compliance at MW-14. Mann-Kendall and Sen's Trend Analysis using a 5-year

data set only generate a declining trend for vinyl chloride in MW-14, with the remaining wells not showing any statistically significant trends. However, curve fitting projections do suggest that vinyl chloride in MW-12I and MW-14 is on track to meet site cleanup goals by 2034, while arsenic in MW-14 is projected to come very close (within 0.001 mg/L) to the cleanup goal by 2034. However, vinyl chloride in MW-6 is projected to only decline to approximately 0.06 µg/L by 2034 (or still in excess of the 0.025 µg/L cleanup goal).

Projections of annualized 95% UCLs (normalized to parameter cleanup goals) in these same wells suggests uncertainty regarding whether vinyl chloride in MW-06 and MW-12I and arsenic in MW-14 will decline to below their respective cleanup levels by 2034. As noted by Ecology, these evaluations represent only the first five years of monitoring data under the Consent Decree and the uncertainty is of a high degree. Additionally, the decision metric is the annualized 95% UCL on the mean of four data points per year, as outlined in the 2011 Cleanup Action Plan (CAP), Appendix D. As Ecology stated on page 8 of the Memorandum, "Using only four points means that if there is considerable variance in the data the 95UCL will be higher than if more data points were used." As demonstrated in the data for MW-6, a single anomalous data point within a given year can result in an unusually high 95% UCL calculation for a given well. Projecting the unusually high value 5, 10, or 18 years into the future multiplies the uncertainty and skews the results dramatically.

The uncertainty associated with projecting a small dataset into the future also applies to the future projection of confidence limit convergence and divergence. Although we recognize that confidence limits should ideally converge over extended periods of time, anomalous data points (or outliers) can easily skew the results to the point where they provide limited meaningful insight. For these reasons, we suggest that routinely projecting 95% UCLs into future years can be problematic, and that these types of evaluations should be reserved for periodic reviews (such as Ecology's 5-year evaluation).

Although a statistically significant decreasing trend may not currently exist for all the site monitoring wells, time series charts showing concentration trends since 2007 indicate an ongoing improvement in groundwater quality at the site. Vinyl chloride trends in MW-12I and MW-14 are on track, while arsenic in MW-14 is trending to a value (0.006 mg/L) which closely approximates the cleanup goal. An additional five years of data could improve the outlook for MW-6 meeting the 2034 cleanup goal at this location. We also acknowledge that uncertainty remains regarding whether 95% UCLs will definitely meet their site cleanup goals by 2034; however a visual examination of the projected arsenic and vinyl chloride data does suggest that the site restoration is moving forward at a reasonable pace.

**Specific Comments to Memorandum**

Page 8: Conclusions and Recommendations:

Bullets #1 and 2: *"Data collected to date does not predict with sufficient certainty that compliance will be achieved in all compliance monitoring wells within the restoration time frame ending August 5, 2034. Nor does the data predict that compliance will not be achieved with sufficient certainty to require additional remedial actions at this time."*

We agree that the data collected during the first 5 years under the CAP does not predict that compliance will be achieved nor does it predict that it will not be achieved. As stated earlier, limited data has a high degree of uncertainty, but the visual projections of parameter results are consistent with improving water quality and, with the exception of MW-06, continue to track towards their respective cleanup goal.

Bullet #3: *"Future reports should include the following:"*

- *"Mann-Kendall, Sen's Slope, and curve fitting should be performed with the same data set."*

We agree with this recommendation. Beginning with the 2016 annual monitoring report, vinyl chloride and arsenic data collected since 2007 will be included in both our statistical trend and curve fitting analyses.

- *"Curves should be extended to the time at which cleanup levels are achieved..."*

The PLPs disagree with this recommendation. The CAP specifies that curve fitting will only be projected forward "a few years". Consistent with this requirement, trends are currently projected three years into the future. Projections beyond this limit are considered to have the potential to be significantly inaccurate. We feel that the CAP's reference to using a "several year" trend projection is reasonable for routine reporting and assessment. Given their inherent uncertainty, long-term trend projections (to 2034) are subjective and of limited use to perform outside of Ecology's 5-year review cycle.

- *"The 95% UCL should be plotted for all of the monitoring wells as was done in Workbook Hansville As and VC Data.xlsx."*

Beginning with the 2016 annual monitoring report, normalized 95% UCL, mean, and LCL will be calculated for all wells that report vinyl chloride and arsenic above their site specific cleanup goals. The confidence limits will be plotted annually and compared to past years results to evaluate whether they are converging and still approaching the cleanup level (i.e., sloping downward).

Page 9-10: Additional Comments:

Bullet #1: *"EIM Data: Some errors were found in entries in the Environmental Information Management System database"*

The three data entry errors reported in the 2011 to 2016 Hansville data set during the review process have been corrected. SCS Engineers will continue to review the data following the upload into EIM to ensure accuracy.

Bullet #1: *"All historic data should be entered in EIM. All data used in the analyses should be entered in EIM"*

There are significant issues regarding entering all site data collected prior to the Consent Decree into EIM due to lack of EDDs and the metadata required by the EIM system.

However, in conjunction with extending future statistical trend calculations back to 2007, we will enter the vinyl chloride and arsenic results into the EIM system if possible.

Bullet #2: *Condition of Landfill Cap and Piping*

The Kitsap Public Health District has been verifying the landfill condition and documenting their observation in quarterly inspections. These inspection summaries are provided to Ecology with the annual monitoring reports.

Bullet #3: *Redox Sensitive Inorganic Parameters and Cleanup Level Comparisons*

We concur with continuing to compare the arsenic and manganese concentrations with the cleanup levels established in the CAP.

Bullet #4: *Reducing the Monitoring Frequency*

Given the concerns expressed in Ecology's memorandum, there are currently no plans to implement reductions in the existing monitoring program through the 2016-2021 remedy performance period. However, we feel that there remain valid reasons for optimizing the program in the future. The PLPs discussed possible monitoring optimization plans with the Port Gamble S'Klallam Tribe's technical and administrative staff prior to submittal of the *Remedial Action Status Report* to Ecology. The Tribe indicated no opposition to the proposed monitoring program optimization.

On behalf of Kitsap County and Waste Management of Washington, I appreciate the comprehensive data review completed by Ecology. We would be pleased to discuss any details of the Memorandum further with Ecology to ensure that all expectations for future deliverables are achieved. If you have any questions or concerns regarding the information provided in this letter, please contact Alexis McKinnon, Kitsap County's Closed Landfill Program Analyst at 360-337-5784 or amckinnon@co.kitsap.wa.us.

Sincerely,

Patricia Campbell

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Hansville Landfill File