

## **Appendix F**

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### **Phase I RI Data Validation Summaries and Checklists**

## MEMORANDUM

To:  
Melissa Kleven and Keri Whetter, Exponent, Inc.

From:  
William Huskie, Nankowep Environmental Consulting,



Golden, Colorado

Date:  
September 7, 2010

Subject:  
Heglar Kronquist Landfill - Quality Control Evaluation – May 2010 Water, Dross, and Air  
Sampling Events

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The purpose of this memorandum is to provide a summary evaluation of data quality associated with groundwater, surface water, dross, and air sampling conducted at the Heglar/Kronquist landfill during May of 2010. The review was conducted by a third party Data Validator, Mr. William Huskie, of Nankowep Environmental Consulting. The review process included evaluation of both field and laboratory quality assurance and quality control (QA/QC) sample results reported. Evaluation criteria for the QA/QC review were based on SW-846 method requirements, EPA data validation guidance, the Final Sampling and Analysis Plan and Quality Assurance Project Plan (SAP/QAPP) prepared for the project (ARCADIS 2009), and professional judgment of the third party Data Validator.

Water, dross, and selected air samples were submitted for analysis to Columbia Analytical Services (CAS) Laboratory located in Kelso, Washington. CAS subcontracted some of the requested dross analyses to other laboratories. Air samples were submitted to CAS for analysis of ammonia, and to Air Toxics laboratory located in Folsom, California, for additional analyses.

A discussion of data quality, in terms of precision, accuracy, completeness, and overall data quality, is presented for each sample matrix in the following pages.

### Dross Sampling

Four field samples were collected from the landfill dross, and were submitted for various organic and inorganic analyses. Dross samples were submitted for analysis to CAS Laboratory. CAS subcontracted analyses for Total Kjeldahl Nitrogen (TKN) to AmTest Laboratory located in Kirkland, Washington. CAS subcontracted analyses for Orthophosphate to Edge Analytical Laboratory located in Burlington, Washington.

Analyses for the following parameters were requested.

- Chloride, Fluoride, and Sulfate      EPA Method 9056M
- Total Solids      EPA Method 160.3M
  
- Ammonia as (N)      EPA Method 350.1M
- Total Cyanide      EPA Method 9012A
- Nitrite as (N) and Nitrate as (N)      EPA Method 9056M
  
- Total Metals - Al, K, and Na      EPA Method 6010B
- Full list Metals      EPA Method 6010/6020 series and 7471A (Hg)
  
- Hydrocarbon ID      Method 3550B NWTPH-HCID
- Aroclors/PCBs      EPA Method 8082
  
- VOCs      EPA Method 8260B
- SVOCs      EPA Method 8270C
  
- (TKN) Nitrogen      SM4500N C (Subcontract to AmTest Laboratory located in Kirkland Washington)
  
- Orthophosphate      SM 4500-P-F (Subcontract to Edge Analytical Laboratory located in Burlington, Washington)

Samples D-1-13, D-3-21 and D-4-36 were only analyzed for aluminum, potassium, sodium, chloride, fluoride, nitrite, nitrate, and total solids. Sample D-4-16 was the only sample submitted for all analyses noted above.

An evaluation of the Dross data quality is summarized in the following table and comments.

**VALIDATION CHECKLIST SUMMARY - DROSS SAMPLING**

| REQUIREMENTS                             | REPORTED / EVALUATED |     | PERFORMANCE ACCEPTABLE* |     | DATA QUALIFIED - COMMENTS |
|--|----------------------|-----|-------------------------|-----|---------------------------|
|  | NO                   | YES | NO                      | YES |                           |
| <b>VARIOUS EPA AND STANDARD METHODS</b>  |                      |     |                         |     |                           |
| 1. Holding times / Preservation          |                      | X   |                         | X   |                           |
| 2. Detection limits / Dilutions          |                      | X   |                         | X   |                           |
| 3. Blanks                                |                      |     |                         |     |                           |
| A. Method/Prep Blanks                    |                      | X   | X                       |     | Yes                       |
| B. Equipment/Decon/Field Blanks          | X                    |     |                         | X   | Not Required              |
| 4. Initial and Continuing Calibration %R |                      | X   |                         | X   |                           |
| 5. Matrix Spike (MS) %R                  |                      | X   | X                       |     | Yes                       |
| 6. MS Duplicate (MSD) %R and RPD         |                      | X   | X                       |     | Yes                       |
| 7. LCS and LCSD %R and RPD               |                      | X   | X                       |     | Yes                       |
| 8. Field/Lab Duplicate Comparison (RPD)  |                      | X   | X                       |     | Yes - Lab only            |
| 9. Surrogate Recoveries                  |                      | X   |                         | X   |                           |
| 10. Serial Dilutions                     |                      | X   | X                       |     | Yes                       |
| 11. Results Quantitation                 |                      | X   |                         | X   | Yes - J values            |

%R - percent recovery

RPD - relative percent difference

LCS – Laboratory Control Sample

\* Performance is flagged as not acceptable, if some of the resulting data are qualified. This is not an indication that the laboratory work was unacceptable. Full explanation is provided with the comments for each quality control element.

COMMENTS: Performance was acceptable, with the following exceptions and/or notes:

- 1) The dross samples were received by CAS at acceptable temperatures and under proper chain-of-custody documentation. The dross sample analyses were performed within applicable holding times for all analyses required.
- 2) Several of the inorganic constituent analyses were performed at dilutions to bring analyte concentrations into appropriate linear range. The maximum dilution required was for chloride, at 10,000 times. Reporting limits are determined to be acceptable.
- 3) Results from one or more method blanks were provided in support of each of the requested analyses. Results from calibration blanks were also provide for some analyses. Several metals were detected in one of the method blanks from the Method 6010/6020 analyses. These detected metals included aluminum, barium, beryllium, chromium, cobalt, lead, magnesium, manganese, and nickel. No action was required, as the concentration of these metals in the blanks was less than 5 times the concentrations in any of the associated dross samples. Field and equipment blanks were not collected with the dross samples.

**Methylene chloride, acetone, and 2-butanone were detected in the method blank associated with the volatile organic compound (VOC) analyses. These three VOCs were also detected in the associated dross sample (D-4-16). Due to potential blank contamination bias, the results for these VOCs were qualified as U/non-detect at the concentrations reported.**

- 4) Results from calibration analyses were provided for some of the analyses. Calibration data was reviewed at a cursory level, and was determined to be acceptable. No data qualification was required based on the calibration review.
- 5-6) The laboratory provided results from project specific MS and MSD analyses (spikes on samples D-4-16 and D-1-13), and from batch specific MS and MSD analyses. Precision and accuracy, as demonstrated by these analyses were acceptable, with the following exceptions. **MS and MSD recoveries were low for fluoride, antimony, and manganese. Due to the low spike recoveries, all detections for fluoride, antimony, and manganese were qualified as J/Estimated.** Concentrations for sulfate, zinc, and copper in the spiked samples were more than 4 times higher than the spike added amounts. Therefore, spike recoveries for these analytes were not evaluated.

MS recoveries for 2-hexanone were high for the VOC analyses. No action was required, as 2-hexanone was not detected in the associated sample.

- 7) The laboratory provided results from LCS and/or LCSD analyses in support of the each method requested. Precision and accuracy, as demonstrated by these analyses is acceptable, with the following exceptions. **The LCS recoveries for fluoride and sulfate were high. Fluoride and sulfate results were qualified as J/Estimated due to potential high bias demonstrated by the high LCS recoveries.**

- 8) Field duplicate samples were not submitted with the samples collected under this chain-of-custody.

The laboratory provided results from project and batch specific laboratory duplicate analyses for most analytes. **Laboratory duplicate precision was acceptable, for all analytes, with the exception of that for sulfate, where the laboratory RPD control limit was exceeded. Due to the poor precision, sulfate detections were qualified as J/Estimated for sample D-4-16.**

- 9) Results from surrogate spikes were reported in support of the VOC, SVOC, and Aroclor analyses. Accuracy, as demonstrated by the surrogate recoveries was determined to be acceptable.
- 10) Results from serial dilution analyses were provided in support of the metals analyses. **The percent differences between the initial and diluted analyses for sodium, copper, and zinc exceeded the upper control limit of 10 percent. Due to the poor serial dilution precision, results for these metals were qualified as J/Estimated in the associated samples.**
- 11) No anomalies were noted with respect to the analytical reporting, with the following considerations. Results for metals (potassium, arsenic, cadmium, silver, and thallium) and for SVOCs (bis[2-ethylhexyl phthalate]), were reported at concentrations between the method detection limit (MDL) and the project reporting limit in some samples. These data were flagged by the laboratory with a “J” flag. **Due to limited accuracy in this portion of the calibration range, the results for these analytes were qualified as J/Estimated.**

### Summary

Data quality for the gross samples collected during May 2010 was evaluated based on SW-846 method requirements, EPA data validation guidance, the Final Sampling and Analysis Plan and Quality Assurance Project Plan (SAP/QAPP) prepared for the project (ARCADIS 2009), and professional judgment of the third party Data Validator.

Data quality was determined to be acceptable, with the following considerations.

Methylene chloride, acetone, and 2-butanone were detected in the method blank associated with the VOC analysis of sample D-4-16. These VOCs were also the only VOCs detected in sample D-4-16. Due to potential blank contamination bias, the results for these VOCs were qualified as U/non-detect at the concentrations reported in the gross sample. The VOC detections are considered to be false positives.

Matrix spike recoveries for fluoride, antimony, and manganese were low. Results for these analytes may be biased low, and were qualified as J/Estimated. Laboratory control sample recoveries for fluoride and sulfate were high. Fluoride and sulfate results were qualified as J/Estimated due to potential high bias demonstrated by the high LCS recoveries.

Serial dilution precision was poor for sodium, copper, and zinc. Due to the poor serial dilution precision, results for these metals were qualified as J/Estimated in the associated samples.

Some target constituents were detected at low concentrations between the laboratory method detection limits and standard reporting limits. These data were flagged by the laboratory as “J” values, and were validated as estimated concentrations, due to limited accuracy in this portion of the

calibration range. These constituents included potassium, arsenic, cadmium, silver, thallium, and bis(2-ethylhexyl)phthalate.

Water Sampling

Several water samples were collected in association with the landfill investigation. Samples were collected from borehole groundwater, monitoring wells, selected private wells, and from surface water locations. Analytical results for the water samples were provided in eight separate CAS laboratory reports.

Analyses for combinations of the following parameters were requested.

- Chloride, Fluoride, and Sulfate           EPA Method 300.0
- Ammonia as (N)                           EPA Method 350.1
- Nitrite as (N) and Nitrate as (N)       EPA Method 353.2
- Orthophosphate                           EPA Method 365.3
- Alkalinity forms                         SM 2320B
- Total Dissolved Solids                 SM 2540C
- Total and Dissolved Metals           EPA Method 200.8/200.7 and 245.1 – CVAA (Hg)
  
- Aroclors/PCBs                         EPA Method 608M
- VOCs                                     EPA Method 624
- SVOCs                                   EPA Method 625

An evaluation of the water data quality is summarized in the following table and comments.

**VALIDATION CHECKLIST SUMMARY - WATER SAMPLING**

| REQUIREMENTS                             | REPORTED / EVALUATED |     | PERFORMANCE ACCEPTABLE* |     | DATA QUALIFIED - COMMENTS |
|--|----------------------|-----|-------------------------|-----|---------------------------|
|  | NO                   | YES | NO                      | YES |                           |
| <b>VARIOUS EPA AND STANDARD METHODS</b>  |                      |     |                         |     |                           |
| 1. Holding times / Preservation          |                      | X   | X                       |     | Yes                       |
| 2. Detection limits / Dilutions          |                      | X   |                         | X   |                           |
| 3. Blanks                                |                      |     |                         |     |                           |
| A. Method/Prep Blanks                    |                      | X   | X                       |     | Yes                       |
| B. Equipment/Field/Trip Blanks           |                      | X   | X                       |     | Yes                       |
| 4. Initial and Continuing Calibration %R |                      | X   | X                       |     | Yes                       |
| 5. Matrix Spike (MS) %R                  |                      | X   |                         | X   |                           |
| 6. MS Duplicate (MSD) %R and RPD         |                      | X   |                         | X   |                           |
| 7. LCS and LCSD %R and RPD               |                      | X   |                         | X   |                           |
| 8. Field/Lab Duplicate Comparison (RPD)  |                      | X   | X                       |     | Yes                       |
| 9. Surrogate Recoveries                  |                      | X   |                         | X   |                           |
| 10. Serial Dilutions                     |                      | X   | X                       |     | Yes                       |
| 11. Results Quantitation                 |                      | X   |                         | X   | Yes – J values            |

%R - percent recovery                      RPD - relative percent difference                      LCS – Laboratory Control Sample

\* Performance is flagged as not acceptable, if some of the resulting data are qualified. This is not an indication that the laboratory work was unacceptable. Full explanation is provided with the comments for each quality control element.

COMMENTS: Performance was acceptable, with the following exceptions and/or notes:

- 1) The groundwater, surface water, and well water samples were received by CAS at acceptable temperatures and under proper chain-of-custody documentation. The water sample analyses were performed within applicable holding times for all analyses required, with the following exceptions. **CAS missed holding times for nitrate (as N) for most all of the samples submitted. All nitrite analyses met the short 48-hour holding time. Due to the missed holding times, nitrate results for most samples were qualified as J/Estimated.**

pH results for all samples were qualified as J/Estimated, as pH analyses should be performed immediately upon sample collection (typically within 15 minutes). All pH analyses were performed past the 15-minute holding time.

- 2) Several of the inorganic constituent analyses were performed at dilutions to bring analyte concentrations into appropriate linear range. The maximum dilution was required for chloride, at 100 times. Reporting limits are determined to be acceptable.
- 3) Results from one or more method blanks were provided in support of each of the requested analyses. Results from calibration blanks were also provided in support of some analyses. Several metals were detected in the method blanks associated with the water samples. Several metals from the Method 200.7/200.8 suites were detected at low concentrations in one or more of the calibration blanks. Equipment blanks and field blanks were collected with some samples groups, and had numerous low concentration metals detections as well. **Several metals were detected in associated samples at concentrations within 5 times those of the blanks. Results for these metals were qualified as U/non-detect at the reporting limits stated, due to potential blank contamination bias. Metals results qualified as U/non-detect due to blank contamination included the following:**

BH-10, BH-12 and BH-14 / Selenium  
BH-10 and BH-14 / Chromium, zinc, and lead  
BH-10 / Arsenic  
BH-11-62 / Arsenic and chromium  
BH-11-62 and BH-9 / Selenium  
BH-3 and BH-4 / Cadmium  
BH-5 / Copper and manganese  
BH-4 / Silver  
BH-3, BH-4, and BH-5 / Chromium and zinc  
BH-2 / Arsenic  
4aad and BH-15 / Chromium  
BH-6 / Vanadium  
SW-2, SW-3, and SW-9 / Antimony, lead, thallium, and cadmium  
SW-3 / Zinc  
3ddd / Antimony  
3ddd and 3bcd-2 / Arsenic, chromium, cobalt, lead, nickel, thallium, vanadium, zinc, and cadmium

Some inorganic analytes were also detected in method blanks, calibration blanks, and/or the equipment blanks resulting in data qualifications. These include ammonia, nitrate, and nitrite as follows:

BH-11-62 and BH-9/Nitrite  
BH-3, BH-4, and BH-5 / Nitrite  
5aad and BH-1 / Ammonia



BH-1, 5add, 4bcd, 14aaa, and 3b / Nitrite  
BH-6, BH-7, and BH-15 / Ammonia  
BH-6, BH-15, and 4aad / Nitrate  
SW-1 and SW-5 / Ammonia  
SW-6 / Nitrate  
SW-1, SW-2, SW-3, SW-4, SW-5, SW-6, and SW-9/Nitrite  
3bcd-2, SW-7, and 3ddd / Ammonia  
3bcd-2, SW-7, and 3ddd / Nitrite

Chloride and sulfate were detected in the equipment/field blanks at low concentrations that did not result in data qualification, as the associated sample concentrations were much higher than the blank detections.

Some water samples were analyzed for VOCs. Several VOCs were detected in the method blanks and field blanks associated with the samples. **Toluene was detected in the trip blanks submitted. Data qualified as U/non-detect due to VOC blank contamination includes the following:**

SW-2, SW-3, and SW-9 / Toluene  
SW-7, 3bcd-2, and 3ddd / Toluene

- 4) Results from calibration analyses were provided for some of the analyses. Calibration data was reviewed at a cursory level, and was determined to be acceptable. No data qualification was required based on the calibration review, with the following exception. **SVOC benzidine was qualified as UJ/Estimated and non-detect at the reporting limits stated in samples 3bcd-2 and 3ddd due to a poor continuing calibration standard recovery.**
- 5-6) The laboratory provided results from project specific MS and MSD analyses and from batch specific MS and MSD analyses. Precision and accuracy, as demonstrated by these analyses were acceptable.
- 7) The laboratory provided results from LCS and/or LCSD analyses in support of each method requested. Precision and accuracy, as demonstrated by these analyses is acceptable.
- 8) Four sets of field duplicate samples were submitted with the water samples, as follows:

**Sample BH-14 was submitted as a blind field duplicate of primary sample BH-10.**  
**Sample 14aaa was submitted as a blind field duplicate of primary sample 3b.**  
**Sample SW-9 was submitted as a blind field duplicate of primary sample SW-2.**  
Sample 3ddd was submitted as a blind field duplicate of primary sample 3bcd-2.

Field duplicate precision was acceptable, for all parameters and all comparisons, with RPDs <40 %, or agreement between primary and duplicate results within a reporting limit increment, with the following exceptions. **For the 3ddd and 3bcd-2 pair, iron was qualified for the primary and duplicate samples for poor precision and an RPD of 77 percent. Lead precision was also poor for this pair, but no action was required, as both values were qualified as U/non-detect due to blank contamination.**

The laboratory provided results from project and batch specific laboratory duplicate analyses for most analytes. Laboratory duplicate precision was acceptable for all analytes, with RPDs less than 25 percent, or with results in agreement within a reporting limit increment.

- 9) Results from surrogate spikes were reported in support of the VOC, SVOC, and Aroclor analyses. Accuracy, as demonstrated by the surrogate recoveries was determined to be acceptable.
- 10) Results from serial dilution analyses were provided in support of the metals analyses. The percent differences between the initial and diluted analyses exceeded the upper control limit of 10 percent for several samples. Due to the poor serial dilution precision, results for the following metals were qualified as J/Estimated in the associated samples.

BH-13 / Aluminum

BH-3 BH-4, BH-5, BH-9, BH-10, BH-11-62, BH-12, and BH-14 / Magnesium

BH-1, BH-2, 5add, 4bcd, 14aaa, and 3b / Iron

BH-6, BH-7, BH-15, 4add, and SW-8 / Iron

SW-1, SW-4, SW-5, SW-6, SW-2, SW-3, and SW-9 / Iron

SW-7, 3bcd-2, and 3ddd / Iron

- 11) No anomalies were noted with respect to the analytical reporting, with the following considerations. Results for several metals (including selenium, silver, thallium, cadmium, lead, beryllium, chromium, vanadium, antimony, manganese, and mercury), were reported at concentrations between the method detection limit (MDL) and the project reporting limit (RL) in some samples. **These data were flagged by the laboratory with a “J” flag. Due to limited accuracy in this portion of the calibration range, the results for these analytes were qualified as J/Estimated (pending the results of the blank evaluations).**

Several general chemistry parameters were detected at concentrations between the MDL and RL, and were qualified as J/Estimated. These included ammonia (BH-9), fluoride (SW-6, BH-3 and BH-4), and nitrite (several samples that were not qualified due to blank contamination).

For the SVOC analyses, bis(2-ethylhexyl)phthalate was reported between the MDL and RL for sample 3bcd-2, and was qualified J/Estimated.

## Summary

Data quality for the water samples is acceptable, with the following considerations. Nitrate analyses were performed out of holding times for most samples and pH was analyzed outside the recommended holding time of 15-minutes. Nitrate and pH data for these samples are qualified as J/Estimated. Nitrite and ammonia were detected in several samples at low concentrations and several of these detections were qualified due to detections in the equipment blanks at similar concentrations.

Several metals results were qualified as J/Estimated due to generally small control limit excursions in the serial dilution analyses. Iron was qualified as J/Estimated in the primary and duplicate samples (3bcd-2 and 3ddd, respectively) due to poor precision.

Many metals, ammonia, fluoride, nitrite, and bis(2-ethylhexyl)phthalate were detected at low concentrations between the MDL and RL. These results were flagged by the laboratory as J/Estimated due to limited accuracy in this portion of the calibration range.

Metals were detected in the method blanks, calibration blanks, equipment blanks, and the field blank at similar concentrations. Many of the low concentration metals detections were qualified due to blank contamination.

VOC detections for the water samples were all qualified due to associated blank detections with the exception of o-xylene in the field duplicate sample. There is no indication that VOCs detected in the water samples are present as anything other than false positives. Benzidine was qualified as UJ/Estimated and non-detect at the reporting limit stated in samples 3bcd-2 and 3ddd due to a poor continuing calibration standard recovery.

Air Sampling

Air samples were collected from gas vents, one of the dross investigation boreholes, and ambient locations upwind and downwind of the landfill. Analyses for ammonia were performed by CAS laboratory. All other air analyses were performed by Air Toxics Laboratory.

Analyses for combinations of the following parameters were requested.

- Ammonia                      OSHA ID-188 Ion Selective Electrode (Anasorb 747 tube)
- VOCs                              EPA Method TO-15 (6-Liter Summa Canisters)
- Methane,  
Natural gases and  
Fixed gases                      ASTM D-1945 for methane and GC/FID  
or GC/TCD for fixed gases and natural gas compounds  
(6-Liter Summa Canisters)
- Siloxane                              GC/MS – Air Toxics Method 71 (Impinger Vials)
- Aroclors                              EPA Method TO-10A (Polyurethane Foam cartridge- PUF)

An evaluation of the air data quality is summarized in the following table and comments.

**VALIDATION CHECKLIST SUMMARY - AIR SAMPLING**

| REQUIREMENTS                             | REPORTED / EVALUATED |     | PERFORMANCE ACCEPTABLE* |     | DATA QUALIFIED - COMMENTS |
|--|----------------------|-----|-------------------------|-----|---------------------------|
|  | NO                   | YES | NO                      | YES |                           |
| <b>VARIOUS EPA AND STANDARD METHODS</b>  |                      |     |                         |     |                           |
| 1. Holding times / Preservation          |                      | X   |                         | X   |                           |
| 2. Detection limits / Dilutions          |                      | X   |                         | X   | See note #2               |
| 3. Blanks                                |                      |     |                         |     |                           |
| A. Method/Prep Blanks                    |                      | X   |                         | X   |                           |
| B. Equipment/Field/Trip Blanks           |                      | X   |                         | X   |                           |
| 4. Initial and Continuing Calibration %R |                      | X   |                         | X   |                           |
| 5. Matrix Spike (MS) %R                  | X                    |     |                         | X   |                           |
| 6. MS Duplicate (MSD) %R and RPD         | X                    |     |                         | X   |                           |
| 7. LCS and LCSD %R and RPD               |                      | X   | X                       |     | No                        |
| 8. Field/Lab Duplicate Comparison (RPD)  |                      | X   | X                       |     | Yes                       |
| 9. Surrogate Recoveries                  |                      | X   |                         | X   |                           |
| 10. Internal Standards                   |                      | X   |                         | X   |                           |
| 11. Results Quantitation                 |                      | X   |                         | X   |                           |

%R - percent recovery

RPD - relative percent difference

LCS – Laboratory Control Sample

\* Performance is flagged as not acceptable, if some of the resulting data are qualified. This is not an indication that the laboratory work was unacceptable. Full explanation is provided with the comments for each quality control element.

COMMENTS: Performance was acceptable, with the following exceptions and/or notes:

- 1) The air samples were received by CAS and Air Toxics at temperatures required by the methods. Holding times are not specified for ammonia analyses in the Final Sampling and Analysis Plan and Quality Assurance Project Plan (ARCADIS 2009). All other air analysis holding times were met as prescribed in the project SAP/QAPP. The published holding time for ammonia in air by OSHA 188 is 14 days, and air samples were analyzed for ammonia within this holding time.
- 2) Some Summa canister samples were analyzed at small dilutions associated with the Summa method. These dilutions do not reflect quantitation due to elevated target compound concentration levels. Several of the ambient air samples were analyzed for VOCs at dilutions of 6 to 25 times due to the presence of an early non-target peak in the sample chromatogram. These dilutions raised the reporting limits for the VOCs to levels that severely compromised the sensitivity of the analyses. All other reporting limits are determined to be acceptable.
- 3) Results from one or more method blanks were provided in support of each of the requested analyses. Results from a field blank were provided in support of the organic compound analyses and a trip blank was provided in support of the VOC analyses. No target compounds were detected in any of the blanks.
- 4) Results from calibration analyses were provided for some of the analyses. Response factors (RFs) and relative standard deviations (RSDs) from the calibrations were acceptable. Results from continuing calibration analyses were acceptable, where provided.
- 5-6) Matrix spike analyses were not provided in support of the air analyses.
- 7) The laboratory provided results from LCS and/or LCSD analyses in support of the each method requested. Precision and accuracy, as demonstrated by these analyses is acceptable, with the following exceptions. The LCS recovery for vinyl chloride was high in one of the VOC spikes. No action is required, as vinyl chloride was not detected in the associated samples. The LCS recovery for hexachlorobutadiene was high in one spike. No action was required, as this VOC was not detected in the associated samples.
- 8) **Sample D-10 is a field duplicate or primary sample D-1.** Field duplicate precision was acceptable, for all parameters and all comparisons, with RPDs <40 %, or agreement between primary and duplicate results within a reporting limit increment, with the following exceptions. **Precision for Hexamethyl disiloxane detections was poor with an RPD of 41 percent in the dup pair. Both values were qualified as J/Estimated. Precision for acetone detections was poor with an RPD of 49 percent in the dup pair. Both acetone values were qualified as J/Estimated.**

The laboratory provided results from project and batch specific laboratory duplicate analyses for most analytes. Laboratory duplicate precision was acceptable for all analytes, with RPDs less than 25 percent, or with results in agreement within a reporting limit increment.
- 9) Results from surrogate spikes were reported in support of the VOC, siloxane, and Aroclor analyses. Accuracy, as demonstrated by the surrogate recoveries was determined to be acceptable.
- 10) Results from internal standards were provided in support of the VOC, siloxane, and Aroclor analyses. Areas and retention times for the internal standards were acceptable.

- 11) No anomalies were noted with respect to the analytical reporting. Detailed review of ion chromatograms was performed to evaluate the hexamethyl disiloxane detections. This review was not helpful, as the surrogate compound for this analysis is a deuterated form of hexamethyl disiloxane, and essentially co-elutes with the target compound. Identification is based solely on GC/MS ion spectra.

### **Summary**

Data quality for the air samples is acceptable, with the following exceptions. VOC analyses for the ambient air samples were diluted due to the presence of an early eluting non-target peak. The dilutions impact the sensitivity of the VOC analyses to the point where they have limited value, due to elevated reporting limits with no VOCs detected.

Acetone and hexamethyl disiloxane were each detected in the primary and duplicate samples (D-1 and D-10, respectively) at low concentrations. Both of these compounds demonstrated poor precision based on the results of the field duplicate sampling and were qualified as J/Estimated.

**HEGLAR KRONQUIST LANDFILL – AMBIENT AIR MONITORING SAMPLES  
VALIDATION OF LABORATORY RESULTS**

**AIR TOXICS LABORATORY  
REPORT 1009208 - DATED OCTOBER 6, 2010**

**INTRODUCTION**

Exponent collected eight ambient air samples and two associated quality control blanks from the Heglar-Kronquist Landfill site on September 7 and 8, 2010. The samples were submitted to Air Toxics Laboratory, located in Folsom, California, on September 10, 2010. All samples were collected in 6-liter Summa canisters. The following samples were collected.

| <b>Geomatrix Sample ID</b> | <b>Laboratory ID</b>        | <b>Analysis / Comment</b>                                    |
|----------------------------|-----------------------------|--|
| ALF-3                      | 1009208-01A*<br>1009208-01B | VOCs by GC/MS and Selective Ion Monitoring                   |
| ALF-2                      | 1009208-02A<br>1009208-02B  | VOCs by GC/MS and Selective Ion Monitoring                   |
| ALF-1                      | 1009208-03A<br>1009208-03B  | VOCs by GC/MS and Selective Ion Monitoring                   |
| ALF-4                      | 1009208-04A<br>1009208-04B  | VOCs by GC/MS and Selective Ion Monitoring                   |
| ALF-5                      | 1009208-05A<br>1009208-05B  | VOCs by GC/MS and Selective Ion Monitoring                   |
| AOS-1                      | 1009208-06A<br>1009208-06B  | VOCs by GC/MS and Selective Ion Monitoring                   |
| AOS-2                      | 1009208-07A<br>1009208-07B  | VOCs by GC/MS and Selective Ion Monitoring                   |
| AOS-3                      | 1009208-08A<br>1009208-08B  | VOCs by GC/MS and Selective Ion Monitoring                   |
| EB090810                   | 1009208-09A<br>1009208-09B  | VOCs by GC/MS and Selective Ion Monitoring / Equipment Blank |
| TB090810                   | 1009208-10A<br>1009208-10B  | VOCs by GC/MS and Selective Ion Monitoring / Trip Blank      |

\* Samples designated with an “A” suffix were analyzed by GC/MS using full scan detections. The “B” suffix samples were analyzed using GC/MS in selective ion monitoring (SIM) mode.

All samples were submitted for analysis of selected Volatile Organic Compounds (VOCs) by USEPA Method TO-15. Each sample was quantified using Gas Chromatography/Mass Spectroscopy (GC/MS) with standard full scan detection (A sample) and selective ion monitoring detections (B sample).

Quality Control for the ambient air monitoring samples is evaluated in the following checklist table and comments. A summary of data quality for the samples analyzed is provided in the final page of this validation report.

**VALIDATION CHECKLIST SUMMARY**  
**HEGLAR KRONQUIST LANDFILL – AMBIENT AIR SAMPLING**  
**VOLATILE ORGANIC COMPOUNDS BY EPA METHOD TO-15**

| REQUIREMENTS   | REPORTED |     | PERFORMANCE ACCEPTABLE |     | DATA QUALIFIED |
|--|----------|-----|------------------------|-----|----------------|
|  | NO       | YES | NO                     | YES |                |
| <b>GAS CHROMATOGRAPHY/ MASS SPECTROMETRY (GC/MS)</b> |          |     |                        |     |                |
| 1. Holding times                                     |          | X   |                        | X   |                |
| 2. Detection limits                                  |          | X   |                        | X   |                |
| 3. Blanks  |          |     |                        |     |                |
| A. Laboratory Method Blanks                          |          | X   |                        | X   |                |
| B. Equipment/Ambient Blanks                          |          | X   | X                      |     | Yes            |
| C. Trip Blanks                                       |          | X   |                        | X   |                |
| 4. Laboratory control sample (LCS) %R                |          | X   |                        | X   |                |
| 5. LCS Duplicate %R and (RPD)                        |          | X   |                        | X   |                |
| 6. Matrix Spike (MS) %R                              | X        |     |                        | X   | Not required   |
| 7. MS Duplicate (MSD) %R and (RPD)                   | X        |     |                        | X   | Not required   |
| 8. Surrogate Recoveries (%R)                         |          | X   |                        | X   |                |
| 9. Field/Lab duplicate/split comparison              | X        |     |                        | X   | Not required   |
| 10. Results Quantitation                             |          | X   |                        | X   |                |
| 11. Canister Certification Review                    |          | X   |                        | X   |                |
| 12. Internal Standards                               |          | X   |                        | X   |                |

%R - percent recovery RPD - relative percent difference

COMMENTS: Performance was acceptable, with the following exceptions and/or notes.

- 1) All air samples were properly collected in Summa Canisters on September 7 and 8, 2010, and were returned to the laboratory on September 10, 2010. All TO-15 analyses were completed by September 29, 2010, within recommended 30-day holding times for VOCs in Summa Canisters.
- 2) All sample results are presented in units of part per billion-volume (ppb-v) and in micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ). **The blank evaluation is based on the results provided in  $\mu\text{g}/\text{m}^3$**  Samples were analyzed at nominal dilutions, ranging from 1.61 to 1.79 times. Reporting limits are determined to be acceptable.
- 3) Results from two full suite laboratory method blanks were provided in support of the VOC analyses. No VOCs were detected in the method blanks. Results from one trip blank were provided with no VOCs detected. Results from one equipment blank were provided in support of the ambient air sample analyses, with the following VOCs detected:



| <u>Equipment Blank</u><br>(EB-090810) | <u>VOCs detected (ug/m<sup>3</sup>)</u> |
|---------------------------------------|---|
| Bromomethane                          | 1.9                                     |
| Freon 11                              | 1.1                                     |
| Ethanol                               | 1.8                                     |
| Acetone                               | 27                                      |
| Methylene chloride                    | 1.7                                     |
| Hexane                                | 0.67                                    |
| 2-Butanone                            | 3.4                                     |
| 4-ethyltoluene                        | 1.4                                     |
| 1,2,4-Trimethylbenzene                | 1.7                                     |
| Benzene                               | 1.2                                     |
| Vinyl chloride                        | 1.3                                     |
| Toluene                               | 3.3                                     |
| Ethylbenzene                          | 0.75                                    |
| M/p-xylene                            | 3.1                                     |
| o-xylene                              | 1.2                                     |

1,2,4-Trimethylbenzene, 4-ethyltoluene, bromomethane, ethylbenzene, hexane, and o-xylene, were not detected in any associated samples, and no action is required,

2-Butanone, acetone, benzene, methylene chloride, ethanol, m/p-xylenes, toluene, Freon 11, and vinyl chloride were all detected in the ambient air monitoring samples at concentrations within five times those of the equipment blank (results for the equipment blank are shown in shaded text below for each VOC). **Due to potential blank contamination bias, these results for each of the VOCs are qualified as U/non-detect at the concentrations reported. The following results are qualified:**

| Sample ID | Chemical Name | Result | Data Qualifier |
|-----------|---------------|--------|----------------|
| ALF-1     | 2-Butanone    | 0.69   | <i>U</i>       |
| ALF-2     | 2-Butanone    | 3.2    | <i>U</i>       |
| ALF-3     | 2-Butanone    | 4.9    | <i>U</i>       |
| ALF-4     | 2-Butanone    | 1.3    | <i>U</i>       |
| ALF-5     | 2-Butanone    | 0.94   | <i>U</i>       |
| AOS-1     | 2-Butanone    | 5.9    | <i>U</i>       |
| AOS-2     | 2-Butanone    | 4.4    | <i>U</i>       |
| AOS-3     | 2-Butanone    | 0.76   | <i>U</i>       |
| EB-090810 | 2-Butanone    | 3.4    |                |
| ALF-1     | Acetone       | 7      | <i>U</i>       |
| ALF-2     | Acetone       | 19     | <i>U</i>       |
| ALF-3     | Acetone       | 22     | <i>U</i>       |
| ALF-4     | Acetone       | 9      | <i>U</i>       |
| ALF-5     | Acetone       | 8.4    | <i>U</i>       |
| AOS-1     | Acetone       | 27     | <i>U</i>       |
| AOS-2     | Acetone       | 14     | <i>U</i>       |
| AOS-3     | Acetone       | 7.8    | <i>U</i>       |
| EB-090810 | Acetone       | 27     |                |

| Sample ID | Chemical Name      | Result | Data Qualifier |
|-----------|--------------------|--------|----------------|
| ALF-1     | Benzene            | 0.28   | <i>U</i>       |
| ALF-4     | Benzene            | 0.29   | <i>U</i>       |
| AOS-2     | Benzene            | 0.27   | <i>U</i>       |
| EB-090810 | Benzene            | 1.2    |                |
| ALF-4     | Methylene Chloride | 3.4    | <i>U</i>       |
| AOS-2     | Methylene Chloride | 5.9    | <i>U</i>       |
| EB-090810 | Methylene Chloride | 1.7    |                |
| ALF-2     | Ethanol            | 2.1    | <i>U</i>       |
| ALF-3     | Ethanol            | 4.4    | <i>U</i>       |
| ALF-4     | Ethanol            | 1.8    | <i>U</i>       |
| ALF-5     | Ethanol            | 1.9    | <i>U</i>       |
| AOS-1     | Ethanol            | 4      | <i>U</i>       |
| AOS-2     | Ethanol            | 4      | <i>U</i>       |
| AOS-3     | Ethanol            | 2      | <i>U</i>       |
| EB-090810 | Ethanol            | 1.8    |                |
| AOS-2     | m,p-Xylenes        | 0.36   | <i>U</i>       |
| EB-090810 | m,p-Xylenes        | 3.1    |                |
| ALF-1     | Toluene            | 0.36   | <i>U</i>       |
| ALF-2     | Toluene            | 0.26   | <i>U</i>       |
| ALF-3     | Toluene            | 0.71   | <i>U</i>       |
| ALF-4     | Toluene            | 0.39   | <i>U</i>       |
| ALF-5     | Toluene            | 0.21   | <i>U</i>       |
| AOS-1     | Toluene            | 0.32   | <i>U</i>       |
| AOS-2     | Toluene            | 1      | <i>U</i>       |
| AOS-3     | Toluene            | 0.37   | <i>U</i>       |
| EB-090810 | Toluene            | 3.3    |                |
| ALF-1     | Freon 11           | 1.2    | <i>U</i>       |
| ALF-2     | Freon 11           | 1.2    | <i>U</i>       |
| ALF-3     | Freon 11           | 1.1    | <i>U</i>       |
| ALF-4     | Freon 11           | 1.2    | <i>U</i>       |
| ALF-5     | Freon 11           | 1.1    | <i>U</i>       |
| AOS-1     | Freon 11           | 1.1    | <i>U</i>       |
| AOS-2     | Freon 11           | 1.3    | <i>U</i>       |
| AOS-3     | Freon 11           | 1.3    | <i>U</i>       |
| EB-090810 | Freon 11           | 1.1    |                |
| ALF-1     | Vinyl chloride     | 0.86   | <i>U</i>       |
| ALF-2     | Vinyl chloride     | 0.33   | <i>U</i>       |
| ALF-3     | Vinyl chloride     | 0.29   | <i>U</i>       |
| ALF-4     | Vinyl chloride     | 0.23   | <i>U</i>       |
| ALF-5     | Vinyl chloride     | 0.059  | <i>U</i>       |
| AOS-1     | Vinyl chloride     | 0.53   | <i>U</i>       |

| Sample ID | Chemical Name  | Result | Data Qualifier |
|-----------|----------------|--------|----------------|
| AOS-2     | Vinyl chloride | 0.59   | <i>U</i>       |
| AOS-3     | Vinyl chloride | 0.94   | <i>U</i>       |
| EB-090810 | Vinyl chloride | 1.3    |                |

- 4-5) Results from two sets of full suite LCS and LCS duplicate (LCSD) analyses were reported in support of the VOC analyses. LCS results were presented for the full scan and SIM mode GC/MS analyses. Precision and accuracy, as demonstrated by the LCS and LCSD analyses are acceptable.
- 6-7) Results from MS and MSD analyses were not provided. Precision and accuracy are evaluated based on the results of the LCS and LCSD analyses.
- 8) Three surrogate compounds were spiked into each ambient air sample in support of the VOC analyses. Surrogate recoveries were within prescribed control limits, ranging from 83 to 104 percent.
- 9) Field duplicate samples were not collected with the samples under this chain-of-custody.
- 10) VOC results quantitation is acceptable. Values were not reported between standard reporting limits and method detection limits (MDLs). Appropriate dilution maintained all sample results within calibration ranges. Raw data and chromatograms for each of the samples were reviewed. Raw data matches the results presented in the summary data forms.
- 11) Certification data for each of the Summa Canisters and associated flow controllers was requested from the laboratory. These data indicated that the canisters and flow controllers were verified clean at the time of testing.
- 12) Results for internal standard area and retention times were reviewed for each sample. Internal standard areas and retention times were within specified control limits.

### **Summary**

Data quality for the ambient air samples collected on and around the landfill during September 2010 was evaluated based on SW-846 method requirements, EPA data validation guidance, the Final Sampling and Analysis Plan and Quality Assurance Project Plan (SAP/QAPP) prepared for the project (ARCADIS 2009), and professional judgment of the third party Data Validator. Based on this review, the internal laboratory quality control (blanks, laboratory control samples, and surrogates) indicates that precision and accuracy of the air data are acceptable.

Evaluation of the field quality control data indicates that there was a source of VOC contamination in the sampling train and/or possibly at the laboratory, as demonstrated by numerous VOC detections in the equipment blank. VOC detections reported in the ambient air samples are typically equivalent in magnitude to those detected in the equipment blank. All ambient air VOC detections were detected at concentrations less than five times the VOC concentration detected in the

equipment blank. Therefore, it cannot be concluded that the VOC detections in the ambient air samples are associated with the landfill. These VOC detections are determined to be false positives, and were all qualified as U/Non-detected at the concentrations reported.

**HEGLAR KRONQUIST LANDFILL – AMBIENT AIR MONITORING SAMPLES  
VALIDATION OF LABORATORY RESULTS**

**AIR TOXICS LABORATORY  
REPORT 1009208 - DATED OCTOBER 6, 2010**

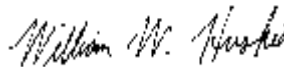
Exponent collected eight ambient air samples and two associated quality control blanks from the Heglar-Kronquist Landfill site on September 7 and 8, 2010. The sample results have been validated in accordance with the EPA Functional Guidelines for Organic Data Review (EPA – most applicable versions), appropriate EPA TO-15 method requirements, and professional judgment of the data reviewer.

The QC information evaluated has been described in the preceding pages. Based on this review, data provided for the ambient air samples collected are determined to be quantitative, with the exceptions noted in the following table.

| <b>Sample Identification(s) / Analyte(s)</b>   | <b>Data Qualifier(s)</b>                           | <b>Reason(s) For Qualification</b>   |
|--|--|--|
| <p><b>SEE LIST OF BLANK QUALIFIED DATA PRESENTED UNDER ITEM #3 IN THIS REPORT.</b></p> <p><b>ALL VOC DETECTIONS FOR THE SAMPLES SUBMITTED ARE QUALIFIED.</b></p> | <p>U/Non-detect at the concentrations reported</p> | <p>These VOCs were detected in the associated equipment blank at concentrations within 5 times those of the air samples. Air samples detections appear to be the result of blank contamination bias.</p> |

VALIDATION PERFORMED BY: William W. Huskie, Consulting Geochemist

SIGNATURE:



DATE: November 10, 2010