Everett Landfill/Tire Fire Site
2015 Ground Water Sampling and Analysis Plan

Project No. 1998 165-660

Prepared for
City of Everett

May 22, 2015

HWA GeoSciences Inc.
• Geotechnical Engineering
• Hydrogeology
• Geoenvironmental Services
• Inspection & Testing

Table of Contents

List of Figures (Following Text)

List of Tables

List of Appendices

EVERETT LANDFILL/TIRE FIRE SITE
2015 GROUND WATER SAMPLING AND ANALYSIS PLAN

1.0 INTRODUCTION

This 2015 Sampling and Analysis Plan (SAP) is for ongoing ground water Performance Monitoring, as outlined in the Compliance Monitoring and Contingency Plan (CMCP) and amended via discussions with Washington State Department of Ecology (Ecology). The CMCP is an attachment to the Cleanup Action Plan (CAP), previously submitted to and approved by Ecology in association with the Consent Decree for the Everett Landfill/Tire Fire Site (Site) that was entered into Snohomish County Superior Court on April 2, 2001 (FSI, 2001). This SAP was prepared based on monitoring results to date and discussions with Ecology, and once approved this SAP replaces the SAP dated March 22, 2005.

This SAP:

1. Specifies procedures for field sampling activities.
2. Identifies quality assurance (QA) procedures to be implemented during sampling activities and laboratory analyses.
3. Meets the requirements of WAC 173-340-820, and WAC 173-340-410(3)(a) of the Model Toxics Control Act (MTCA), for sampling and analysis plans.

Sampling and analysis will be conducted by HWA GeoSciences Inc. under the direction of the City of Everett Public Works Department (City). The City will report results to Ecology in accordance with the schedule defined in the CMCP.

1.1 MONITORING REQUIREMENTS

The City completed three years of Evaluation Monitoring for ground water, and submitted an Evaluation Monitoring Report to Ecology (HWA, 2004). Following the Evaluation Monitoring period, the City conducted Performance Monitoring from 2005 until 2014, per the 2005 SAP and the requirements of Section 4.5 of the Compliance Monitoring and Contingency Plan (2001 Consent Decree) . This 2015 SAP specifies changes in Performance Monitoring protocol after 2015 based on monitoring results to date, discussions with Ecology, and the expected near-term installation of piles within the landfill (expected within 2 years).

Per the CMCP, Performance Monitoring will occur for a minimum of 10 years, and as triggered by certain development actions. The landfill site has had limited development, including ground improvement via preloading, and some roadways and utilities. No buildings or above-ground site development has occurred yet. Per the CMCP: *Performance Monitoring will be reset or reinstated after the first pile installation activity occurs on the site. Additional pile installation activities will reset or reinstate Performance Monitoring only if such pile installation occurs in a*

zone identified for pile restrictions. If such restricted pile installation occurs, the ten-year minimum Performance Monitoring requirement will be reset following pile installation.

Confirmation Monitoring will be then initiated once development conditions are stable.

1.2 PROJECT ORGANIZATION

Individuals responsible for ensuring the quality of the field operations and the collection of data are identified in this section. The City of Everett will provide oversight of all project activities and will be the point of contact with Ecology. Sampling activities, data evaluation, and reporting will be performed by HWA GeoSciences Inc. (HWA). Laboratory analysis will be done by Ecology-certified laboratories, and include the City of Everett Environmental Laboratory (for conventional and metals analyses) and by CCI Analytical Laboratories, Inc., Everett, Washington for organic parameters. Contacts for this project include:

Mark Sadler	City of Everett Site Manager (425) 257-8967
Arnie Sugar	HWA Project Manager (206) 774-0106
Chris Merwede	City of Everett Environmental Laboratory Lead (425) 257 7865
Rick Bagan	CCI Analytical Laboratory Project Manager (425) 356 2600

1.3 PROJECT SCHEDULE

As stated above, Performance Monitoring has been conducted for nine years, and will continue for a minimum of one more year (to bring the total to 10 years), and end after site development is substantially complete. Once piles are installed the Performance Monitoring period will reset for at least another 10 years. Confirmation Monitoring will be then initiated once development conditions are stable.

Performance monitoring after 2015 will include semi-annual ground water monitoring of deep aquifer wells to document and confirm that cleanup standards for ground water around the site have been met and are being maintained. Sample laboratory analysis will be completed within four weeks of sample delivery to the laboratory.

2.0 SAMPLING AND ANALYSIS

Ground water quality - Ground water monitoring after the 2015 SAP is approved will include semi-annual ground water quality monitoring as follows:

- Five deep aquifer network monitoring wells: MW-11R, MW-29, MW-30, MW-31, and MW-21R (upgradient)
- Four deep aquifer point of compliance wells: MW-36, MW-37, MW-38, MW-39
- Elevated chloride concentrations in MW-37 were detected between July 2005 and July 2006. A memo entitles "MW37 Chloride Investigation" was submitted to Ecology in December 2006, requesting monitoring in MW-37 be discontinued. Ecology reviewed the memo recently and determined monitoring well MW-37 should continue to be monitored along with the other compliance monitoring wells MW-36, MW-38 and MW-39. If chloride concentrations in MW-37 continue to exceed the Site cleanup level, additional data collection and analysis may be conducted.

The monitoring well locations are shown on Figure 1. Semi-annual monitoring will begin in July 2015 due to the preceding nine years of stable ground water compliance in the deep aquifer point of compliance wells.

The results of the Evaluation Monitoring were used to refine the list of analytes for the subsequent Performance Monitoring to those compounds that are identified as compounds of concern (COCs). COCs to be analyzed during Performance Monitoring include:

- Dissolved Metals: nickel, zinc, iron, manganese, arsenic
- Conventional Analytes: chloride
- SVOCs: bis(2-ethylhexyl)phthalate

HWA will send the samples to CCI Analytical Laboratories, Inc., Everett Washington, for organic analyses, and to the Everett Environmental Laboratory for inorganic analyses.

Hydraulic control of leachate collection system – In order to demonstrate ongoing hydraulic control of the landfill leachate collection system, ground water levels will be measured in a shallow piezometer located just upgradient (west) of the leachate collector. Lower water levels inside the collector than outside of it will demonstrate hydraulic control. The shallow piezometer will be located in the section of leachate collection system that is not adjacent to the sheet pile cutoff wall installed east of it (to reduce flow coming from the downgradient, river side). Annual reporting will also include data on operation of the collection system, such as water levels inside the wet wells, volume of the water collected, pump malfunctions, etc.

Ground water gradient – Ground water levels will be measured in all wells sampled, as part of standard sampling procedure, but no gradient maps will be prepared for the annual reports, as

shallow and deep ground water gradients have already been established over many years of monitoring, and most of the remaining wells are located in a line parallel to the river, making estimation of the gradient direction and magnitude difficult.

2.1 GROUND WATER SAMPLING

Ground water monitoring included in this SAP will include sampling and analysis for selected semi-volatile organic compounds, priority pollutant metals and inorganic parameters. Samples will also be tested in the field for specific conductance, pH, dissolved oxygen and temperature. The following sections describe the sampling rationale and methods.

2.2 SAMPLE COLLECTION METHODOLOGY

2.2.1 GROUND WATER MONITORING WELLS

Monitoring wells will be purged before sample collection to obtain ground water samples that are representative of the formation water rather than stagnant water from the well casing. Ground water that has occupied the well casing is often under oxidizing conditions, and thus may be chemically different from true formation water.

Monitoring wells will be purged and sampled using low-flow purging methods (Barcelona et al. 1994). Sampling staff will measure ground water levels to the nearest 0.01-foot using a decontaminated electronic well probe prior to collection of samples. Prior to collection of ground water samples, the wells will be purged by pumping a small volume of water to ensure sampled water represents aquifer conditions. The volume pumped will be determined in the field based on stabilization of field parameters: specific conductance, dissolved oxygen, and pH. Wells will be purged by very slowly lowering semi-rigid polyethylene tubing to a depth corresponding to roughly the midpoint of the screen, securing the tubing to prevent vertical movement, connecting it to a peristaltic pump, and then pumping at a rate not to exceed 0.5 liters/minute (0.132 gallons/minute). At a minimum, two pump and tubing volumes will be purged (1/2" I.D. tubing = 0.010 gallon/lineal foot). Wells which are too deep to use a peristaltic pump will be purged and sampled using dedicated pneumatic bladder pumps, at a rate not to exceed 0.5 liters/minute. Samples from all wells will be collected once the parameter values have stabilized over the course of three sets of measurements as follows:

specific conductance	10 uS
dissolved oxygen	2 mg/L
pH	0.1

If a well can be pumped dry prior to reaching the desired purge volume, it will be allowed to recover prior to sampling, using the minimum time between purging and sampling that would allow collection of sufficient sample volume. Samples will be pumped directly into the appropriate containers, as provided by the laboratory. A Field Data Sampling Sheet (provided in Appendix A) will be filled out for each well. New tubing will be used for each well. All purge water will be collected and discharged to one of the two leachate wet wells.

Dissolved metals samples will be filtered through a disposable 0.45-micron filter at the time of sample collection. The filters will attach directly to the discharge tube of the sampling pump. Each in-line filter will be used only once.

After collection, all samples will be labeled, chilled in a cooler to 4^{o}C, and shipped to the testing laboratories for analysis (CCI Analytical Laboratories, Inc. for organic analyses, and the Everett Environmental Laboratory for inorganic analyses). Full chain-of-custody and field documentation procedures will be employed, as described in Section 2.6. The laboratory will analyze the water samples for the constituents listed on Table 1. PQLs listed in Table 2are equal to or less than those listed in the CMCP.

Table 1
Proposed Analytical Methods

Analyte	Proposed Analytical Method	Method PQL µg/L
Conventional Parameters		
Chloride	300.0 / 325.2	800
Dissolved Metals		
Arsenic	206.2 / 7060	20
Nickel	200.8 / 6020 / 249.2 / 7521	10
Zinc	200.7 / 6010 / 7951	32
Iron	200.7 / 6010	56
Manganese	200.7 / 6010	4
Semivolatile Organic Compounds		
Bis(2-ethylhexyl)phthalate	8270	10

2.2.2 FIELD FILTERING

Samples collected for dissolved constituent analysis must be filtered through a 0.45-micron filter. The filters will attach directly to the discharge tube of the sampling pump. The filter must be

changed between sample points, or more frequently if clogging occurs. If samples are collected with disposable bailers, then vacuum or pressure filters are an acceptable method of filtering. Where in-line filtration is not possible, prefiltration bottles may be used to collect the samples. Prefiltration bottles must be obtained from the laboratory with the sample coolers and identified with the bottle request. Prefiltration bottles, used for vacuum or pressure filtering, will not be used for more than one well. The use of prefiltration bottles must be noted on the Chain-of-Custody form in the comments section. Samples that have been field-filtered or that require laboratory filtering must be noted on the Chain-of-Custody forms in the comments section. The laboratory will note which samples require filtering on the individual bottle labels.

2.2.3 SAMPLE COLLECTION

When filling the sample bottles, the following procedures and precautions will be adhered to:

1. Sample bottles will be filled directly from the bailer, dedicated pump, or filter apparatus, with minimal air contact.
2. Bottle caps will be removed carefully so that the inside of the cap is not touched. Caps must never be put on the ground. Caps for volatile organic compound (VOC) vials will contain a Teflon-lined septum. The Teflon side of the septum must be facing the sample to prevent contamination of the sample through the septum.
3. The sampling team will wear appropriate nonpowdered latex or nitrile gloves (PVC or vinyl gloves can leave trace levels of phthalate or vinyl chloride). Gloves will be changed between wells or more often.
4. Tubing or hoses from the sampling systems must not touch or be placed in the sample bottles.
5. Semivolatile organic compound (SVOC) bottles and VOC vials must be filled so that they are headspace-free. These sample bottles therefore need to be slightly overfilled (water tension will maintain a convex water surface in the bottle). The caps for these bottles will be replaced gently, to eliminate air bubbles in the sample. The bottles must then be checked by inverting them and tapping them sharply with a finger. If air bubbles appear, open the bottle, add more water, and repeat the process until all air bubbles are gone. Do not empty the bottle and refill it, as VOC bottles already contain preservatives.
6. Sample bottles, caps, or septums that fall on the ground before filling will be discarded.
7. Metals sampling will be conducted with “clean technique.” Bottles will be bagged in plastic and the cap placed in the bag during sampling.

Table 3 shows sample bottle requirements and preservatives. Samples will be collected in the reverse order shown on Table 3, in the event sample volume is limited. The analytical laboratory will provide the sample containers and necessary preservation.

Table 2
Sample Bottle Requirements

Analytical Parameter	Required Bottle*	Preservative
Chloride	250 ml poly	
Dissolved metals	500 ml poly	HNO_3 to pH<2
SVOCs	1 L amber glass	

* Collect one sample in triplicate per sampling event (matrix spike & matrix spike duplicate), and one sample in duplicate (field duplicate), and mark for analysis on Chain of Custody form as separate samples.

2.2.4 WATER LEVEL MONITORING

HWA will measure ground water levels at each of the monitoring wells at the start of each sampling round in order to monitor changes in seasonal or long-term water elevations.

2.3 EQUIPMENT DECONTAMINATION

In order to mitigate the potential for cross-contamination, all nondedicated, sample-contacting, and downhole equipment used in the collection and sampling processes will be decontaminated before sample collection. Included are nondedicated pumps, nondedicated bailers, ground water level measurement devices, and nondedicated filtering apparatuses.

A water level probe must be dedicated to ground water monitoring well use only. Under no circumstance shall this dedicated probe be used to measure other fluid levels (e.g., leachate).

The following steps will constitute the decontamination procedure:

1. Wash items in a solution of non-phosphate (e.g., Alconox) detergent and tap water
2. Rinse with tap water
3. Rinse with deionized water
4. Air dry in a clean environment

Decontaminated equipment will be stored and transported in clean containers or wrapping.

2.4 SAMPLE PRESERVATION, STORAGE, AND SHIPMENT

2.4.1 SAMPLE PRESERVATION

The sample containers (including preservative, if required) will be prepared and provided by the analytical laboratory. Samples will be preserved consistent with analytical laboratory recommendations. After each bottle is filled and capped, the sample container will be inverted to ensure complete mixing of the sample with the preservative. The sample container should not be shaken.

2.4.2 TEMPERATURE CONTROL

The sample container and samples will be cooled to 4°C, from the time the sample is collected through analysis. Samples will be maintained in temperature-regulated refrigerators, in coolers, or in sample coolers containing double-bagged or commercially frozen icepacks. The icepacks will be frozen solid before use.

2.4.3 SAMPLE PACKING AND STORAGE

Before the sample bottles are packed into the shipment coolers, the sample designations will be recorded in the appropriate spaces on the Chain-of-Custody form. After the samples are collected and the preservatives are added (when applicable), the bottles will be capped and placed in the sample cooler. The frozen icepacks will be placed into the sample cooler such that they are not in direct contact with the sample bottles. Glass containers should not be packed in contact with each other. Bottle holders, cushions, or bubble wrap will be used for glass bottles to protect them from breakage.

Bottles will be wiped clean with paper towels before placement in the sample cooler. The sample cooler must be kept as clean as possible to minimize the potential for cross-contamination. Bottle caps will be checked to ensure they are tight and will not become loose when inserted in the cooler. Bottle caps will not be taped.

The Chain-of-Custody form will be placed in a plastic bag, sealed, and placed inside the sample cooler or taped to the inside lid of the cooler. A copy of the Chain-of-Custody form will be retained for verification.

Samples will be stored at 4°C, in an enclosed cooler or dedicated refrigerator where possible, before shipment to the laboratory. Samples will be shipped daily to the laboratory to ensure proper temperature control and that holding time requirements are met.

2.5 QUALITY ASSURANCE/QUALITY CONTROL

Samples will be collected and analyzed with sufficient quality assurance/quality control (QA/QC) to ensure representative and reliable results. The overall QA objective for this investigation is to

ensure that all decisions based on laboratory and field data are technically sound, statistically valid, and properly documented. Specific QA protocols will be executed and are described for all activities related to the collection of samples, the analyses of these samples by the laboratory, and the handling of data generated during the investigation. There are two parts to the QA/QC program for this project: field and laboratory.

2.5.1 FIELD

Field QA/QC includes proper documentation of field activities and sampling/handling procedures, as described in Section 2.6. Field QA/QC samples will consist of the following:

- One duplicate per 12 samples
- One field blank per 12 samples (optional analysis based on well sample results)

2.5.1.1 Duplicates and Split Samples

Duplicate samples will be collected from a well with known or suspected contamination.

Duplicates are used to confirm analytical results from a given sample point. Duplicate samples are collected in the field using a matching set of laboratory-supplied bottles and sampling from the selected well, as requested. Each duplicate should be sampled by alternating between the regular and the duplicate sample bottles, proceeding in the designated sampling order (VOCs first). The well where the duplicate is collected must be identified on the field sampling data sheet. All duplicates shall be blind-labeled (i.e., the well designation is not listed on the sample bottle or Chain-of-Custody form). Once a duplicate is collected, it is handled and shipped in the same manner as the rest of the samples. Duplicate results will be reported in the laboratory results as separate samples, using the designation DUP-(#).

Split samples are collected when a well is sampled with a third party (e.g., Ecology). Split samples should be collected using the same method as a duplicate, alternating between sample bottles, and proceeding in the designated sampling order. The well at which a split sample is collected must be identified on the field sampling data sheet. Also note the condition of the bottles or preservatives, the sample-collection method (if different from the standard), and the selected agency laboratory.

2.5.1.2 Trip Blanks

Trip blanks are used to detect contamination that may be introduced in bottle preparation, in transit to or from the sampling site, or in the field. Trip blanks are usually used to detect VOC contamination, and are not anticipated for performance monitoring as no VOC analysis is planned.

2.5.1.3 Field Blanks

Field blanks are used to detect contamination that may be introduced in the field. Field blanks will be prepared in the field by pumping laboratory reagent-quality water through new tubing

and into the equipment blank bottles. The well at which the equipment blank is prepared must be identified on the field sampling data sheet.

Field blank results will be reported in the laboratory results as separate samples, using the designation FB-(#).

2.5.2 LABORATORY

Laboratory QA/QC samples will consist of the following:

- One matrix spike (MS) per 12 samples
- One matrix spike duplicate (MSD) per 12 samples

Method-specific QA/QC samples may include the following:

- Method blanks
- Duplicates
- Instrument calibration verification standards
- Laboratory control samples
- Surrogate spiked samples
- Performance evaluation QC check samples

2.5.3 DATA EVALUATION

Data evaluation will include checking holding times, method blank results, surrogate recovery results, field and laboratory duplicate results, completeness, detection limits, laboratory control sample results, and Chain-of-Custody forms. After the data has been checked, it will be entered into the project database with any assigned data qualifiers.

2.6 FIELD DOCUMENTATION AND CHAIN-OF-CUSTODY

The following sections describe the recording system for documenting all site field activities, and the sample chain-of-custody procedures.

2.6.1 FIELD DOCUMENTATION

An accurate chronological recording of all field activities is vital to the documentation of any environmental investigation. To accomplish this, field team members will maintain field log books and data sheets providing a daily record of significant events, observations, deviations from the sampling plan and measurements collected during the field activities.

2.6.1.1 Field Sampling Data Sheet

A field sampling data sheet (example in Appendix A) will be filled out for each sample point. This sheet contains information regarding site and well conditions, sampling and purging procedures, and field measurements. At a minimum, the following information must be documented:

1. **Purging Information**, including date, time, well number, casing volume, elapsed time, discharge color (if different than for sampling), water level before and after purging. Note if the well was dry, purged dry, or was otherwise impossible to sample.
2. **Purging and Sampling Equipment**, including pump type and tubing material.
3. **Field Measurements**, including fluid surface elevation (depth to ground water or to leachate), temperature, pH, dissolved oxygen, and specific conductance.
4. **Additional Field Measurements**, as necessary.

2.6.1.2 Field Observations

The comments section on the field sampling data sheet will include such field observations as the following:

- Weather condition: wind direction, speed, upwind activities (ensure that vehicles or gasoline-engine generators or compressors are not upwind of sampling activities), temperature, and barometric pressure (if required).
- Sample appearance, including odor, color, and turbidity:
  - ♦ Odor: (e.g., rotten eggs, earthy, strong, moderate, slight, metallic, landfill gas - ***do not sniff sample***).
  - ♦ Color: True "color" is the color after turbidity has been removed, if samples are filtered. True color may be caused by metallic ions, humus, peat, or industrial chemicals. Hold the sample up to the light and describe the true color in as much detail as possible (color charts are acceptable descriptive methods). If samples are not filtered, then color may be a function of turbidity.
  - ♦ Turbidity (regardless of whether turbidity measurements are taken):
    - None: sample is clear.
    - Trace: sediment slightly clouds or colors sample; does not accumulate in bottle.
    - Moderate: definite cloudiness, sediment accumulates at bottom of bottle.
    - High: muddy or dark brown appearance.

    When a turbidity-measuring device is used, measurements must be provided in nephelometric units.
- Reference point for well measurements (i.e., is it clearly marked on top of casing?).
- Well I.D. where the field blank or duplicate sample is collected.

- Calculations for purge volumes and temperature conversions. Note when wells are purged dry.
- Duplicate field measurement results.
- Other conditions, such as sample splits with regulatory agencies, potential safety or health hazards (e.g., landfill gas in well).

2.6.1.3 Sample Certification

The bottom of the field sampling data sheet must be signed to certify that the sampling procedures were in accordance with those described in this sampling plan. The person certifying the sampling assumes full responsibility that the sampling process satisfied the required criteria.

2.6.1.4 Maintenance Conditions at Well

The condition of the well and its surrounding area must be observed and problems and changes recorded on the field sampling data sheet each time the well is sampled. The following items, at a minimum, will be checked:

- Presence and condition of the well's identification sign
- Whether the well's protective casing is locked and whether the key works
- Well integrity
- Physical surroundings (e.g., high weeds, standing water, cleanliness, nearby activities)
- Condition of the pump and appurtenances
- Obstructions or kinks in the well casing.
- Presence of water in the annular space
- Grease or other unnatural substances on the top of the well or the threaded caps
- Whether the cap fits securely to prevent the introduction of contaminants
- Evidence of natural contamination (e.g., animal or insect parts in the well)
- Condition of well guard post and concrete pad

The condition of flush-mounted well head covers and locks must also be recorded once per year. Other items that will be noted include any physical alterations to the well, any alterations to the surrounding soils and associated drainage, or any other notable changes in conditions near the well.

Notify the project manager immediately of any conditions that would prevent or preclude sampling or affect sample integrity. Any damage to a monitoring device will be reported to Ecology in writing within 14 days of its discovery, along with a description of the proposed repair or replacement measures and a schedule for completion of the work.

2.6.2 SAMPLE IDENTIFICATION

Following sample collection, field personnel will affix labels to each sample container. Samplers will use waterproof ink, plastic bags, or clear tape to ensure labels remain legible even when wet. A sample label form that may be copied on to adhesive label paper is provided in Appendix A. Samplers will record the following information on the labels:

- Project name and number
- Sample identification number
- Date and time of collection
- Required test methods
- Name of sample collector

Sample numbering will follow the following format:

MW-29-0701 = monitoring well MW-29 collected in July 2001

DUP 1, DUP 2, etc. = duplicate (do not indicate which well a duplicate is from)

TB 1, TB 2, etc. = trip blank (indicate matrix for all blanks, e.g., ground water, surface water)

FB 1, FB 2, etc. = field blank

2.6.3 CHAIN-OF-CUSTODY RECORD

The objective of the chain-of-custody procedures is to allow the tracking of possession and handling of individual samples from the time of field collection through laboratory analysis. Once a sample is collected, it becomes part of the chain-of-custody process. A sample is "in custody" when: (1) it is in someone's possession, (2) it is within visual proximity of that person, (3) it is in that person's possession, but locked up and sealed (e.g., during transport), or (4) it is in a designated secure sample storage area. Sampling staff will complete a Chain-of-Custody form, which will accompany each batch of samples. The record will contain the following information:

- Project name and number
- Names of sampling team members
- Requested testing program
- Required turnaround time
- Sample number
- Date and time collected
- Sample type
- Matrix

- Number of containers
- Special Instructions
- Signatures of persons involved in the chain of possession

When sample custody is transferred to another individual, the samples must be relinquished by the present custodian and received by the new custodian. This will be recorded at the bottom of the Chain-of-Custody form where the persons involved will sign, date and note the time of transfer. An HWA Chain-of-Custody form is provided in Appendix A.

Sampling team members will keep sample coolers in locked vehicles while not in active use or visual range. If couriers are used to transport samples, Chain-of-Custody seals will be affixed to sample coolers.

2.7 INVESTIGATION-DERIVED WASTE

Purge water from the wells will be collected and discharged to the leachate wet wells. Solid waste (e.g., disposable bailers, gloves, etc.) will be disposed of as ordinary municipal waste.

2.8 CALIBRATION AND USE OF METERS

Before being taken to the field, equipment must be cleaned and checked for malfunctions. Meters must be calibrated each morning before they are used in the field, following manufacturers' procedures. Equipment will be calibrated at least daily. All field monitoring equipment will be calibrated consistent with manufacturers' procedures using instrument calibration standards prepared according to the manufacture's specifications. In all cases, proper documentation must be made of all calibration procedures for each sampling event, including calibration methodology (one- or two-point calibration, difference, standard concentration, and expiration date).

Logbooks should be maintained for all field meters. The logbooks must contain the same information as those for permanent laboratory instruments (serial number, name and model of meter, year purchased, etc.). The books also must contain quality control (QC) results, maintenance performed by the factory, and calibration notes for each day the equipment is used. Instruments used to measure pH and electrical conductivity should be calibrated at least once each day of sampling. Temperature-measuring devices should be calibrated against a standardized laboratory thermometer at a frequency recommended by the manufacturer. Additional data (e.g., turbidity, dissolved oxygen) should be calibrated in accordance with manufacturer recommendations and documented.

2.9 FIELD MEASUREMENTS

2.9.1 STATIC WATER LEVEL MEASUREMENTS

The depth-to-water should be recorded to the nearest hundredth of a foot (0.01 ft). Water levels should be measured before and after purging to assess drawdown effects at each well, and to produce a representative static ground water contour map. To alleviate potential errors, previous water level data should be used for comparison during field activities. Water levels are preferably measured before purging a well and as close in time as possible, to minimize interference from drawdown or barometric pressure effects.

2.9.2 DEPTH-OF-WELL MEASUREMENTS

The total depth of the well will be measured in wells where there is visible or significant turbidity, or when tampering is noted. Also, evaluate and respond to any excessive sediment accumulation.

The well depth measurements should be compared with the pump or tubing intake depths. The intake should be located at the middle of the screen or lower, depending on the screen length and well recharge characteristics, maintaining a minimum of two feet (where possible) between the pump intake and the bottom of the well. If the intake location in a well does not appear appropriate for collecting representative samples, adjust the placement.

3.0 DATA ANALYSIS AND REPORTING

Results of the sampling and laboratory testing will be summarized in spreadsheets and the data entered into a relational database. HWA will prepare annual data reports during the performance monitoring phase. The data reports will include summary tables of the analytical and ground water level data, laboratory reports, any significant field sampling or QA/QC issues, and a cover letter describing the evaluation of the data, in accordance with the CMCP.

The first annual report will include statistical analysis and recommendations for cleanup levels based on background values for iron, manganese and arsenic. Reports will be transmitted to Ecology as per the CMCP (FSI 2001).

4.0 REFERENCES

Barcelona, Michael J., Wehrmann, H. Allen, and Varljen, Mark D. 1994. Reproducible Well Purging Procedures and VOC stabilization Criteria for Ground Water Sampling. *Ground Water* Vol. 32, No. 1, pp. 12-22. January-February.

Floyd & Snider Inc. (FSI). 2001. Attachment CAP-2 – Compliance Monitoring and Contingency Plan, *Everett Landfill/Tire Fire Site Cleanup Action Plan*. Seattle, Washington. March.

HWA GeoSciences Inc. (HWA) 2004. *Evaluation Monitoring Report, July 2001 - April 2004, Everett Landfill*, December 14, 2004.

HWA GeoSciences Inc. (HWA) 2006. *MW-37 Chloride Investigation, Everett Landfill, Everett, Washington*, December 22, 2006.

MW-33
MW-34
MW-35
(ABANDONED)
MW-21
(DECOMMISSIONED)
MW-21-R
Leachate collector
MW-28
MW-27
(ABANDONED)
MW-39
MW-26
MW-29
Proposed hydraulic
controll piezometer
MW-22
Sheet pile cutoff wall
MW-25
MW-30
MW-38
MW-24
MW-31
MW-37
MW-11R
MW-36
SNOHOMISH RIVER
SNOHOMISH RIVER
SNOHOMISH RIVER
BNSF RR
SMITH AVE
HARBOR LINE
STATE HWY 2

LEGEND

MW–12	SHALLOW MONITORING WELLS
MW–12	DEEP MONITORING WELLS
	WELLS TO BE MONITORED

0’ 100’ 200’ 300’ 600’

SCALE: 1”=300’

HWA GEOSCIENCES INC.

EVERETT LANDFILL
EVERETT, WASHINGTON

2015 PERFORMANCE
GROUND WATER
MONITORING

DRAWN BY EFK
CHECKED BY VA
DATE 4.21.15

FIGURE NO. 1
PROJECT NO. 98165–660

S:\1998 PROJECTS\98165 EVERETT LANDFILL\CAD\NBB GW.DWG <FIG 1 july 18–19 2013> Plotted: 10/7/2013 4:24 PM

APPENDIX A

SAMPLING DOCUMENTATION

Chain-of-Custody Form

Field Sampling Data Sheet

Sample Labels

HWA GEOSCIENCES INC.

21312 30th Drive SE, Suite 110, Bothell, Washington 98021-7010
Tel 425.774.0106 Fax 425.774.2714 www.hwageo.com

Chain of Custody and Laboratory Anaylsis Request

DATE: _____

PAGE: ___ of ___

PROJECT NAME: _____ #: _____

SAMPLERS NAME: _____ PHONE: _____

SAMPLERS SIGNATURE: _____ DATE: _____

HWA CONTACT: _____ PHONE: _____

ANALYSIS REQUESTED

TURNAROUND TIME

☐ DAYS

☐ STANDARD

HWA SAMPLE ID	DATE	TIME	MATRIX	LAB ID	# OF BOTTLE	EDD	REMARKS

PRINT NAME	SIGNATURE	COMPANY	DATE	TIME	REMARKS
Relinquished by:					
Received by:					
Relinquished by:					
Received by:					

DISTRIBUTION: WHITE - Return to HWA GeoSciences; YELLOW - Retain by Lab; PINK - Retain by Sampler

HWA GEOSCIENCES INC.
21312 30th Drive SE, Suite 110, Bothell, WA 98021
Tel: 425-774-0106 / Fax: 425-774-2714

FIELD SAMPLING DATA SHEET

Project Name: _____ Well Number:_____

Project Number:_____ Sample Number:_____

Project Location:_____ Weather: _____

Client/Contact:_____ Date:_____

WELL MONITORING:

Time	Pump Depth	Depth to Water	Measuring Point (TOC?)	Measuring Point Elevation	Water Level Elevation	Gallons in Well (Case Volume)

(2" dia=0.163 gal/ft)
(4" dia=0.653 gal/ft)

WELL PURGING:

Time	Method	Gallons	Case Volume	pH	Conductivity	Temperature	Dissolved Oxygen		

WELL SAMPLING:

Time	Sampling Method	Sample Analysis	Container Number	Container Volume	Container Type	Field Filtered (Y/N)	Preservative	Iced (Y/N)

COMMENTS/NOTES: (Include equipment used: Bailers, Filters, Well Probe, pH/Conductivity, Meter, etc.)

Total # of Bottles:_____ Sampler**:**_____ Signature:_____

HWA GeoSciences Inc.
Everett Landfill #98165
Sampler ____ Date/Time _____
Analysis: SVOCs (8270)

Sample _____

HWA GeoSciences Inc.
Everett Landfill #98165
Sampler ____ Date/Time _____
Analysis: SVOCs (8270)

Sample _____

HWA GeoSciences Inc.
Everett Landfill #98165
Sampler ____ Date/Time _____
Analysis: Chloride

Sample _____

HWA GeoSciences Inc.
Everett Landfill #98165
Sampler ____ Date/Time _____
Analysis: Chloride

Sample _____

HWA GeoSciences Inc.
Everett Landfill #98165
Sampler ____ Date/Time _____
Analysis: Dissolved Metals

Sample _____

HWA GeoSciences Inc.
Everett Landfill #98165
Sampler ____ Date/Time _____
Analysis: Dissolved Metals

Sample _____

HWA GeoSciences Inc.
Everett Landfill #98165
Sampler ____ Date/Time _____
Analysis:

Sample _____

HWA GeoSciences Inc.
Everett Landfill #98165
Sampler ____ Date/Time _____
Analysis:

Sample _____

HWA GeoSciences Inc.
Everett Landfill #98165
Sampler ____ Date/Time _____
Analysis:

Sample _____

HWA GeoSciences Inc.
Everett Landfill #98165
Sampler ____ Date/Time _____
Analysis:

Sample _____