March 2017

QIKIQ15 BAFFIN REGION DEW LINE SITE MONITORING

2016 FOX-2 Monitoring Report

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ADM (Infrastructure & Environment)
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Golder Associates

Executive Summary

Golder Associates Ltd. (Golder) has been contracted by Public Services and Procurement Canada (PSPC), on behalf of the Department of National Defence (DND), to complete the 2015-2018 Distant Early Warning (DEW) Line Sites Landfill Monitoring Program in the Baffin Region of Nunavut. The five DEW Line sites that were monitored in 2016 as part of the QIKIQ15 contract are FOX-2, FOX-3, FOX-4, FOX-5 and DYE-M. These sites are all now in the Post-Construction Monitoring Phase of their remedial program.

This monitoring report presents the 2016 post-construction inspection and monitoring results for five landfills at FOX-2: Airstrip Camp Landfill Lobe A, Non-Hazardous Waste Landfill, West Landfill Lobe E, Tier II Disposal Facility and Upper Site Landfill Lobe A. The 2016 monitoring was Year 5 for FOX-2; remediation was completed in 2011. FOX-2 was monitored annually from 2012 to 2016.

Airstrip Camp Landfill Lobe A

Based on the visual inspection, there is no significant erosion, settlement, cracking, exposed waste or indications of instability at the Airstrip Camp Landfill Lobe A. Some areas of minor settlement on the crest surface of the landfill were observed but are not considered to be a concern. The Preliminary Stability Assessment conducted based on the visual inspection suggests that the Airstrip Camp Landfill Lobe A has an “Acceptable” overall performance.

The concentrations of most metal parameters were highest at F2-9, located downgradient (southwest) of the toe of the landfill. In a few cases, the 2016 concentrations were slightly higher than in earlier years (e.g., cobalt and lead in the shallow sample at F2-7, lead in the shallow sample at F2-9 and copper in the deep sample at F2-9); however in most cases they were similar to previous monitoring results. The concentration of chromium in the deep sample at F2-6 exceeded the baseline mean concentration plus 3σ. The modified TPH concentration observed in the shallow sample at F2-9 in 2016 exceeded the baseline mean concentration plus 3σ, whereas the modified TPH concentration observed in the deep sample at F2-8 remained well below the baseline mean concentration plus 3σ. No PHC were detected at the remaining sampling locations and no cadmium, mercury or PCB were noted in any of the samples in 2016.

The data from this site are not indicative of increasing influence from the landfill, with the possible exception of location F2-9, where results from both the shallow and deep samples may be reflective of a potential influence; insufficient data are currently available to confirm this. No modifications to the ongoing monitoring program at this landfill are recommended at this time.

Non-Hazardous Waste Landfill

Based on the visual inspection, there is no significant erosion, settlement, cracking, exposed waste or indications of instability at the Non-Hazardous Waste Landfill. There was some minor settlement and self-armouring erosion on the cover and slope of the landfill that is not considered a concern. The Preliminary Stability Assessment conducted based on the visual inspection suggests that the the Non-Hazardous Waste Landfill has an “Acceptable” overall performance.

The concentrations of most metals parameters in soil were highest overall at the shallow sample location MW-08, located downgradient of the northwest corner of the landfill, however the concentrations observed at this location in 2016 were less than those observed in previous years. The concentration of nickel slightly exceeded the

baseline mean concentration plus 3σ, but was lower than previously observed. At MW-05, MW-06 and MW-07, the concentrations of most metals were similar to or less than those observed in previous years. No detectable concentrations of cadmium, mercury, PHC or PCB were noted in any of the soil samples in 2016.

At MW-06 and MW-07, the concentrations of most metals in groundwater were greater than those reported in 2015 but less than those reported in 2012. No detectable concentrations of lead, chromium, arsenic, mercury, PHC or PCB were noted in any of the groundwater samples in 2016.

Comparison of groundwater elevations based on estimated grade elevation and the measured water depth in the wells indicates that the groundwater was lowest towards the southwest at MW-06, which follows the topography in the area.

Whereas elevated concentrations in soil are noted at MW-08 (including the exceedance of the baseline mean nickel concentration plus 3σ in the shallow sample), there does not appear to be evident increasing impact to groundwater quality from the landfill at the monitoring wells adjacent to the landfill. No modifications to the ongoing monitoring program at this landfill are recommended at this time.

West Landfill Lobe E

Based on the visual inspection, there is no significant erosion, settlement, cracking, exposed waste or indications of instability at the West Landfill Lobe E. There was some minor settlement and self-armouring erosion on the cover and slope of the landfill. None of the observed features are considered to be significant or of concern. The Preliminary Stability Assessment conducted based on the visual inspection suggests that the West Landfill Lobe E has an “Acceptable” overall performance.

Nickel and Zinc concentrations were highest at F2-3 (shallow sample), located near the southwestern toe of the landfill whereas copper, lead and chromium concentrations were highest at F2-2 (shallow sample), located near the northeastern toe. At F2-2 and F2-3, the concentrations of most metals were less than or similar to those observed in previous years. Similarly, at the other sampling locations, 2016 metals concentrations were lower than or similar to concentrations reported in earlier years.

Concentrations of petroleum hydrocarbons slightly above or near the baseline mean concentration plus 3σ (81 mg/kg) were noted in the shallow samples at F2-2 (average 83 mg/kg) and in the shallow sample at F2-5 (79 mg/kg). No PHC were detected in the duplicate sample and therefore this result should be interpreted with caution. No cadmium, mercury or PCB were detected in any of the samples in 2016.

Given that the environmental sampling results are largely the same as the previous sampling events, there appears to be no evident impact of the landfill on soil quality. No modifications to the ongoing monitoring program at this landfill are recommended at this time.

Tier II Disposal Facility

Based on the visual inspection, there is no significant erosion, settlement, cracking, exposed waste or indications of instability at the Tier II Disposal Facility. Some minor settlement on the landfill cover surface and self-armouring erosion on the crest edge were observed. None of the observed features are considered to be significant or of concern. The Preliminary Stability Assessment conducted based on the visual inspection suggests that the Tier II Disposal Facility has an “Acceptable” overall performance.

Metal concentrations in soil were highest at MW-10 (shallow sample), located near the northeastern toe of the landfill. At this location, the concentration of copper, nickel, lead and chromium exceeded the baseline mean concentration plus 3σ and the concentration of copper, cobalt and lead represent new historical maxima. At MW-09, MW-11 and MW-12, the concentrations of most metals were less than or similar to those observed in previous years.

Concentrations of petroleum hydrocarbons slightly above or near the baseline mean concentration plus 3σ (73 mg/kg) were noted in the shallow sample at MW-10 (100 mg/kg) and in the shallow sample at MW-12 (67 mg/kg). The concentration of modified TPH at MW-10 was greater than the concentration observed in 2015 (88 mg/kg) but less than those observed in 2012 and 2013 (148 mg/kg and 170 mg/kg, respectively). No cadmium, mercury or PCB were detected in any of the soil samples in 2016.

The concentrations of all metals at MW-09, MW-10 and MW-12 were less than or similar to those reported in previous years. No detectable concentrations of arsenic, mercury, PHC or PCB were noted in any of the groundwater samples in 2016.

Comparison of groundwater elevations based on estimated grade elevation and the measured water depth in the wells indicates that the groundwater elevation was higher at MW-09, and lowest towards the north at MW-10 and MW-12, which is consistent with the topography in the area.

The data from this site are not indicative of increasing influence from the landfill, with the possible exception of location MW-10, where the shallow sample soil sampling results may be reflective of a potential influence from the landfill; insufficient data are currently available to confirm this. Based on the groundwater monitoring results, there does not appear to be significant impact to groundwater quality from the landfill at the monitoring wells adjacent to the landfill. No modifications to the ongoing monitoring program at this landfill are recommended at this time.

Upper Site Landfill Lobe A

Based on the visual inspection, there is no significant erosion, settlement, seepage, cracking, exposed waste or indications of instability at the Upper Site Landfill Lobe A. Some minor settlement and self-armouring erosion was observed. None of the observed features are considered to be significant or of concern. The Preliminary Stability Assessment conducted based on the visual inspection suggests that the Upper Site Landfill Lobe A has an “Acceptable” overall performance.

Similar metal concentrations in soil were observed at all sampling locations at this landfill. In some cases, the 2016 concentrations were slightly higher than in earlier years, however, in most cases they were less than or similar to previous monitoring results. For the shallow samples at MW-13 and MW-15 (0-15 cm at both locations), the concentrations of arsenic and copper, respectively, were greater than those observed in previous years and represent new historical maximum concentrations at those locations. The concentration of modified TPH (24 mg/kg) observed at MW-13 remained well below the concentrations reported in 2012 and 2013 (178 mg/kg and 34 mg/kg, respectively). No PHC were detected at the remaining sampling locations and no detectable concentrations of cadmium, mercury or PCB were noted in any of the soil samples in 2016. None of the reported soil values exceeded their respective baseline mean concentrations plus 3σ.

At all four groundwater wells adjacent to the landfill, the concentrations of most metals were less than or similar to those reported in previous years. No detectable concentrations of lead, arsenic, mercury, PHC or PCB were noted in any of the groundwater samples in 2016.

Comparison of groundwater elevations based on estimated grade elevation and the measured water depth in the wells indicates that the highest groundwater elevation was highest at MW-13 and lowest towards the northeast at MW-14, MW-15 and MW-16, which follows the topography in the area.

Based on the results, there does not appear to be significant impact from the landfill at the soil sampling locations or groundwater monitoring wells adjacent to the landfill. No modifications to the ongoing monitoring program at this landfill are recommended at this time.

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1.0 INTRODUCTION

Golder Associates Ltd. (Golder) has been contracted by Public Services and Procurement Canada (PSPC), on behalf of the Department of National Defence (DND), to complete the 2015-2018 Distant Early Warning (DEW) Line Sites Landfill Monitoring Program in the Baffin Region of Nunavut (hereafter referred to as the "project"). The contract number with PSPC is W6837-151002/001/NCS. The DND file number for the project is QIKIQ15. The contracted scope of work was defined in the project's Terms of Reference (TOR) dated April 2015, Golder Proposal P1530908 dated June 16, 2015 ("Golder Proposal") and the minutes of the May 12, 2016 meeting attended by Golder and DND.

The five DEW Line sites that were monitored in 2016 as part of the QIKIQ15 contract are FOX-2, FOX-3, FOX-4, FOX-5 and DYE-M. These sites are all now in the Post-Construction Monitoring Phase of their remedial program. Post-Construction Monitoring was carried out in accordance with the TOR and implemented as per Golder's Logistics and Work Plan (LWP) dated July 25, 2016. Monitoring activities included geotechnical visual inspection, thermal monitoring, soil sampling and groundwater sampling.

This monitoring report presents the 2016 post-construction inspection and monitoring results for FOX-2 (the site). The 2016 monitoring was Year 5 for FOX-2; remediation was completed in 2011. FOX-2 has been monitored annually from 2012 to 2016.

Appendix A is a summary of the report limitations and forms part of the report.

1.1 Objective of the Study

The objective of the Landfill Monitoring Program is to collect sufficient information to assess the performance, integrity, and stability of the landfills from a geotechnical and environmental perspective for the protection of human health and the environment. The monitoring program is designed to monitor landfill integrity and to determine, in the event of any evident deterioration or impacts identified from sampling results, if remedial measures are required.

1.2 Scope of Work

The scope of work for this project includes the following:

1) Project management including liaison with DND, project team coordination, scope management, cost management, schedule management and resource coordination;

2) Preparation of a site-specific Health Safety and Environment Plan (HASEP) and procurement of safety equipment and supplies (e.g., personal protective equipment, first aid kits and satellite phones);

3) Development of a LWP for each field season that outlines the field schedule, travel plans, accommodation, hiring of local Inuit contract workers, rental of All-Terrain Vehicles (ATV) and charter aircraft;

4) Completion of field work consisting of visual inspection, photographic documentation, thermistor data collection and soil and water sample collection;

5) Preparation of a Field Work Progress Report that summarizes field work activities completed each year (submitted under separate cover);

6) Preparation of a Consultant's Inuit Participation Plan (CIPP) and Report (CIPR), submitted under separate cover; and,

7) Preparation of draft and final monitoring reports for each site with visual inspection results, photographic log, thermistor data collection, figures of inspection features and photograph locations, soil and groundwater quality monitoring results, Quality Analysis / Quality Control (QA/QC) and data interpretation.

2.0 BACKGROUND

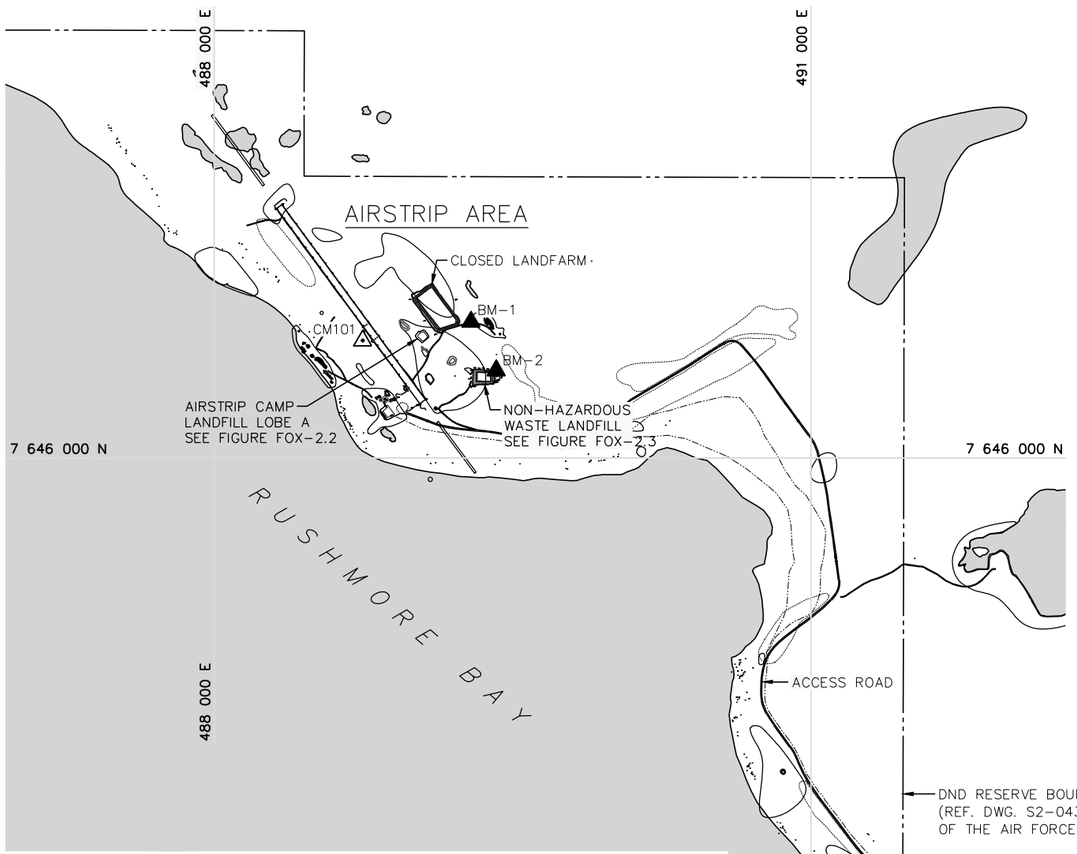
2.1 Site Description

The FOX-2 Longstaff Bluff DEW Line site is located on the southwestern coast of Baffin Island, near the Baird Peninsula. The location of the airstrip servicing the station is 68° 55’ 55” north latitude and 75° 16’ 54” west longitude. FOX-2 was a former auxiliary radar site within the original DEW Line system, which was decommissioned in 1991. The nearest community with charter aircraft and a full range of commercial and public services available is Hall Beach, located 245 km to the west.

A Short Range Radar (SRR) station occupies a site approximately 300 m southeast of the former FOX-2 station area, approximately 6 km southeast of the southern end of the airstrip runway. The North Warning System (NWS) holds a reserve on this area, and an area at the Beach (Petroleum Oil and Lubricant (POL) area) where fuel tanks servicing the station are located.

The landfills undergoing long term monitoring are located in three areas: (i) at the Airstrip Area, (ii) at the West Beach Area approximately 5 km southeast of the airstrip and (iii) at the Station Area, approximately 6.7 km southeast of the airstrip. The overall site plan is shown on Figure FOX-2.1. The landfills are:

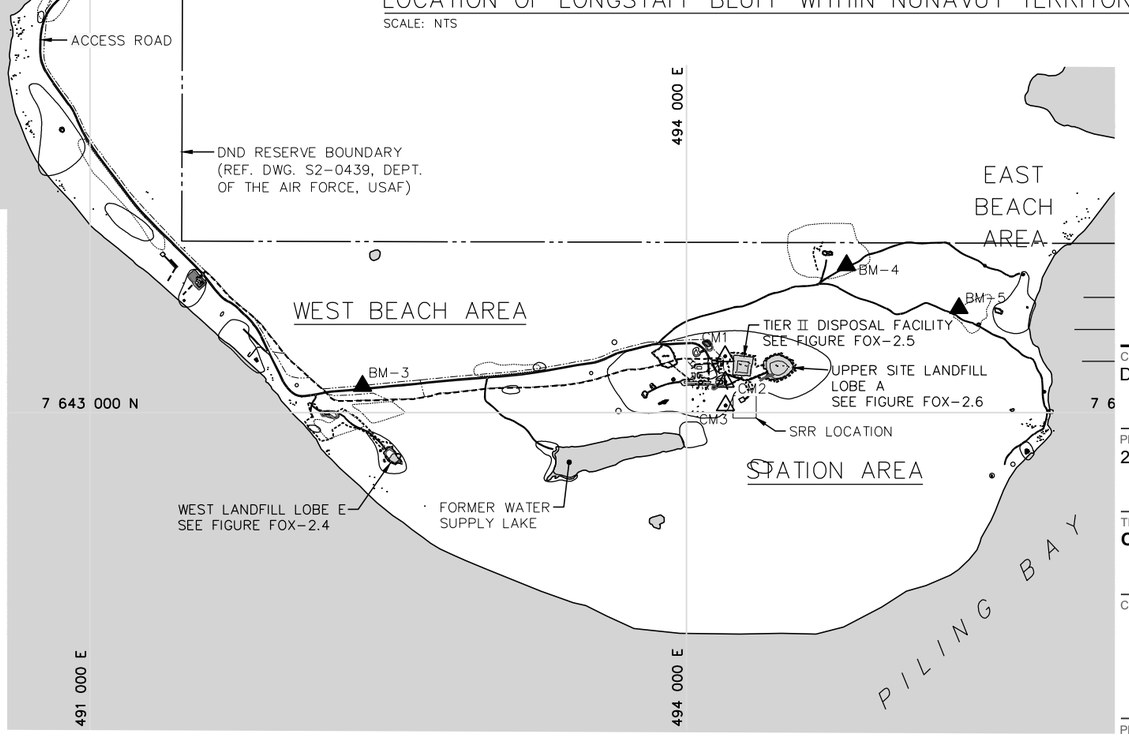
- Airstrip Camp Landfill Lobe A (Airstrip Area)
- Non-Hazardous Waste Landfill (Airstrip Area)
- West Landfill Lobe E (West Beach Area)
- Tier II Disposal Facility (Station Area)
- Upper Site Landfill Lobe A (Station Area)





LOCATION OF LONGSTAFF BLUFF WITHIN NUNAVUT TERRITORY

SCALE: NTS



LEGEND

- DND RESERVE BOUNDARY
- SURVEY CONTROL MONUMENT
- PERMANENT BENCHMARK LOCATION
- BODY OF WATER

NOTES

GRID PROJECTION IS NAD83 ZONE 18N. ELEVATIONS ARE GEODETIC.

REFERENCE

PREVIOUS INSPECTION FIGURE PROVIDED BY BIOGENIE, A DIVISION OF ENGLOBE CORPORATION, PROJECT NO.CD2655_400_403, DATED JUNE 2015.

0 500 1,000
1:30,000 METRES

SURVEY CONTROL MONUMENTS				
NO.	UTM COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
CM1	7 643 282.694	494 194.669	150.604	FOX-2 BASELINE STA. 0+00
CM2	7 643 154.373	494 195.664	155.980	FOX-2 BASELINE STA. N/A
CM3	7 643 035.836	494 196.504	158.975	FOX-2 BASELINE STA. N/A
CM101	7 646 589.787	488 746.333	12.088	FOX-2 BASELINE STA. 12+00

NOTE: BASELINE STATIONS SHOWN ARE IN IMPERIAL UNITS.

PERMANENT BENCHMARK (AS-BUILT)				
NO.	UTM COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
BM-1	7 646 684.430	489 291.060	29.490	25mm DIA. STEEL PIPE
BM-2	7 646 440.000	489 417.870	29.760	25mm DIA. STEEL PIPE
BM-3	7 643 133.590	492 370.950	37.280	25mm DIA. STEEL PIPE
BM-4	7 643 740.820	494 804.820	80.570	25mm DIA. STEEL PIPE
BM-5	7 643 525.070	495 369.930	43.210	25mm DIA. STEEL PIPE

NOTE: COORDINATES AND ELEVATIONS INDICATED ARE TOP OF BENCHMARK PIPE.

CLIENT
DEPARTMENT OF NATIONAL DEFENCE CANADA

PROJECT
2016 FOX-2 MONITORING REPORT

TITLE
OVERALL SITE PLAN

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-02-06
DESIGNED	RM
PREPARED	TDR
REVIEWED	DCJ
APPROVED	DP

PROJECT NO.	PHASE	REV.	FIGURE
1530908	2000	A	FOX-2.1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25 mm

Path: \\golder.gds\gal\Mississauga\SIM\Clients\Public_Works_Canada\Canada99_PROJ\1530908_FWSSC_Dev_Line_Mon_Program_2015_2018\40_PROD\0008_Fox_2_Field_Summary_Report_2016\ | File Name: 1530908-0008-CM-0006.dwg

2.2 Site Geology, Hydrogeology and Hydrology

The site is on the northeastern edge of the Precambrian (Canadian) Shield. Most Precambrian bedrock has been metamorphosed (altered by intense heat and pressure) into granite. Surficial soils have been formed by the erosive forces of glaciation and deposited by retreating glaciers. Glacial retreat has deposited glacial till moraine, boulders and talus slopes over the landscape. The landscape is dominated by bedrock outcrops and boulder fields; tundra vegetation is generally limited to valleys.

The groundwater flow processes at the site are expected to be significantly influenced by the presence of continuous permafrost. Annual active thaw layers are typically limited to a few metres below ground surface, depending on ground cover, soil materials and surface water features. Shallow groundwater representing meltwater (both surficial and within the active layer) and infiltration from precipitation during the summer thaw is perched within the active layer during the short summer season. Movement of the groundwater is dictated by soil type, presence of shallow permafrost and hydraulic pressures resulting from topographic differences and distribution (elevation) of the water within the soils. Water elevations are only measured at some wells, and therefore the use of terms upgradient or downgradient may not be truly reflective of the actual flow direction. Nevertheless, for the purposes of this report, upgradient and downgradient are used to maintain consistency with the identification of monitoring locations in previous annual reports.

The landscape in the area is characterized by an extensive bedrock upland identified as the Longstaff Bluff formation. Elevations range from only a few metres above sea level (masl) along the coastline, to over 150 masl in the area of the Upper Landfill Lobe A in the Station Area.

Lakes in the area of FOX-2 include a former water supply lake at the Station Area and two larger lakes located 1.5 km inland from the ocean, between the Airport Area and West Beach Area. Streams lead west from these latter two lakes, into the ocean. Smaller water bodies and streams are present at the Airport Area. The smaller shallow surface water features typically freeze solid during the winter months. The larger, deeper lakes may not freeze solid, which may therefore support fish populations.

2.3 Land-Use Description

In the 1950s, DEW Line sites were constructed across the northern parts of Alaska, Canada and Greenland between latitudes 65 and 70 degrees to maintain surveillance of the North American Airspace. In 1963, improvements in surveillance technology led to the closure of most of the DEW Line sites and their replacement with the NWS. Since the 1990s, investigations, decommissioning, and clean-up activities have been undertaken at the DEW Line sites. Clean-up and decommissioning activities involved the demolition of surplus buildings and structures, excavation of contaminated soils, and the retrofitting of existing landfills. New engineered landfills were also constructed for the disposal of excavated soils and building materials.

Landfills at DEW Line sites can be categorized as follows:

- **Regraded:** Existing landfills that were regraded and capped with gravel;
- **Leachate Contained:** Existing landfills that were capped with gravel and provided with an impermeable membrane keyed into the permafrost (either only on the sides or over the entire surface), to contain leachate;
- **New NH:** New non-hazardous waste landfills; and,

- **New Tier II:** New Tier II disposal facilities (used for the disposal of Tier II soils as described by the DEW Line Cleanup Criteria) have impermeable liners below and above the contaminated soil to encapsulate the contents and contain the leachate. Tier II landfills are designed with a saturated granular perimeter berm keyed into the permafrost and sufficient cover of granular material to promote permafrost aggradation into the landfilled materials.

The five landfills in the monitoring program at FOX-2 fall into the following categories:

- Airstrip Camp Landfill (Regraded)
- West Landfill (Regraded)
- Non-Hazardous Waste Landfill (New NH Landfill)
- Tier II Disposal Facility (New Tier II)
- Upper Site Landfill (Leachate Contained)

The airstrip at FOX-2 is maintained for the purpose of ongoing NWS operations and long-term monitoring.

2.4 Field Program Staff and Schedule

Table 2-1 presents a list of field personnel, roles, responsibilities and dates for the FOX-2 2016 monitoring program.

Table 2-1: Field Personnel and Roles

Name (Affiliation)	Role / Responsibility	Site	Date
Reza Moghaddam (Golder)	Field Geotechnical Lead / Inspections	FOX-2	August 19-20
Jamie Bonany (Golder)	Field Environmental Lead / Soil and Water Sampling	FOX-2	August 19-20
Kent Bretzlaff (Golder)	Environmental Field Technician / Soil and Water Sampling	FOX-2	August 19-21
Jaypootie Moesesie (Inuit Subcontractor)	Wildlife Monitor	FOX-2	August 19-21
Jonah Audlakiak (Inuit Subcontractor)	Wildlife Monitor	FOX-2	August 19-21

2.5 Weather Conditions

Table 2-2 presents a summary of weather conditions on each day of the FOX-2 monitoring program.

Table 2-2: Summary of Weather Conditions

Date	Weather
August 19	Sun and Cloud, 4°C to 9°C
August 20	Sun and Cloud, 6°C to 16°C
August 21	Sun and Cloud, 8°C to 16°C

2.6 Project References

Canadian Council of Ministers of the Environment (CCME, 1993), "Guidance Manual on Sampling, Analysis and Data Management for Contaminated Sites Guidance Manual on Sampling, Analysis and Data Management for Contaminated Sites – Volumes I and II, Main Report and Analytical Methods".

Department of National Defence (DND, 2015), "Terms of Reference, DEW Line Monitoring Program CAM-5, FOX-M, 2, 3, 4, 5, DYE-M", QIKIQ15 Contract, April 2015.

Golder Associates Ltd. (Golder, 2015), "Solicitation No. W6837-151002/A Baffin Region Dew Line Sites Monitoring Program", Report P1530908, dated June 16, 2015.

Golder Associates Ltd. (Golder, 2016a), "*2015 FOX-2 Monitoring Report*", Report 1530908-1600-Rev2, dated March, 2016.

Golder Associates Ltd. (Golder, 2016b). "*Baffin Region DEW Line Site Monitoring Health Safety and Environment Plan*", Report 1530908-1200-Rev2, dated July 25, 2016.

Golder Associates Ltd. (Golder, 2016c), "2016 Landfill Monitoring Program for QIKIQ15 Contract: Logistics and Work Plan", Report 1530908-1300-Rev1, dated July 25, 2016.

Golder Associates Ltd. (Golder, 2016d). "*2016 Baffin Region DEW Line Site Landfill Monitoring Field Work Progress Report*", Report 1530908-1300-Rev1, dated October, 2016.

2.7 Report Structure

This report describes the monitoring program carried out in August 2016 at FOX-2. Results from soil and groundwater sampling, thermal monitoring and visual inspection activities are presented in Section 4 in accordance with the TOR. Each of the landfills is described in separate sub-sections (Sections 4.1 to 4.5). Each section contains the following 2016 monitoring information for that landfill:

- Scope Deviations summary;
- Visual Inspection Checklist;
- Preliminary Stability Assessment Table;
- Table of visual inspection photographs;
- Landfill plan with photograph locations and observed features;
- Summary of thermal monitoring (if applicable for landfill);
- Summary of soil sampling analytical results;
- Summary of groundwater sampling analytical results (if applicable for landfill); and,
- Discussion of overall landfill performance based on available monitoring data.

The methodology for the monitoring program is described in Section 3. Information on the development of Background and Baseline data used for comparison of soil and groundwater samples described herein is provided at the beginning of Section 4. The Quality Analysis / Quality Control (QA/QC) data interpretation is contained in Section 5.

Appendix A provides a Limitation of Responsibilities and forms part of the report. Thermal and groundwater monitoring field record sheets are included in Appendix B. Laboratory certificates of analysis, historical landfill monitoring results and QA/QC Reports are included in Appendix C. A photographic log is included in Appendix D. An electronic version of the report, tables, figures, full resolution photos and laboratory certificates of analysis are saved on a DVD-ROM, which is appended to the hardcopy of the report.

3.0 APPROACH & METHODOLOGY (GENERAL)

3.1 Summary of Work

3.1.1 Health and Safety

Golder developed a Health Safety and Environment Plan (Golder, 2016b) for the QIKIQ15 field program that described potential hazards, risks and proposed mitigation measures. Unique health and safety risks included the potential for wildlife encounters, long distances to the nearest emergency health care facilities and variable weather conditions. In addition, Golder developed a Logistics and Work Plan (Golder, 2016c) for the field program that outlined travel plans, contact information, accommodation details, transportation, communications, field equipment and sampling protocols.

3.1.2 Field Program

Table 3-1 provides a summary of the monitoring schedule for the seven DEW Line sites that are part of the QIKIQ15 Project. FOX-2 was monitored in 2016 (Year 5 post-remediation) and will be monitored again in 2018 (Year 7 post-remediation). The field monitoring program consisted of the following activities:

- Visual inspection including photographic documentation of observed conditions;
- Thermal monitoring (i.e., datalogger downloading at landfills with thermistors);
- Soil sampling; and
- Groundwater sampling (at landfills with monitoring wells).

Table 3-1: Summary of QIKIQ15 Site Monitoring Schedule

DEW Line Site	Year			
	2015	2016	2017	2018
CAM-5 Mackar Inlet	Year 5		Year 7	
FOX-M Hall Beach			Year 10	
FOX-2 Longstaff Bluff	Year 4	Year 5		Year 7
FOX-3 Dewar Lakes	Year 4[(a)]	Year 5[(a)]		Year 7
FOX-4 Cape Hooper		Year 18		Year 20
FOX-5 Broughton Island		Year 10		
DYE-M Cape Dyer	Year 2	Year 3	Year 4	Year 5

Legend	
	Phase I Monitoring
	Phase II Monitoring

Note:

a) At FOX-3 in 2015 and 2016 (Years 4 and 5) – Complete a geotechnical inspection of the thermokarst regrade.

Table 3-2 provides a summary of monitoring activities by landfill.

Table 3-2: Summary of Monitoring Requirements by Landfill

Landfill Designation	Type of Landfill	Visual Inspection	Soil Sampling[a]	Groundwater Sampling	Thermal Monitoring
		✓ = yes	Locations x Samples	# of Monitoring Wells	# of Thermistors
FOX-2					
Airstrip Camp Landfill Lobe A	Regraded	✓	4 x 2		
Non-Hazardous Waste Landfill	NEW NH	✓	4 x 2	4	
West Landfill Lobe E	Regraded	✓	5 x 2		
Tier II Disposal Facility	NEW Tier II	✓	4 x 2	4	4
Upper Site Landfill Lobe A	Leachate contained	✓	4 x 2	4	4
	TOTAL	***5***	***42***	***12***	***8***

Notes:

a) (# x #) Indicates approximate number of sampling points at each landfill and requirement to collect samples from 2 depths at each sampling point; from 0-15 cm and from 40-50 cm (or at refusal).

3.1.3 Visual Inspection

At each of the landfill locations mentioned above, a visual inspection was conducted to observe whether there were any visual signs of erosion, cracking, seepage, ponded water, stressed vegetation (potentially caused by the landfill) and for physical stability. Photographic records of the landfill were taken to document the observed condition of the landfill and other notable features that were observed. Northing and Easting coordinates were recorded for all photograph and feature locations using a Garmin GLO portable GPS receiver (2-5 m accuracy) with Bluetooth connection to a field tablet.

Visual inspection information was used to complete a Preliminary Stability Assessment for each landfill. Each observed feature was assigned a Severity Rating (Acceptable, Marginal, Significant or Unacceptable) and Extent (Isolated, Occasional, Numerous or Extensive) and then the landfill was assigned an overall Performance Rating (Acceptable, Marginal, Significant or Unacceptable). If a type of feature was not observed during the inspection then the Severity Rating was reported as “Not Observed” in the Preliminary Stability Assessment. Definitions of these terms are as follows:

Feature Severity Rating / Landfill Performance Rating	Description
Not Observed	This type of feature was not observed at the landfill during the inspection.
Acceptable	Noted features are of little consequence. The landfill is performing as designed. Minor deviations in environmental or physical performance may be observed, such as isolated areas of erosion, settlement.

Feature Severity Rating / Landfill Performance Rating	Description
Marginal	Physical/environmental performance appears to be deteriorating with time. Observations may include an increase in size or number of features of note, such as differential settlement, erosion or cracking. No significant impact on landfill stability to date, but potential for failure is assessed as low or moderate.
Significant	Significant or potentially significant changes affecting landfill stability, such as significant changes in slope geometry, significant erosion or differential settlement; scarp development. The potential for failure is assessed as imminent.
Unacceptable	Stability of landfill is compromised to the extent that ability to contain waste materials is compromised. Examples may include: ■ Debris exposed in erosion channels or areas of differential settlement. ■ Liner exposed. ■ Slope failure.

Extent	Description
Isolated	Singular feature
Occasional	Features of note occurring at irregular intervals/locations
Numerous	Many features of note, impacting less than 50% of the surface area of the landfill
Extensive	Impacting greater than 50% of the surface area of the landfill

3.1.4 Thermal Monitoring

The landfills that require leachate containment (e.g., Tier II disposal facilities) and rely on permafrost aggradation incorporate ground temperature monitoring systems with vertical thermistor strings that measure temperature at various depths and automated dataloggers that allow for data collection. The data recorded on the dataloggers was downloaded using a laptop computer and Prolog software from Lakewood Systems Ltd. Thermistor inspection and data downloading details were recorded on field record sheets included in Appendix B.

At the FOX-2 site, thermistors and dataloggers were installed only at the Tier II Disposal Facility and Upper Site Landfill Lobe A. A repaired datalogger from thermistor VT-2 was returned to the site and reinstalled at the Tier II Disposal Facility in 2016.

3.1.5 Soil Sampling

Soil samples were collected in accordance with the TOR, the Golder Proposal, Logistics and Work Plan and Canadian Council of Ministers of the Environment (CCME) Guidance Manual on Sampling, Analysis and Data Management for Contaminated Sites – Volumes I and II, Main Report and Analytical Methods (CCME, 1993). Soil sampling procedures of note are as follows (deviations from the TOR are noted *in italics*):

- Soil samples were collected within 2 to 4 metres of monitoring wells (where applicable). Where there was no corresponding monitoring well, soil samples were collected within 2 to 4 metres of previous sample locations. Pins with tags have been left in the ground at some historic soil sampling locations. Golder sampled away from previous soil sampling locations, identified by either pins or disturbed ground surface, and did not leave pins in the ground.
- Coordinates of the 2016 soil sampling locations were recorded using a field tablet equipped with a Garmin GPS and confirmed to be consistent with previous/required sampling locations prior to sampling.
- Test pits were dug with a shovel that was washed between sample locations. The shovel was decontaminated with soap and water, methyl hydrate and rinsed with distilled water before each use. Soil samples were collected by hand using a single-use disposable nitrile glove and placed into new/clean glass sample jars provided by the laboratory that were labelled with the sample location ID and depth.
- Soil samples were generally collected at 0 to 15 centimetres (cm) depth and at 40 to 50 cm depth at the locations in accordance with the TOR. *At some locations, the sample collection depth was adjusted where soil was frozen or refusal on rock was encountered. Where refusal on a large rock(s) was encountered near surface, the sampling location was moved slightly to avoid the large rock(s). When rocks were encountered prior to reaching the target sampling depth, the test pit was enlarged and the rock(s) were excavated if possible. If the specified sampling depth could not be reached after expending reasonable effort to enlarge the hole in an attempt to remove rock(s), a sample was collected at or near the zone of refusal (in accordance with the TOR). If refusal was encountered after the shallow soil sample depth and even with additional effort it was not possible to remove the rock(s) causing refusal, then only one soil sample was collected at that location (noted as "refusal" in summary tables below).*
- *At locations where the ground was covered with snow and ice, excavation of the snow was attempted but, typically, it was impossible to dig through the ice and frozen ground beneath the snow and soil samples were not collected (noted as "frozen" in summary tables below).*
- Inter-lab field duplicates were collected for approximately 10% of the total soil samples collected. The field duplicates were collected from relatively homogenous soil material *in the test pit*, such that the composition of the samples was the same and to minimize escape of volatile compounds.
- In order to assess the effectiveness of decontamination of the shovel used for soil sampling, an equipment rinsate (equipment blank) sample was completed following a typical decontamination procedure. This was conducted during sampling of the FOX-4 landfill, by pouring distilled water over the decontaminated shovel and capturing it in water sample bottles.

3.1.6 Groundwater Sampling

Groundwater samples were collected in accordance with the TOR, the Golder Proposal, Logistics and Work Plan and CCME (1993). Groundwater sampling procedures of note are as follows (*deviations in italics*):

- Water levels in the wells were measured with an interface probe that was decontaminated with soap and water, methyl hydrate and rinsed with distilled water before each use.
- *At monitoring well locations where there was snow on the ground surrounding the well and no measurable water level or water that could be pumped with the peristaltic pump, water samples were not collected (noted as "frozen" in the summary tables below).*
- *At monitoring well locations that had no measurable water level or water that could be pumped with the peristaltic pump, water samples were not collected (noted as "dry" in summary tables below).*
- *In wells with limited water depth and/or slow recharge, purging was only carried out until the field parameters were observed to stabilize* and then sampling was commenced in the priority order outlined in the TOR. *The number of water sample bottles collected and parameters that could not be analysed are listed in footnotes following the respective summary tables below.*
- Purging and sampling was carried out using a peristaltic pump and a low-flow purge rate of less than 100 mL/min was maintained. Peristaltic pump flexible tubing and nylon tubing extending down the well was single-use and disposed after use at each well (i.e., not reused). Sample tubing was removed from the wells after completion of the sampling event and disposed off-site.
- Groundwater samples were pumped directly from the well into analysis-specific bottles provided by the laboratory that were labelled with the sample location ID. Groundwater samples were not field filtered and were not field-acidified or preserved (in accordance with the TOR).
- Where groundwater was insufficient, sampling was prioritized in the following order:
  - Petroleum hydrocarbons: F1 fraction;
  - Inorganic elements – total concentrations: arsenic, cadmium, chromium, cobalt, copper, lead, nickel, zinc and mercury. Samples were not filtered (which is why low turbidity is so important) or preserved;
  - Petroleum hydrocarbons: F2, F3 and F4 fractions; and,
  - PCBs (polychlorinated biphenyls – Total Aroclor analysis).
- Inter-lab duplicates were collected for 10% of the total groundwater samples collected.
- A field blank was filled in the field with distilled water and analyzed for all parameters.
- A travel blank of laboratory prepared water accompanied the sampling containers for the whole duration of the program, and analyzed for the entire suite of parameters.
- In order to assess the effectiveness of decontamination of the groundwater level / interface probe, an equipment rinsate (equipment blank) sample was completed following a typical decontamination procedure. This was conducted during sampling of the FOX-2 landfills, by pouring distilled water over the decontaminated probe and capturing it in water sample bottles.
- No equipment blanks were required for the sample collection tubing as new tubing was used at each sampling location.

3.2 Field Notes and Data

Visual inspection photographs, features, locations and notes were recorded in the field with a tablet computer equipped with a camera and Global Positioning System (GPS). Field data and photographs from the tablet were uploaded to an online Geographic Information System (GIS) database that was used to generate the photograph log and figures presented in this report.

Thermistor inspection and monitoring data were recorded on field record sheets included in Appendix B. Thermistor locations were recorded with either the field tablet or a hand-held GPS.

Soil sampling locations were photographed before test pit excavation, at the maximum depth of the test pit excavation and after backfilling. Soil sampling locations were recorded with either the field tablet or a hand-held GPS.

Groundwater monitoring data was recorded on field record sheets included in Appendix B. Monitoring well locations were recorded with either the field tablet or a hand-held Global Positioning System (GPS).

3.3 QA/QC

Quality Assurance (QA) is the system of validation checks performed to measure quality in order to determine if the quality objectives have been met. Quality Control (QC) is the set of procedures which are incorporated into the project's standard operating procedures to ensure that it achieves its quality objectives.

The QC procedures incorporated into the monitoring program carried out at FOX-2 included:

- Using only ISO 17025 certified environmental labs to perform the soil and groundwater analyses. Golder used Paracel Laboratories Ltd. (Paracel) of Ottawa as the primary lab and AGAT Environmental (AGAT) of Mississauga for the duplicate samples. Both of these laboratories are ISO 17025 certified for the analyses performed. The laboratories also exchanged their "Standard Methods" for the analyses in the program to harmonize their procedures for the duplicate analysis;
- The field sampling for soil and groundwater was completed by a two-person team, which helped to ensure that all of the sampling and field identification procedures were followed in order;
- Duplicate soil samples were collected from relatively homogenous soil material *in the test pit*, such that the composition of the samples was the same and to minimize escape of petroleum hydrocarbon (F1 fraction) compounds;
- Duplicate groundwater samples were prepared by alternately filling bottles for each lab for each parameter type; the yield of the wells in some cases prevented filling the whole suite of sample bottles;
- To minimize the possibility of cross contamination, soil samples were collected directly from the test pits with nitrile gloved hands, at the designated depth intervals, and placed into lab-supplied sample jars leaving no headspace. New gloves were used for each sample. The shovel and trowel used to open the test pit were cleaned manually then rinsed with methyl hydrate and distilled water;
- To minimize the risk of cross-contamination, groundwater samples were pumped from the monitoring wells using dedicated tubing inserted into the well and another dedicated length of tubing between the rollers in the peristaltic pump. Staff holding the sample bottles wore nitrile gloves. Samples were labelled at the monitoring well with identification, time and date;

- Groundwater samples were neither filtered nor preserved in the field. The low-flow sampling technique was employed to minimize the presence of sediment in the water sample;
- Soil samples were not preserved in the field;
- To minimize the time delay from actual sample collection to receipt at the lab, Golder sent coolers from the site to the staging point every time a resupply flight occurred. From the staging point communities, the coolers were sent via First Air to Ottawa Airport where Golder picked them up and took them to Golder's office in Ottawa, where they were checked for breakage, legibility of the labels and accuracy and completeness of the chain of custody. After being checked in Ottawa, the samples were dispatched to the primary and duplicate labs. The maximum allowable hold times for samples were largely met; where they were exceeded, it was due to the logistical limitations of flying in and out of the sites and the long chain of transport from the staging points to the labs.

QA was measured by the duplicate analysis and review of the QA/QC data contained in each laboratory certificate of results. In addition to the duplicate analyses, a field blank (consisting of bottles filled with distilled water in the field) was submitted to Paracel for analysis of all specified parameters. Trip blanks consisted of bottles filled with distilled water and sealed at the laboratory. A trip blank was brought to the field for the overall 2016 program and back, then submitted to Paracel for analysis of all specified parameters.

The soil samples and groundwater samples were collected with only dedicated single-use equipment. The water sampling tubing was single-use from the well to sample bottle, and soil samples were collected from the test pits into sample jars using single-use gloves. This was possible because the texture of the soil samples was generally loose sandy soil. Nevertheless, equipment blanks were prepared for each type of sample. For groundwater sampling, the equipment blank was a sample of water poured over the water level probe, after it had been washed off, and for soil sampling it was a sample of water poured over the trowel after it had been washed between samples.

A discussion of the QA/QC results is provided in Section 5.

4.0 2016 MONITORING PROGRAM RESULTS

Photographs 1 through 203 (in Appendix D) document the observed conditions during the visual inspection including features on the cover/toe of the landfills, the groundwater monitoring wells, soil sample locations before excavation, after excavation and after backfilling as well as the condition of thermistors. The photographs taken at each of the landfill sites to document the observed conditions are organized as follows:

- **Airstrip Camp Landfill Lobe A** - Photographs 1 through 32;
- **Non-Hazardous Waste Landfill** - Photographs 33 through 75;
- **West Landfill Lobe E** - Photographs 160 through 203.
- **Tier II Disposal Facility** - Photographs 76 through 114; and,
- **Upper Site Landfill Lobe A** - Photographs 115 through 159.

A complete log of all photographs is included in Appendix D. Copies of all digital photograph files are included on a DVD attached to this report. Visual inspection photographs are identified by an "ATT number" in the file name, which are noted in brackets in the visual inspection photograph log tables.

Many of the features assessed to have an "Acceptable" Severity Rating do not appear to be related to landfill performance. For example, shallow depressions that appear to be unchanged since construction of the landfill (i.e., as-built condition) or minor hydrocarbon staining from post-construction anthropogenic activities (e.g., ATV use). These acceptable features that do not appear to be related to landfill performance have been reported as "*not a concern*". Self-armouring erosion, minor water ponding and seepage without staining have also been reported as "*not a concern*" because they are not indicative of deteriorating landfill performance and/or may just be weather related. In addition, some minor cracking that appears to be related to thaw creep does not indicate slope instability and is not considered to be a concern at the present time. Significant features that are related to landfill performance have been photographed and described in detail.

The monitoring program results are listed for each landfill in the sections below. In the tables contained within the text and Appendix C, data which exceed the arithmetic mean background data and baseline arithmetic mean data are identified by underlined and **bold** fonts, respectively. The background arithmetic mean limits for each landfill have been previously established using the arithmetic mean concentrations for soil samples collected outside of the landfills in 1990 and 2005. The baseline arithmetic mean limits were calculated based on the concentrations for soil samples collected at each of the current soil sampling locations adjacent to the landfills, between 2005 and 2011. Soil and groundwater quality data are also compared to the baseline mean concentration plus three standard deviations (3σ); exceedances of this standard are shaded. This limit is based on the "three-sigma rule of thumb", wherein it is expected that nearly all values not influenced by changes in impact lie within three standard deviations of the arithmetic mean.

A modified total petroleum hydrocarbons (TPH) value, calculated as the sum of the PHC F1, F2 and F3 fractions, is discussed throughout this report to allow for comparison to TPH baseline data.

Historical soil and groundwater results and charts are included in Appendix C. It should be noted there are discrepancies in the highlighting of baseline and background arithmetic mean exceedances between the 2016 soil and groundwater data summary tables within the body of the report and the historical chemistry tables in Appendix C; exceedances noted in the data tables within the body of the report are considered the correct

interpretation of the 2016 results. It is recommended that seven data points be used as a minimum to identify a soil or groundwater quality trend for these landfills. As of the end of 2016, the maximum of four sample results is less the seven year standard and there is therefore insufficient information available to establish a reliable trend. Discussion of the 2016 data in this report focused on identifying data results for locations where concentrations significantly different (typically greater) than previous years are observed, or locations where concentrations exceeded the baseline mean concentration plus 3σ.

Duplicate soil samples were collected at a total of four locations at FOX-2. This included the shallow F2-2 (0-15 cm) at the West Landfill Lobe E, deep F2-7 (40-50 cm) at the Airstrip Camp Landfill Lobe A, deep MW-07 (40-50 cm) at the Non-Hazardous Waste Landfill and shallow MW-14 (0-15 cm) at the Upper Site Landfill Lobe A sample locations. A duplicate groundwater sample was also collected at monitoring well MW-09 at the Tier II Disposal Facility. For these duplicate sample locations, the average of the two concentrations are presented in the tables and used to discuss in the results in Section 4. The reproducibility of the duplicate sample results is discussed in Section 5.

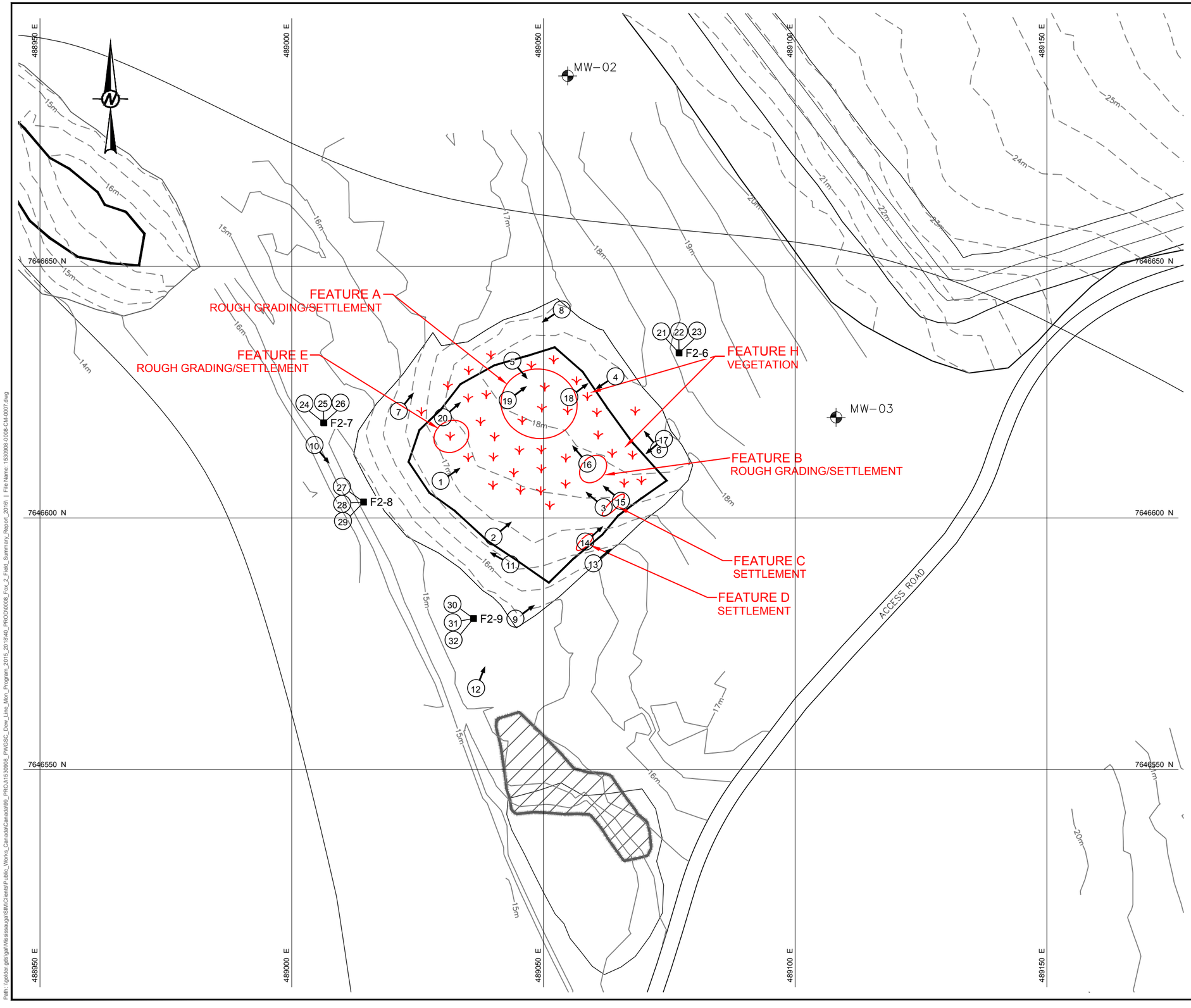
4.1 Airstrip Camp Landfill Lobe A

4.1.1 Landfill Description

The Airstrip Camp Landfill is located in the Airstrip Area, 380 m northeast of the hangar, approximately 200 m east of the airstrip (Figure FOX-2.2). The landfill is located approximately 600 m from the ocean. Local elevations range from 18masl to the east, sloping west to approximately 15 masl on the west side of the landfill. Ponding and drainage channels leading toward the ocean are observed west of the landfill, notably west of the runway.

This landfill covers an approximate area of 1,170 m^2 (2,600 m^2 including the sideslopes). Remediation at this landfill is reported to have consisted of the removal of contaminated soil and debris, as well as regrading of an existing landfill.

The long term monitoring plan consists of visual monitoring, and the periodic collection of soil samples. Locations for the collection of soil samples are identified on Figure FOX-2.2. Two groundwater monitoring wells, MW-02 and MW-03, are present north and east of the landfill.



LEGEND

- MONITORING WELL
- SOIL SAMPLING LOCATION
- SETTLEMENT (NTS)
- VEGETATION (NTS)
- PHOTOGRAPH VIEWPOINT LOCATION
- GROUND SURFACE CONTOUR

NOTES

GRID PROJECTION IS NAD83 ZONE 18N.
ELEVATIONS ARE GEODETIC.

REFERENCE

PREVIOUS INSPECTION FIGURE PROVIDED BY BIOGENIE, A DIVISION OF ENGLOBE CORPORATION, PROJECT NO.CD2655_400_403, DATED JUNE 2015.

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1:750 METRES

CLIENT
DEPARTMENT OF NATIONAL DEFENCE CANADA

PROJECT
2016 FOX-2 MONITORING REPORT

TITLE
AIRSTRIP CAMP LANDFILL LOBE A

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-03
DESIGNED	RM
PREPARED	TDR
REVIEWED	DCJ
APPROVED	DP

PROJECT NO.	PHASE	REV.	FIGURE
1530908	2000	A	FOX-2.2

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4.1.2 Summary of Scope Deviations

The field work was conducted as per the TOR. There were no notable exceptions to the scope of work.

4.1.3 Visual Inspection

The Airstrip Camp Landfill Lobe A exhibits some vegetation growth and minor settlement on the cover. No cracking, erosion or exposed waste was observed in 2016. Table 4-1 presents a summary of observed visual inspection features and Table 4-2 presents the Preliminary Stability Assessment results. This landfill was assessed to have an “Acceptable” overall performance because all observed features were assessed as “Acceptable”. Table 4-3 is a log of photographs taken during the 2016 visual inspection.

Ponded water was not observed along the toe in 2016 (previous Features F and G). There are two previously observed minor linear settlement features along the south crest edge (Features C and D). There are also several previously observed rough graded areas (with some possible shallow settlement) on the landfill cover surface (Features A, B and E). These features remained unchanged since the previous inspection in 2015. Some sparse grass vegetation (Feature H) is becoming established in a bigger area on the cover surface as compared to the 2015 inspection.

Table 4-1: Visual Inspection Checklist - Airstrip Camp Landfill Lobe A

SITE NAME: FOX-2 Longstaff Bluff
LANDFILL DESIGNATION: Airstrip Camp Landfill Lobe A
DATE OF INSPECTION: August 20, 2016
DATE OF PREVIOUS INSPECTION: August 22, 2015
INSPECTED BY: Reza Moghaddam
REPORT PREPARED BY: Reza Moghaddam
MONITORING EVENT NUMBER: 5
The inspector/reporter represents to the best of his/her knowledge that the following statements and observations are true and correct and to the best of the preparer's actual knowledge, no material facts have been suppressed or misstated.

Table 4-1: Visual Inspection Checklist - Airstrip Camp Landfill Lobe A

Checklist Item	Present (Y/N)	Feature ID (A, B, etc.)	Location Description	Easting	Northing	Length (m)	Width (m)	Depth (m)	Extent of Landfill Area (%)	Description (Severity Rating)	Comparison to Historical Observations	Photos
Settlement	Y	A	Northeast crest surface	489055.1 489042.9	7646624.0 7646623.4	15.0	10.0	0.20	5.77%	Rough grading and/or minor settlement (Acceptable)	Unchanged since previous inspection	18, 19
		B	Southeast crest surface	489058.7	7646610.8	3.0	3.0	0.10	0.35%	Rough grading and/or minor settlement (Acceptable)	Unchanged since previous inspection	16
		C	South crest edge	489055	7646605	2.0	0.5	0.10	0.04%	Linear depression (Acceptable)	Unchanged since previous inspection	15
		D	South crest edge	489058.3	7646595.3	2.0	0.5	0.10	0.04%	Linear depression (Acceptable)	Unchanged since previous inspection	14
		E	Northwest corner	489030	7646620	5	5	0.1	0.96%	Rough grading and/or minor settlement (Acceptable)	Unchanged since previous inspection	20
Erosion	N											
Lateral Movement	N											
Frost Action	N											
Sloughing	N											
Cracking	N											
Animal Burrows	N											

Table 4-1: Visual Inspection Checklist - Airstrip Camp Landfill Lobe A

Checklist Item	Present (Y/N)	Feature ID (A, B, etc.)	Location Description	Easting	Northing	Length (m)	Width (m)	Depth (m)	Extent of Landfill Area (%)	Description (Severity Rating)	Comparison to Historical Observations	Photos
Vegetation	Y	H	Cover surface	489073.9	7646615.7	30.0	30.0	-	34.6%	Sparse vegetation (Acceptable)	Expanded area	1, 2, 3, 4, 5, 17, 18
Staining	N											
Vegetation Stress	N											
Seepage or Ponded Water	N	F	South toe	489059.9	7646591.0					Previously noted as ponded water along toe	No water in 2016	13
		G	West toe	489036.6	7646566.2					Previously noted as ponded water along toe	No water in 2016	12
Debris and/or Liner Exposed	N											
Presence / Condition of Monitoring Instruments	N											
Features of Note / Other Observations	N											

Landfill Area = 2,600 m^2.

Table 4-2: Preliminary Stability Assessment - Airstrip Camp Landfill Lobe A

Feature	Severity Rating	Extent
Settlement	Acceptable	Occasional
Erosion	Not observed	-
Lateral Movement	Not observed	-
Frost Action	Not observed	-
Sloughing	Not observed	-
Cracking	Not observed	-
Animal Burrows	Not observed	-
Vegetation Establishment	Acceptable	Occasional
Staining	Not observed	-
Vegetation Stress	Not observed	-
Seepage/Ponded Water	Not observed	-
Debris and/or Liner Exposure	Not observed	-
Other	Not observed	-
Overall Landfill Performance	**Acceptable**	

Table 4-3: Summary Table of Photographic Log - Airstrip Camp Landfill Lobe A Visual Inspection

Photo	Description	Easting	Northing	Date
1	FOX-2 – Airstrip Camp Landfill Lobe A – Cover surface, some sparse vegetation (Feature H), facing northeast (ATT94_Photo94.jpg)	489029.56	7646607.37	20-Aug-2016
2	FOX-2 – Airstrip Camp Landfill Lobe A – Cover surface, some sparse vegetation (Feature H), facing northeast (ATT95_Photo95.jpg)	489040.06	7646596.30	20-Aug-2016
3	FOX-2 – Airstrip Camp Landfill Lobe A – Cover surface, some sparse vegetation (Feature H), facing northwest (ATT97_Photo97.jpg)	489061.94	7646602.15	20-Aug-2016
4	FOX-2 – Airstrip Camp Landfill Lobe A – Cover surface, some sparse vegetation (Feature H), facing southwest (ATT98_Photo98.jpg)	489064.30	7646628.14	20-Aug-2016
5	FOX-2 – Airstrip Camp Landfill Lobe A – Cover surface, rough grading area (Feature A), facing southeast (ATT100_Photo100.jpg)	489043.82	7646631.24	20-Aug-2016
6	FOX-2 – Airstrip Camp Landfill Lobe A – Northeast slope, facing northwest (ATT91_Photo91.jpg)	489073.70	7646614.94	20-Aug-2016
7	FOX-2 – Airstrip Camp Landfill Lobe A – Northwest slope, some sparse vegetation (Feature H), facing northeast (ATT92_Photo92.jpg)	489021.25	7646621.29	20-Aug-2016
8	FOX-2 – Airstrip Camp Landfill Lobe A – Northwest slope, facing southwest (ATT99_Photo99.jpg)	489053.61	7646641.42	20-Aug-2016
9	FOX-2 – Airstrip Camp Landfill Lobe A – Southeast slope and toe, no ponded water along toe (previous Feature F), facing northeast (ATT90_Photo90.jpg)	489044.41	7646580.02	20-Aug-2016

Table 4-3: Summary Table of Photographic Log - Airstrip Camp Landfill Lobe A Visual Inspection

Photo	Description	Easting	Northing	Date
10	FOX-2 – Airstrip Camp Landfill Lobe A – Southwest slope and toe, no ponded water along toe (previous Feature G), facing southeast (ATT93_Photo93.jpg)	489004.52	7646614.48	20-Aug-2016
11	FOX-2 – Airstrip Camp Landfill Lobe A – Southwest slope and crest, facing northwest (ATT96_Photo96.jpg)	489043.40	7646590.82	20-Aug-2016
12	FOX-2 – Airstrip Camp Landfill Lobe A – Southwest and southeast toes – no ponded water along toes (previous Features F and G), facing northeast (ATT35_Photo35.jpg)	489036.60	7646566.20	20-Aug-2016
13	FOX-2 – Airstrip Camp Landfill Lobe A – Southeast toe – No ponded water along toe (previous Feature F), facing northeast (ATT36_Photo36.jpg)	489059.90	7646591.00	20-Aug-2016
14	FOX-2 – Airstrip Camp Landfill Lobe A – Southeast crest edge – Feature D – Linear depression, facing northeast (Acceptable) (ATT37_Photo37.jpg)	489058.30	7646595.30	20-Aug-2016
15	FOX-2 – Airstrip Camp Landfill Lobe A – Southeast crest edge – Feature C – Linear depression, facing northwest (Acceptable) (ATT38_Photo38.jpg)	489054.06	7646607.19	20-Aug-2016
16	FOX-2 – Airstrip Camp Landfill Lobe A – Cover surface – Feature B – Rough grading and/or minor settlement, facing northwest (Acceptable) (ATT39_Photo39.jpg)	489058.70	7646610.80	20-Aug-2016
17	FOX-2 – Airstrip Camp Landfill Lobe A – Cover surface – Feature H – Sparse vegetation, facing southwest (Acceptable) (ATT40_Photo40.jpg)	489073.90	7646615.70	20-Aug-2016
18	FOX-2 – Airstrip Camp Landfill Lobe A – Northeast crest surface – Feature A – Rough grading and/or minor settlement, facing northeast (Acceptable) (ATT41_Photo41.jpg)	489055.10	7646624.00	20-Aug-2016
19	FOX-2 – Airstrip Camp Landfill Lobe A – Northeast crest surface – Feature A – Rough grading and/or minor settlement, facing northeast (Acceptable) (ATT42_Photo42.jpg)	489042.90	7646623.40	20-Aug-2016
20	FOX-2 – Airstrip Camp Landfill Lobe A – Northwest crest surface – Feature E – Rough grading and/or minor settlement, facing northeast (Acceptable) (ATT43_Photo43.jpg)	489030.00	7646620.00	20-Aug-2016

4.1.4 Soil Sampling

Table 4-4 presents a summary of analytical results for soil samples collected at the Airstrip Camp Landfill Lobe A. F2-6 represents an upgradient sampling location, whereas F2-7, F2-8 and F2-9 represent downgradient sampling locations.

Table 4-4 also lists the arithmetic mean background and baseline values for the site, in addition to the baseline plus three-sigma (baseline plus 3σ) limit. At the Airstrip Camp Landfill Lobe A, the baseline arithmetic means for copper, nickel, cobalt, zinc and chromium are lower than the background arithmetic means.

F2-6

Sampling location F2-6 is located upgradient of the landfill, approximately 7 m northeast of the toe. The estimated elevation of this sampling point is 18.5 masl. As shown in Photos 21 and 22, the area consists of sand and gravel with some rocks and established vegetation. The soils consisted of brown sand with gravel and stone.

For the shallow sample at F2-6 (0-15 cm), the concentrations of all metals were less than those observed in previous years. No cadmium, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

The deep sample at F2-6 (30-40 cm) exhibited similar metals concentrations to those in the shallow sample. The concentration of chromium (69 mg/kg) marginally exceeded the baseline mean concentration plus 3σ (67 mg/kg); no other reported values exceeded their respective baseline mean concentrations plus 3σ. The concentration of chromium was greater than the concentration reported in 2015 (58 mg/kg) but less than the concentrations reported in 2014 (107 mg/kg) and 2012 (82 mg/kg). Similarly, the concentrations of most other metals were comparable to those observed in 2015 but less than those observed in 2012 and 2014. No cadmium, mercury, PHC or PCB were detected at this location in 2016.

F2-7

Sampling location F2-7 is located downgradient of the landfill, approximately 8 m west of the toe. The estimated elevation of this sampling point is 15.5 masl. As shown in Photos 24 and 25, the area consists of sand and gravel with some rocks and vegetation. The soils consisted of brown sand and gravel.

For the shallow sample at F2-7 (0-15 cm), the concentrations of cobalt and lead were slightly greater than those observed in previous years whereas the concentrations of other metals were similar to those reported in previous years. No cadmium, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

The deep sample at F2-7 (40-50 cm, duplicate location) exhibited similar metals concentrations to those in the shallow sample. Metals concentrations in 2016 were similar to those observed in previous years. No cadmium, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

F2-8

Sampling location F2-8 is located downgradient of the landfill, approximately 6 m southwest of the toe. The estimated elevation of this sampling point is 15.5 masl. As shown in Photos 27 and 28, the area consists of sand and gravel with some rocks and established vegetation. Photo 27 also illustrates the area of the sample and saturated soil along the western toe of the landfill, immediately east of the sampling location. The soil in the area

of the sample location consisted of wet brown sand, gravel and stone. The excavation filled with water soon after it was completed.

For the shallow sample at F2-8 (0-15 cm), the concentrations of all metals were less than or similar to those observed in previous years. No cadmium, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

For the deep sample at F2-8 (40-50 cm), the concentrations of most metals were slightly lower than those in the shallow sample. The concentrations of all metals were similar to those observed in previous years. The modified TPH concentration in 2016 was 17 mg/kg, which remained well below the baseline mean concentration plus 3σ (47 mg/kg). No PHC were detected at this location in 2014 or 2015, however a modified TPH concentration of 118 mg/kg was reported in 2012. No cadmium, mercury, PHC F4 fraction or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

F2-9

Sampling location F2-9 is located downgradient of the landfill, approximately 6 m southwest of the toe. The estimated elevation of this sampling point is 15.5 masl. As shown in Photos 30 and 31, the area consists of sand and gravel with some rocks and established vegetation. The soils consisted of brown sand and gravel.

For the shallow sample at F2-9 (0-15 cm), the concentration of lead (26 mg/kg) represents a new historical maximum concentration, and is marginally below the baseline mean concentration plus 3σ (27 mg/kg). Conversely, the concentration of arsenic represents a new historical minimum concentration. The concentrations of all other metals were within the range of concentrations observed in previous years. The modified TPH concentration in 2016 was 353 mg/kg and exceeded the baseline mean concentration plus 3σ (47 mg/kg) for the first time. No PHC were detected in 2012 or 2015, however a modified TPH concentration of 90 mg/kg was reported in 2014. The concentration of the PHC F4 fraction in 2016 was 36 mg/kg. No cadmium, mercury or PCB were detected at this location in 2016.

The deep sample at F2-9 (40-50 cm) exhibited similar metals concentrations to those in the shallow sample. The concentration of copper was slightly greater than those observed in previous years, whereas the concentrations of all other metals were similar to those observed in previous years. No cadmium, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

Table 4-4: Soil Chemical Analysis Results - Airstrip Camp Landfill Lobe A

ID	Depth (cm)	Cu (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Cr (mg/kg)	As (mg/kg)	Hg (mg/kg)	Total PCB (mg/kg)	F1 (mg/kg)	F2 (mg/kg)	F3 (mg/kg)	F4 (mg/kg)
Background Mean		54.9	45.6	17.2	1.0	10.0	84.2	59.4	23.4	NA	NA	NA	NA	NA	NA
Baseline Mean		**44.5**	**41.4**	**15.1**	**1.0**	**10.0**	**77.6**	**51.3**	**25.4**	**0.10**	**0.10**	**NA**	**NA**	**NA**	**NA**
Baseline + 3σ		96.7	74.0	26.7	1.0	27.3	120.7	66.8	52.9	0.10	0.16	NA	NA	NA	NA
Upgradient															
F2-6b	0-15	27	**44**	13	<0.5	8	**78**	**64**	18	<0.1	<0.05	<7	<4	<8	<6
F2-6a	30-40	27	41	12	<0.5	7	76	**69**	17	<0.1	<0.05	<7	<4	<8	<6
Downgradient															
F2-7b	0-15	**57**	**52**	**16**	<0.5	**11**	73	48	**53**	<0.1	<0.05	<7	<4	<8	<6
F2-7a	40-50	**48**	**54**	15	0.5	**11**	77	**58**	**33**	<0.1	<0.05	<7	<4	<8	<6
F2-7a dup	40-50	41	**47**	13.9	<0.5	10	**87**	51	**35**	<0.10	<0.05	<5	<10	<50	<50
F2-7a (Dup Avg)	40-50	44.5	**51**	14	0.5	**11**	**82**	**55**	**34**	<0.1	<0.05	<6	<7	<29	<28
F2-8b	0-15	**54**	**58**	**16**	<0.5	**11**	**81**	50	**42**	<0.1	<0.05	<7	<4	<8	<6
F2-8a	40-50	**48**	**46**	14	<0.5	10	69	47	**44**	<0.1	<0.05	<7	<4	11	<6
F2-9b	0-15	**71**	**57**	**17**	<0.5	**26**	**97**	**61**	**33**	<0.1	<0.05	<7	31	318	36
F2-9a	40-50	**76**	**60**	**16**	<0.5	**14**	**112**	**64**	**32**	<0.1	<0.05	<7	<4	<8	<6

Notes:
NA: Not available; ID: Soil sample location ID
Underlined values: Results exceed Background arithmetic mean.
Bold Values: Results exceed Baseline arithmetic mean.
Shaded Values: Results exceed the Baseline arithmetic mean plus 3σ.

4.1.5 Conclusions and Overall Performance of the Airstrip Camp Landfill Lobe A

Based on the visual inspection, there is no significant erosion, settlement, cracking, exposed waste or indications of instability at the Airstrip Camp Landfill Lobe A. Some areas of minor settlement were observed on the crest surface but they are not considered to be a concern. Overall the cover at the Airstrip Camp Landfill Lobe A appears to be performing well and no significant features of concern were noted. The Preliminary Stability Assessment conducted based on the visual inspection suggests that the Airstrip Camp Landfill Lobe A has an “Acceptable” overall performance.

Soil samples were collected at all designated locations in 2016; two soil samples (shallow and deep) were collected at all of the locations. The concentrations of most metal parameters were highest at F2-9, located downgradient (southwest) of the toe of the landfill. In a few cases, the 2016 concentrations were slightly higher than in earlier years (e.g., cobalt and lead in the shallow sample at F2-7, lead in the shallow sample at F2-9 and copper in the deep sample at F2-9); however in most cases they were similar to previous monitoring results. The concentration of chromium in the deep sample at F2-6 exceeded the baseline mean concentration plus 3σ. The modified TPH concentration observed in the shallow sample at F2-9 in 2016 exceeded the baseline mean concentration plus 3σ, whereas the modified TPH concentration observed in the deep sample at F2-8 remained well below the baseline mean concentration plus 3σ. No PHC were detected at the remaining sampling locations and no cadmium, mercury or PCB were noted in any of the samples in 2016.

The data from this site are not indicative of increasing influence from the landfill, with the possible exception of location F2-9, where results from both the shallow and deep samples may be reflective of a potential influence; insufficient data are currently available to confirm this.

4.1.6 Recommendations for Airstrip Camp Landfill Lobe A

No modifications to the ongoing monitoring program at this landfill are recommended.

4.2 Non-Hazardous Waste Landfill

4.2.1 Landfill Description

The Non-Hazardous Waste Landfill is located in the Airstrip Area approximately 300 m east of the airstrip, 300 m south of the Airstrip Camp Landfill and approximately 700 m from the ocean. Local elevations east of the Non-Hazardous Waste Landfill are approximately 27 masl.

The landfill was constructed for the disposal of non-hazardous wastes and debris generated and collected during site clean-up. The design of this landfill includes perimeter berms and the placement of a cover of compacted granular fill over the landfilled material. The landfill is approximately 7,500 m^2 in area, including the sideslopes.

The long term monitoring plan consists of visual inspection, and the periodic collection of soil and groundwater samples. Approximate locations for the collection of soil and groundwater samples are identified in Figure FOX-2.3. Four groundwater monitoring wells, MW-05 through MW-08, were installed around the landfill perimeter.

4.2.2 Summary of Scope Deviations

The field work was conducted as per the TOR with the following exceptions:

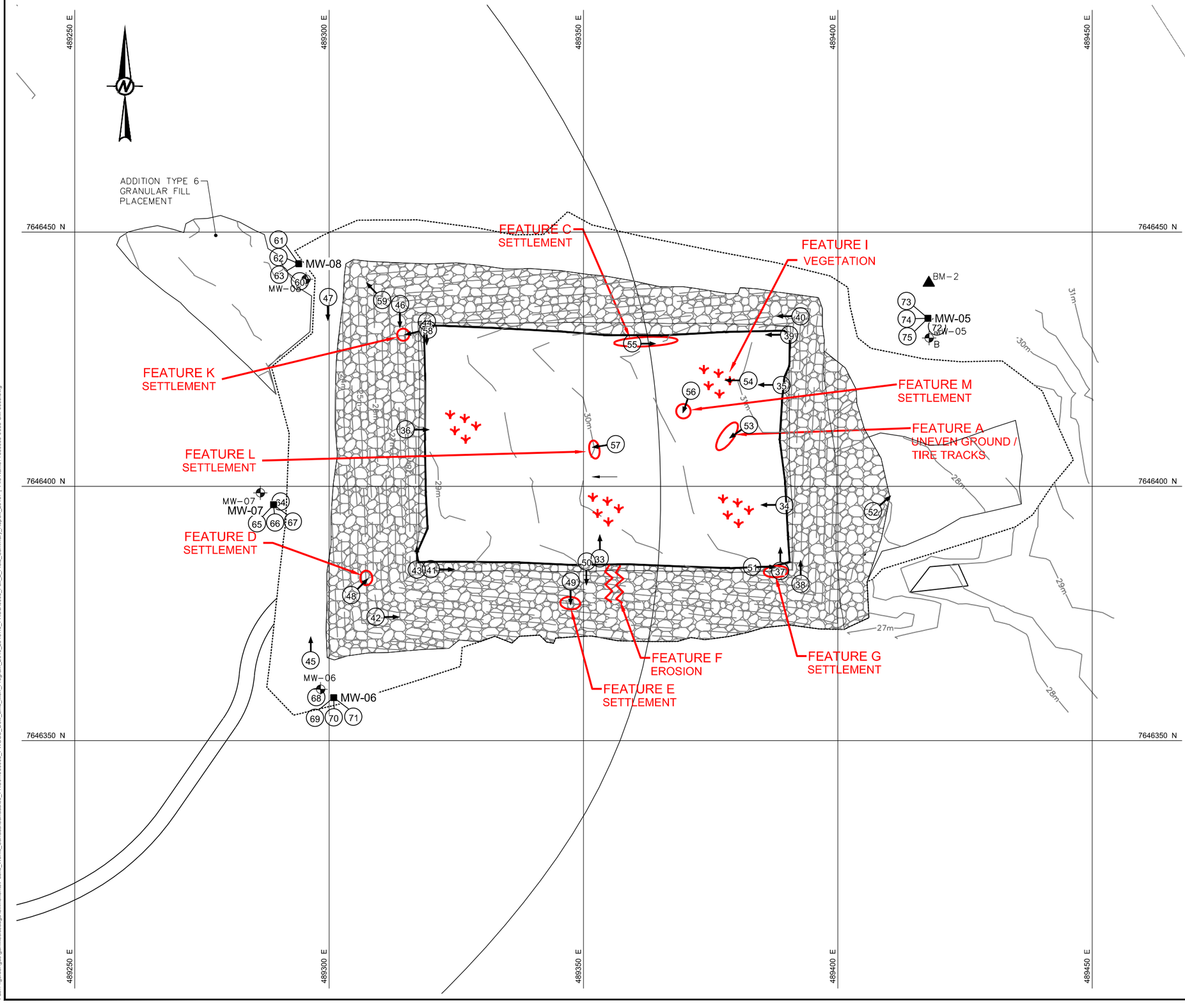
- The deep soil samples at MW-06 and MW-08 could not be collected due to refusal on rock.
- The groundwater samples at MW-05 and MW-08 could not be collected because the groundwater in the wells was frozen.

4.2.3 Visual Inspection

The Non-Hazardous Waste Landfill exhibited sparse vegetation on the landfill cover. Minor settlement and erosion were observed. No cracking or exposed waste was observed. Table 4-5 presents a summary of observed visual inspection features; Table 4-6 presents the Preliminary Stability Assessment results. This landfill was assessed to have an “Acceptable” overall performance, as all observed features were assessed to be “Acceptable”. Table 4-7 is a log of photographs taken during the 2016 visual inspection.

No wet areas were observed along the east and northwest toes (previous Features H and J) during the 2016 inspection. Previously observed tire tracks (Feature A) were unchanged since the previous inspection. The previously observed minor settlement area (Feature C) could be from construction rather than settlement. All minor settlement areas observed in 2015 (Features D, E, G, K, L and M) appeared to be unchanged in 2016. There is also an unchanged area with rough grading and some minor self-armouring erosion on the south slope (Feature F). Some sparse grass vegetation (Feature I) is becoming established in an expanded area on the cover surface.

Previously observed Feature B was not observed during the 2016 visual inspection.



LEGEND

- BM-2 — APPROXIMATE PERMANENT BENCHMARK LOCATION
- MONITORING WELL LOCATION
- B — BACKGROUND MONITORING WELL LOCATION
- SOIL SAMPLING LOCATION
- 42 — PHOTOGRAPH VIEWPOINT LOCATION
- EROSION (NTS)
- SETTLEMENT (NTS)
- VEGETATION (NTS)
- 27m — GROUND SURFACE CONTOUR

NOTES

GRID PROJECTION IS NAD83 ZONE 18N.
ELEVATIONS ARE GEODETIC.

REFERENCE

PREVIOUS INSPECTION FIGURE PROVIDED BY BIOGENIE, A DIVISION OF ENGLOBE CORPORATION, PROJECT NO.CD2655_400_403, DATED JUNE 2015.

0 12.5 25
1:750 METRES

CLIENT
DEPARTMENT OF NATIONAL DEFENCE CANADA

PROJECT
2016FOX-2 MONITORING REPORT

TITLE
NON-HAZARDOUS WASTE LANDFILL

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-03
DESIGNED	RM
PREPARED	TDR
REVIEWED	DCJ
APPROVED	DP

PROJECT NO.	PHASE	REV.	FIGURE
1530908	2000	A	FOX-2.3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25 mm

Path: \\golder.gds\gal\Mississauga\SIM\Clients\Public_Works_Canada\Canada\9g_PRO\A1530908_PWGSC_Dev_Line_Mon_Program_2015_2018\40_PROD\0008_Fox_2_Field_Summary_Report_2016\ | File Name:1530908-0008-CM-0008.dwg

Table 4-5: Visual Inspection Checklist - Non-Hazardous Waste Landfill

SITE NAME: FOX-2 Longstaff Bluff
LANDFILL DESIGNATION: Non-Hazardous Waste Landfill
DATE OF INSPECTION: August 20, 2016
DATE OF PREVIOUS INSPECTION: August 22, 2015
INSPECTED BY: Reza Moghaddam
REPORT PREPARED BY: Reza Moghaddam
MONITORING EVENT NUMBER: 5
The inspector/reporter represents to the best of his/her knowledge that the following statements and observations are true and correct and to the best of the preparer's actual knowledge, no material facts have been suppressed or misstated.

Table 4-5: Visual Inspection Checklist - Non-Hazardous Waste Landfill

Checklist Item	Present (Y/N)	Feature ID (A, B, etc.)	Location Description	Easting	Northing	Length (m)	Width (m)	Depth (m)	Extent of Landfill Area (%)	Description (Severity Rating)	Comparison to Historical Observations	Photos
Settlement	Y	C	North crest	489370.7	7646429.9	10.0	0.5	0.10	0.07%	2 areas of minor settlement, but could be from construction grading. The total length of these areas and the area between the two was estimated to be 10 m. (Acceptable)	Unchanged since previous inspection	55
		D	West slope	489304.3	7646378.6	3.0	3.0	0.20	0.12%	Minor settlement (Acceptable)	Unchanged since previous inspection	48
		E	South slope	489347.5	7646381.3	0.5	0.5	0.20	<0.01%	Minor settlement (Acceptable)	Unchanged since previous inspection	49
		G	Southeast corner	489383.1	7646384.2	5.0	1.0	0.20	0.07%	Rough area and settlement (Acceptable)	Unchanged since previous inspection	51
		K	Northwest crest edge	489319.4	7646430.8	1.0	0.5	0.10	<0.01%	Minor settlement (Acceptable)	Unchanged since previous inspection	58
		L	Central crest surface	489356.3	7646408.3	0.5	0.3	0.10	<0.01%	Minor settlement (Acceptable)	Unchanged since previous inspection	57
		M	Northeast crest surface	489371.1	7646418.8	0.5	0.5	0.15	<0.01%	Minor settlement (Acceptable)	Unchanged since previous inspection	56

Table 4-5: Visual Inspection Checklist - Non-Hazardous Waste Landfill

Checklist Item	Present (Y/N)	Feature ID (A, B, etc.)	Location Description	Easting	Northing	Length (m)	Width (m)	Depth (m)	Extent of Landfill Area (%)	Description (Severity Rating)	Comparison to Historical Observations	Photos
Erosion	Y	F	South slope	489350.6	7646385.2	8.0	4.0	0.10	0.43%	Rough area and self-armouring erosion (Acceptable)	Unchanged since previous inspection	50
Lateral Movement	N											
Frost Action	N											
Sloughing	N											
Cracking	N											
Animal Burrows	N											
Vegetation	Y	I	Cover surface	489382.4	7646420.8	50.0	25.0	-	16.6%	Sparse vegetation (Acceptable)	Expanded area by 10%	34, 35, 53, 54, 55, 56
Staining	N											
Vegetation Stress	N											
Seepage or Ponded Water	N	H	East toe	489406.9	7646395.1					Previously observed as wet area and ponded water	Not observed in 2016	52
		J	Northwest toe	489300.0	7646450.0					Previously observed as wet area	Not observed in 2016	59
Debris and/or Liner Exposed	N											

Table 4-5: Visual Inspection Checklist - Non-Hazardous Waste Landfill

Checklist Item	Present (Y/N)	Feature ID (A, B, etc.)	Location Description	Easting	Northing	Length (m)	Width (m)	Depth (m)	Extent of Landfill Area (%)	Description (Severity Rating)	Comparison to Historical Observations	Photos
Presence / Condition of Monitoring Instruments	Y	MW-05,06, 07,08								All monitoring wells intact		60, 64, 68, 72
Features of Note / Other Observations	Y	A	East crest surface	489382.5	7646412.1	10.0	0.3	0.10	0.04%	Tire tracks and uneven ground (Acceptable)	Unchanged since previous inspection	53

Landfill Area = 7,500 m^2.

Table 4-6: Preliminary Stability Assessment - Non-Hazardous Waste Landfill

Feature	Severity Rating	Extent
Settlement	Acceptable	Occasional
Erosion	Acceptable	Isolated
Lateral Movement	Not observed	-
Frost Action	Not observed	-
Sloughing	Not observed	-
Cracking	Not observed	-
Animal Burrows	Not observed	-
Vegetation Establishment	Acceptable	Occasional
Staining	Not observed	-
Vegetation Stress	Not observed	-
Seepage/Ponded Water	Not observed	-
Debris and/or Liner Exposure	Not observed	-
Other	Acceptable	Isolated
Overall Landfill Performance	**Acceptable**	

Table 4-7: Summary Table of Photographic Log - Non-Hazardous Waste Landfill Visual Inspection

Photo	Description	Easting	Northing	Date
33	FOX-2 – Non-Hazardous Waste Landfill – Cover surface, some sparse vegetation (Feature I), facing north (ATT79_Photo79.jpg)	489353.17	7646385.85	20-Aug-2016
34	FOX-2 – Non-Hazardous Waste Landfill – Cover surface, some sparse vegetation (Feature I), facing west (ATT82_Photo82.jpg)	489389.49	7646396.31	20-Aug-2016
35	FOX-2 – Non-Hazardous Waste Landfill – Cover surface, some sparse vegetation (Feature I), facing west (ATT83_Photo83.jpg)	489388.93	7646419.91	20-Aug-2016
36	FOX-2 – Non-Hazardous Waste Landfill – Cover surface, some sparse vegetation (Feature I), facing east (ATT89_Photo89.jpg)	489315.02	7646411.20	20-Aug-2016
37	FOX-2 – Non-Hazardous Waste Landfill – East crest, facing north (ATT80_Photo80.jpg)	489388.64	7646383.38	20-Aug-2016
38	FOX-2 – Non-Hazardous Waste Landfill – East slope, facing north (ATT81_Photo81.jpg)	489392.63	7646380.82	20-Aug-2016
39	FOX-2 – Non-Hazardous Waste Landfill – North crest, facing west (ATT84_Photo84.jpg)	489390.40	7646429.76	20-Aug-2016
40	FOX-2 – Non-Hazardous Waste Landfill – North slope and toe, facing west (ATT85_Photo85.jpg)	489392.62	7646433.41	20-Aug-2016
41	FOX-2 – Non-Hazardous Waste Landfill – South crest, facing east (ATT78_Photo78.jpg)	489319.97	7646383.71	20-Aug-2016
42	FOX-2 – Non-Hazardous Waste Landfill – South slope and toe, facing east (ATT76_Photo76.jpg)	489309.11	7646374.36	20-Aug-2016
43	FOX-2 – Non-Hazardous Waste Landfill – West crest, facing north (ATT77_Photo77.jpg)	489317.20	7646383.63	20-Aug-2016
44	FOX-2 – Non-Hazardous Waste Landfill – West crest, facing south (ATT86_Photo86.jpg)	489319.21	7646432.42	20-Aug-2016

Table 4-7: Summary Table of Photographic Log - Non-Hazardous Waste Landfill Visual Inspection

Photo	Description	Easting	Northing	Date
45	FOX-2 – Non-Hazardous Waste Landfill – West slope and toe, facing north (ATT75_Photo75.jpg)	489296.34	7646365.79	20-Aug-2016
46	FOX-2 – Non-Hazardous Waste Landfill – West slope and toe, facing south (ATT87_Photo87.jpg)	489313.94	7646435.85	20-Aug-2016
47	FOX-2 – Non-Hazardous Waste Landfill – West toe, facing south (ATT88_Photo88.jpg)	489299.79	7646437.21	20-Aug-2016
48	FOX-2 – Non-Hazardous Waste Landfill – West slope – Feature D – Minor settlement (Acceptable), facing northeast (ATT23_Photo23.jpg)	489304.30	7646378.60	20-Aug-2016
49	FOX-2 – Non-Hazardous Waste Landfill – South slope – Feature E – Minor settlement (Acceptable), facing south (ATT24_Photo24.jpg)	489347.50	7646381.30	20-Aug-2016
50	FOX-2 – Non-Hazardous Waste Landfill – South slope – Feature F – Rough area and self-armouring erosion (Acceptable), facing south (ATT25_Photo25.jpg)	489350.60	7646385.20	20-Aug-2016
51	FOX-2 – Non-Hazardous Waste Landfill – Southeast corner – Feature G – Rough area and settlement (Acceptable), facing east (ATT26_Photo26.jpg)	489383.10	7646384.20	20-Aug-2016
52	FOX-2 – Non-Hazardous Waste Landfill – East toe – previously reported as wet area and ponded water (Feature H), no ponded water, facing northeast (ATT27_Photo27.jpg)	489406.90	7646395.10	20-Aug-2016
53	FOX-2 – Non-Hazardous Waste Landfill – Cover surface – Feature A – Tire tracks and uneven ground (Acceptable), facing southwest (ATT28_Photo28.jpg)	489382.50	7646412.10	20-Aug-2016
54	FOX-2 – Non-Hazardous Waste Landfill – Cover surface – Feature I – Sparse vegetation (Acceptable), facing west (ATT29_Photo29.jpg)	489382.40	7646420.80	20-Aug-2016
55	FOX-2 – Non-Hazardous Waste Landfill – North crest – Feature C – 2 areas of minor settlement (Acceptable), facing east (ATT30_Photo30.jpg)	489370.70	7646429.90	20-Aug-2016
56	FOX-2 – Non-Hazardous Waste Landfill – Cover surface – Feature M – Minor settlement (Acceptable), facing south (ATT31_Photo31.jpg)	489371.10	7646418.80	20-Aug-2016
57	FOX-2 – Non-Hazardous Waste Landfill – Central crest surface – Feature L – Minor settlement (Acceptable), facing west (ATT32_Photo32.jpg)	489356.30	7646408.30	20-Aug-2016
58	FOX-2 – Non-Hazardous Waste Landfill – Northwest crest edge – Feature K – Minor settlement (Acceptable), facing west (ATT33_Photo33.jpg)	489319.40	7646430.80	20-Aug-2016
59	FOX-2 – Non-Hazardous Waste Landfill – Northwest toe – Previously reported as wet area (previous Feature J) not observed, facing northwest (ATT34_Photo34.jpg)	489300.00	7646450.00	20-Aug-2016

4.2.4 Soil Sampling

Table 4-9 presents a summary of analytical results for soil samples collected at the Non-Hazardous Waste Landfill. MW-05 represents an upgradient sampling location, whereas MW-06, MW-07 and MW-08 represent downgradient sampling locations. The deep soil samples at MW-06 and MW-08 could not be collected due to refusal on rock.

Table 4-9 lists the arithmetic mean background and baseline values for the site, in addition to the baseline plus 3σ limit. At the Non-Hazardous Waste Landfill, the baseline arithmetic means for copper and arsenic are lower than the background arithmetic means.

MW-05

Sampling location MW-05 is located upgradient of the landfill, approximately 10 m east of the toe. The estimated elevation of this sampling point is 29.5 masl. As shown in Photos 73 and 74, the area consists of sand and gravel with some rocks and established vegetation. The soils consisted of brown sand with some gravel.

For the shallow sample at MW-05 (0-15 cm), the concentrations of most metals were less than the concentrations reported in previous years. No cadmium, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

For the deep sample at MW-05 (30-40 cm), the metals concentrations observed in 2016 were similar to those observed in the shallow sample. The concentrations of most metals were less than the concentrations reported in previous years. No cadmium, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

MW-06

Sampling location MW-06 is located downgradient of the landfill, approximately 5 m south of the toe. The estimated elevation of this sampling point is 22 masl. As shown in Photos 69 and 70, the area is covered with gravel and stones and is sparsely vegetated. The soil in the area of the sample location consisted of brown sand, gravel and stone.

For the shallow sample at MW-06 (0-15 cm), the concentration of copper was greater than that reported in previous years, but similar to that reported in 2014. The concentrations of most other metals were lower than the concentrations reported in previous years. No cadmium, mercury, PHC or PCB were detected at this location in 2016; modified TPH concentrations between 78 mg/kg and 200 mg/kg were noted in previous years. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

MW-07

Sampling location MW-07 is located downgradient of the landfill, approximately 4 m west of the toe. The estimated elevation of this sampling point is 23 masl. As shown in Photos 65 and 66, the area consists of sand and gravel with some rocks and established vegetation. The soils consisted of grey-brown sand with gravel and stone.

For the shallow sample at MW-07 (0-15 cm), the concentrations of most metals were less than the concentrations reported in previous years. No cadmium, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

For the deep sample at MW-07 (40-50 cm, duplicate location), the metals concentrations observed in 2016 were similar to those observed in the shallow sample. The concentrations of most metals were less than the concentrations reported in previous years. No cadmium, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

MW-08

Sampling location MW-08 is located downgradient of the landfill, immediately west of the toe. The estimated elevation of this sampling point is 24 masl. As shown in Photos 61 and 62, the area is sparsely vegetated and consists of sand and gravel with some rocks. The soil in the area of the sample location consisted of grey-brown sand, gravel and stone.

The shallow sample at MW-08 (0-15 cm) exhibited elevated concentrations of metals compared to the other sampling locations at this landfill, however the concentrations of all metals were less than those reported in previous years. The concentration of nickel (96 mg/kg) slightly exceeded the baseline mean concentration plus 3σ (92 mg/kg), but is lower than previously observed; no other reported values exceeded their respective baseline mean concentrations plus 3σ. No cadmium, mercury, PHC or PCB were detected at this location in 2016.

Table 4-8: Soil Chemical Analysis Results - Non-Hazardous Waste Landfill

ID	Depth (cm)	Cu (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Cr (mg/kg)	As (mg/kg)	Hg (mg/kg)	Total PCB (mg/kg)	F1 (mg/kg)	F2 (mg/kg)	F3 (mg/kg)	F4 (mg/kg)
Background Mean		54.9	45.6	17.2	1.0	10.0	84.2	59.4	23.4	NA	NA	NA	NA	NA	NA
Baseline Mean		**48.2**	**51.7**	**18.9**	**1.0**	**10.0**	**85.2**	**69.1**	**23.1**	**0.10**	**0.10**	**NA**	**NA**	**NA**	**NA**
Baseline + 3σ		107.1	91.6	39.2	1.0	21.3	130	98.3	48.0	0.10	0.16	NA	NA	NA	NA
Upgradient															
MW-05b	0-15	24	40	14	<0.5	7	**103**	**86**	19	<0.1	<0.05	<7	<4	<8	<6
MW-05a	30-40	26	42	14	<0.5	4	81	**88**	12	<0.1	<0.05	<7	<4	<8	<6
Downgradient															
MW-06a	0-15	**60**	51	16	<0.5	8	78	**68**	16	<0.1	<0.05	<7	<4	<8	<6
MW-06 (deep) [1]															
MW-07b	0-15	20	39	13	<0.5	8	**86**	**80**	19	<0.1	<0.05	<7	<4	<8	<6
MW-07a	40-50	31	38	13	<0.5	4	82	**71**	**29**	<0.1	<0.05	<7	<4	<8	<6
MW-07a dup	40-50	26	36	12.2	<0.5	4	**86**	**72**	**28**	<0.10	<0.05	<5	<10	<50	<50
MW-07a (Dup Avg)	40-50	29	37	13	<0.5	4	84	**72**	**29**	<0.1	<0.05	<6	<7	<29	<28
MW-08a	0-15	**56**	**96**	**30**	<0.5	10	**117**	65	**24**	<0.1	<0.05	<7	<4	<8	<6
MW-08 (deep) [1]															

Notes:
NA: Not available; ID: Soil sample location ID
Underlined values: Results exceed Background arithmetic mean.
Bold Values: Results exceed Baseline arithmetic mean.
Shaded Values: Results exceed the Baseline arithmetic mean plus 3σ.
1: The deep soil samples at MW-06 and MW-08 could not be collected due to refusal on rock.

4.2.5 Groundwater Sampling

Groundwater sampling and monitoring well inspection field records are included in Appendix B. Table 4-9 presents a summary of groundwater levels and analytical results for groundwater samples collected at the Non-Hazardous Waste Landfill. The groundwater samples at MW-05 and MW-08 could not be collected because the groundwater in the wells was frozen.

MW-06

The depth to groundwater measured at MW-06 in 2016 was 2.25 m below grade. The concentrations of most metals were greater than those reported in 2015 but less than those reported in 2012. No cadmium, lead, chromium, arsenic, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

MW-07

The depth to groundwater measured at MW-07 in 2016 was 2.92 m below grade. The concentrations of most metals were greater than those reported in 2015 but less than those reported in 2012. No lead, chromium, arsenic, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentration plus 3σ.

Table 4-9: Monitoring Well Groundwater Levels and Groundwater Chemical Analysis Results – Non-Hazardous Waste Landfill

ID	GW Depth BGS (m)	Cu (mg/L)	Ni (mg/L)	Co (mg/L)	Cd (mg/L)	Pb (mg/L)	Zn (mg/L)	Cr (mg/L)	As (mg/L)	Hg (mg/L)	Total PCBs (mg/L)	F1 (mg/L)	F2 (mg/L)	F3 (mg/L)	F4 (mg/L)
Baseline Mean		**0.033**	**0.340**	**0.037**	**0.001**	**0.001**	**0.050**	**0.096**	**0.007**	**0.0004**	**0.003**	**NA**	**NA**	**NA**	**NA**
Baseline + 3σ		0.063	1.05	0.12	0.001	0.019	0.16	0.24	0.023	0.0004	0.006	NA	NA	NA	NA
Upgradient															
MW-05 [1]															
Downgradient															
MW-06	2.25	0.0064	0.053	0.0045	<0.0001	<0.0001	0.008	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	<0.100
MW-07	2.92	0.0097	0.201	0.0308	0.0003	<0.0001	**0.059**	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	<0.100
MW-08 [1]															

Notes:
ID: Monitoring well location ID.
GW: Groundwater.
BGS: Below ground surface.
NA: Not available
Bold Values: Results exceed Baseline arithmetic mean.
1: The groundwater samples at MW-05 and MW-08 could not be collected because the groundwater in the wells was frozen.

4.2.6 Conclusions and Overall Performance of the Non-Hazardous Waste Landfill

Based on the visual inspection, there is no significant erosion, settlement, cracking, exposed waste or indications of instability at the Non-Hazardous Waste Landfill. There was some minor settlement and self-armouring erosion on the cover and slope of the landfill that is not considered a concern. Overall, the Non-Hazardous Waste Landfill appears to be performing well and did not have any features of concern. The Preliminary Stability Assessment conducted based on the visual inspection suggests that the the Non-Hazardous Waste Landfill has an “Acceptable” overall performance.

Two soil samples were collected at two of the four designated locations in 2016; deep samples could not be collected at MW-06 and MW-08 as a result of refusal (on boulders). The concentrations of most metals parameters in soil were highest overall at the shallow sample location MW-08, located downgradient of the northwest corner of the landfill, however the concentrations observed at this location in 2016 were less than those observed in previous years. The concentration of nickel slightly exceeded the baseline mean concentration plus 3σ, but was lower than previously observed concentrations. At MW-05, MW-06 and MW-07, the concentrations of most metals were similar to or less than those observed in previous years. No detectable concentrations of cadmium, mercury, PHC or PCB were noted in any of the soil samples in 2016.

In 2016, groundwater samples were collected from two of four monitoring wells adjacent to the landfill due to the groundwater being frozen at MW-05 and MW-08. At MW-06 and MW-07, the concentrations of most metals were greater than those reported in 2015 but less than those reported in 2012. No detectable concentrations of lead, chromium, arsenic, mercury, PHC or PCB were noted in any of the groundwater samples in 2016.

Comparison of groundwater elevations based on estimated grade elevation and the measured water depth in the wells indicates that the groundwater was lowest towards the southwest at MW-06, which follows the topography in the area.

Whereas elevated concentrations in soil are noted at MW-08 (including the exceedance of the baseline mean nickel concentration plus 3σ in the shallow sample), there does not appear to be an evident increasing impact to groundwater quality from the landfill at the monitoring wells adjacent to the landfill.

4.2.7 Recommendations for Non-Hazardous Waste Landfill

No modifications to the ongoing monitoring program at this landfill are recommended.

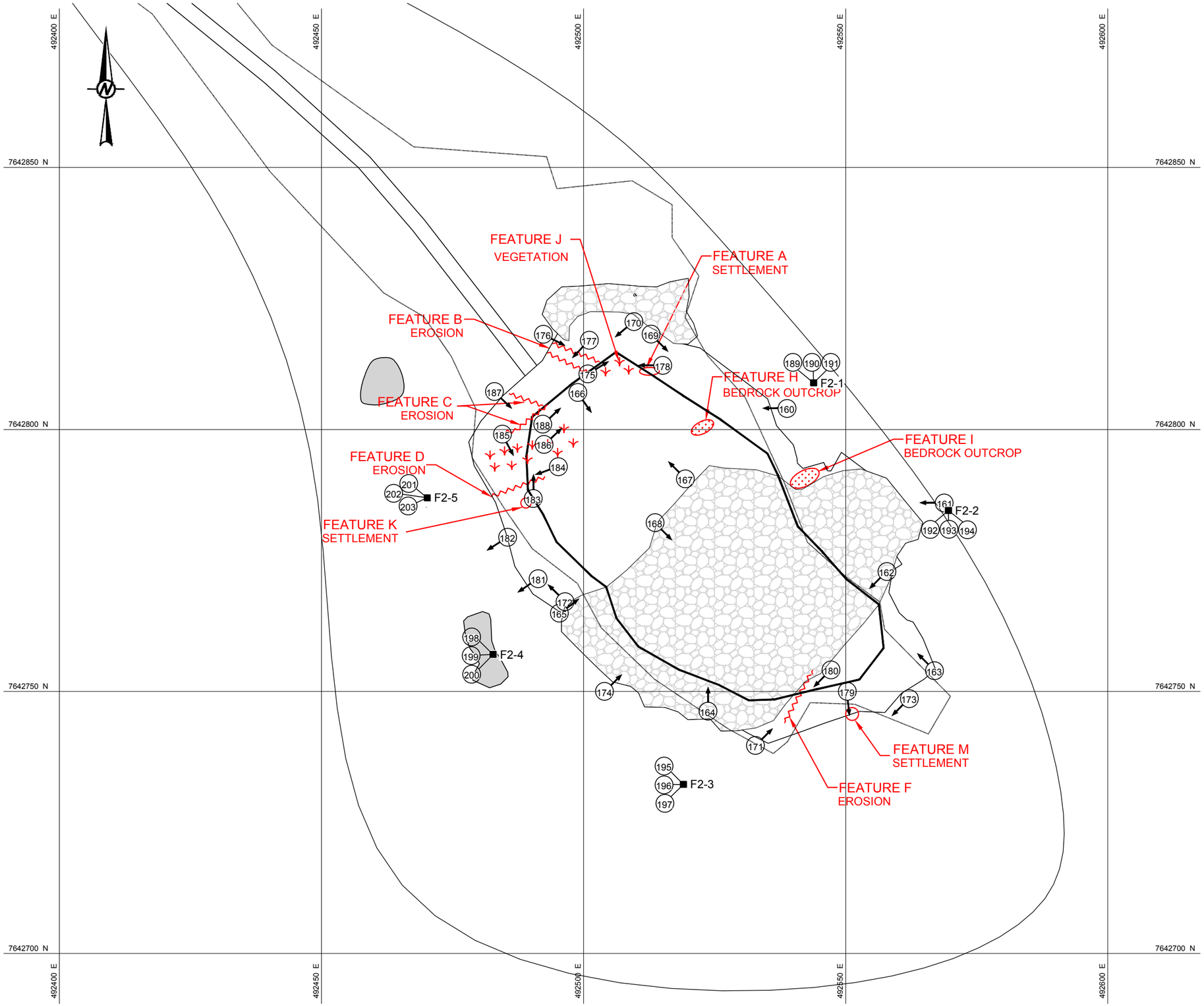
4.3 West Landfill Lobe E

4.3.1 Landfill Description

The West Landfill is located in the west beach area, approximately 4,600 m south of the airstrip and approximately 200 m from the ocean. Local elevations range from approximately 19 masl west of the landfill to approximately 23 masl to the east. A road extends south from the main station access road into the landfill area. Photos 169 and 172 illustrate the local conditions in the area of the landfill.

Lobe E has an area of 1,780 m^2 (approximately 4,700 m^2 after regrading including sideslopes), with an estimated depth of 1.5 m. Remediation of this landfill included removal of surface debris and regrading.

The long term monitoring plan consists of visual inspection, and the periodic collection of soil samples. Approximate locations for the collection of soil samples are identified in Figure FOX-2.4. There are no groundwater monitoring wells at this landfill. Soil samples are collected at five stations surrounding the landfill, F2-1 through F2-5.



LEGEND

- SOIL SAMPLING LOCATION
- BEDROCK OUTCROP (NTS)
- SETTLEMENT (NTS)
- EROSION (NTS)
- VEGETATION (NTS)
- PHOTOGRAPH VIEWPOINT LOCATION (160)
- BODY OF WATER

NOTES

GRID PROJECTION IS NAD83 ZONE 18N.
ELEVATIONS ARE GEODETIC.

REFERENCE

PREVIOUS INSPECTION FIGURE PROVIDED BY BIOGENIE, A DIVISION OF ENGLOBE CORPORATION, PROJECT NO.CD2655_400_403, DATED JUNE 2015.

0 12.5 25
1:750 METRES

CLIENT
DEPARTMENT OF NATIONAL DEFENCE CANADA

PROJECT
2016 FOX-2 MONITORING REPORT

TITLE
WEST LANDFILL LOBE E

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-03
DESIGNED	RM
PREPARED	TDR
REVIEWED	DCJ
APPROVED	DP

PROJECT NO.	PHASE	REV.	FIGURE
1530908	2000	A	FOX-2.4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25 mm

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4.3.2 Summary of Scope Deviations

The field work was conducted as per the TOR with the following exceptions:

- The deep soil samples at F2-1, F2-2, F2-4 and F2-5 could not be collected due to refusal on rock.

4.3.3 Visual Inspection

The West Landfill Lobe E has sparse vegetation on the north end. Minor settlement and self-armouring erosion are observed. No cracking or exposed waste was observed. Table 4-10 presents a summary of observed visual inspection features and Table 4-11 presents the Preliminary Stability Assessment results. This landfill was assessed to have an “Acceptable” overall performance as all observed features were assessed as “Acceptable”. Table 4-12 is a log of photographs taken during the 2016 visual inspection.

There are some minor settlement areas on the cover surface (previous Feature A, Features K and M first observed in 2015). There is also some previously observed minor self-armouring erosion on the northwest crest and slope (previous Features B and C). The southwest slope continues to exhibit previously observed minor self-armouring erosion (previous Feature D). This minor self-armouring erosion was observed to be slightly longer and wider than it was reported previously. The previously observed erosion does not appear to have deteriorated since the last inspection and no exposed waste materials were observed. A previously observed erosion channel on the southwest slope (Feature E) was not identified during the 2015 and 2016 inspections. A previously observed minor erosion channel on the southeast slope (Feature F) was identified during the 2016 inspection, however, no seepage or running water was observed along the toe. Previously observed minor seepage and ponded water along the southwest toe (Feature L) was not identified in 2016. Some sparse grass vegetation is becoming established on the cover surface (previous Feature J), which covers the same area as observed in 2015. Previously observed bedrock outcrops (Features H and I) and non-compacted cover (Feature G) are not considered significant features for visual inspection.

Table 4-10: Visual Inspection Checklist – West Landfill Lobe E

SITE NAME: FOX-2 Longstaff Bluff
LANDFILL DESIGNATION: West Landfill Lobe E
DATE OF INSPECTION: August 19, 2016
DATE OF PREVIOUS INSPECTION: August 21, 2015
INSPECTED BY: Reza Moghaddam
REPORT PREPARED BY: Reza Moghaddam
MONITORING EVENT NUMBER: 5
The inspector/reporter represents to the best of his/her knowledge that the following statements and observations are true and correct and to the best of the preparer's actual knowledge, no material facts have been suppressed or misstated.

Table 4-10: Visual Inspection Checklist – West Landfill Lobe E

Checklist Item	Present (Y/N)	Feature ID (A, B, etc.)	Location Description	Easting	Northing	Length (m)	Width (m)	Depth (m)	Extent of Landfill Area (%)	Description (Severity Rating)	Comparison to Historical Observations	Photos
Settlement	Y	A	Northeast crest	492515.1	7642812.2	0.6	0.2	<0.1	<0.01%	Minor settlement (Acceptable)	Unchanged since previous inspection	178
		K	Southwest slope	492490.4	7642786.8	1.0	0.3	<0.1	<0.01%	Minor settlement (Acceptable)	Unchanged since previous inspection	183
		M	Southeast slope near toe	492550.3	7642750.0	2.0	1.0	<0.1	0.04%	Linear depression (Acceptable)	Unchanged since previous inspection	179
Erosion	Y	B	Northwest slope	492501.1	7642817.0	10	1.0	0.02	0.2%	Minor self-armouring erosion (Acceptable)	Unchanged since previous inspection	176
				492499.9	7642816.3	10	1.0	0.02	0.2%		Unchanged since previous inspection	177
		C	Northwest crest	492492.2	7642801.0	20	1.0	0.02	0.4%	Minor self-armouring erosion (Acceptable)	Unchanged since previous inspection	187, 188
				492493.3	7642806.3							
		D	Southwest slope	492488.6	7642788.1	10	0.5	0.02	0.2%	Minor self-armouring erosion (Acceptable)	Slightly expanded area	184
		F	Southeast slope	492547.2	7642754.1	15.0	1.0	0.1	0.32%	Minor erosion channel on slope with no running water (Acceptable)	The erosion channel remained unchanged since previous inspection; no running water was observed in 2016	180, 171

Table 4-10: Visual Inspection Checklist – West Landfill Lobe E

Checklist Item	Present (Y/N)	Feature ID (A, B, etc.)	Location Description	Easting	Northing	Length (m)	Width (m)	Depth (m)	Extent of Landfill Area (%)	Description (Severity Rating)	Comparison to Historical Observations	Photos
Lateral Movement	N											
Frost Action	N											
Sloughing	N											
Cracking	N											
Animal Burrows	N											
Vegetation	Y	J	Cover surface	492500.8	7642810.6	10.0	10.0	-	2.13%	Sparse vegetation (Acceptable)	Same area as previous inspection	175, 185, 186
			Northwest slope	492484.5	7642799.1							
Staining	N											
Vegetation Stress	N											
Seepage or Ponded Water	N	L	Southwest slope and toe	492485.5	7642779.4					Previously observed minor seepage at toe of slope	Not observed in 2016	182
			Southwest toe	492491.3	7642771.5					Previously observed ponded water	Not observed in 2016	181
Debris and/or Liner Exposed	N											
Presence / Condition of Monitoring Instruments	N											

Table 4-10: Visual Inspection Checklist – West Landfill Lobe E

Checklist Item	Present (Y/N)	Feature ID (A, B, etc.)	Location Description	Easting	Northing	Length (m)	Width (m)	Depth (m)	Extent of Landfill Area (%)	Description (Severity Rating)	Comparison to Historical Observations	Photos
Features of Note / Other Observations	Y	H	East edge							Bedrock outcrop	Unchanged since previous inspection	160
		I	East edge							Bedrock outcrop	Unchanged since previous inspection	161

Landfill Area = 4,700 m^2.

Table 4-11: Preliminary Stability Assessment - West Landfill Lobe E

Feature	Severity Rating	Extent
Settlement	Acceptable	Occasional
Erosion	Acceptable	Occasional
Lateral Movement	Not observed	-
Frost Action	Not observed	-
Sloughing	Not observed	-
Cracking	Not observed	-
Animal Burrows	Not observed	-
Vegetation Establishment	Acceptable	Occasional
Staining	Not observed	-
Vegetation Stress	Not observed	-
Seepage/Ponded Water	Not observed	-
Debris and/or Liner Exposure	Not observed	-
Other	Not observed	-
Overall Landfill Performance	**Acceptable**	

Table 4-12: Summary Table of Photographic Log – West Landfill Lobe E Visual Inspection

Photo	Description	Easting	Northing	Date
160	FOX-2 – West Landfill Lobe E – Cover surface – Feature H – bedrock outcrop, facing west (ATT41_Photo41.jpg)	492538.80	7642804.00	19-Aug-2016
161	FOX-2 – West Landfill Lobe E – Cover surface, Feature I – bedrock outcrop, facing west (ATT42_Photo42.jpg)	492568.79	7642785.97	19-Aug-2016
162	FOX-2 – West Landfill Lobe E – Cover surface, facing southwest (ATT43_Photo43.jpg)	492557.85	7642772.87	19-Aug-2016
163	FOX-2 – West Landfill Lobe E – Cover surface, facing northwest (ATT44_Photo44.jpg)	492566.94	7642753.96	19-Aug-2016
164	FOX-2 – West Landfill Lobe E – Cover surface, facing north (ATT47_Photo47.jpg)	492523.71	7642746.23	19-Aug-2016
165	FOX-2 – West Landfill Lobe E – Cover surface, facing northeast (ATT49_Photo49.jpg)	492495.38	7642764.93	19-Aug-2016
166	FOX-2 – West Landfill Lobe E – Cover surface, facing southeast (ATT51_Photo51.jpg)	492498.88	7642807.03	19-Aug-2016
167	FOX-2 – West Landfill Lobe E – Cover surface, facing northwest (ATT52_Photo52.jpg)	492519.42	7642790.56	19-Aug-2016
168	FOX-2 – West Landfill Lobe E – Cover surface, facing southeast (ATT53_Photo53.jpg)	492513.62	7642782.20	19-Aug-2016
169	FOX-2 – West Landfill Lobe E – Northeast crest and toe, facing southeast (ATT40_Photo40.jpg)	492512.88	7642818.18	19-Aug-2016
170	FOX-2 – West Landfill Lobe E – Northwest crest, facing southwest (ATT39_Photo39.jpg)	492509.61	7642820.55	19-Aug-2016
171	FOX-2 – West Landfill Lobe E – Southeast slope, Feature F – minor erosion channel with no seepage, facing northeast (ATT46_Photo46.jpg)	492532.76	7642739.69	19-Aug-2016
172	FOX-2 – West Landfill Lobe E – Southwest slope and toe, facing northwest (ATT50_Photo50.jpg)	492496.45	7642767.12	19-Aug-2016

Table 4-12: Summary Table of Photographic Log – West Landfill Lobe E Visual Inspection

Photo	Description	Easting	Northing	Date
173	FOX-2 – West Landfill Lobe E – Southeast slope, facing southwest (ATT45_Photo45.jpg)	492562.14	7642748.62	19-Aug-2016
174	FOX-2 – West Landfill Lobe E – Southwest slope and toe, facing northeast (ATT48_Photo48.jpg)	492503.98	7642750.00	19-Aug-2016
175	FOX-2 – West Landfill Lobe E – Cover surface – Feature J – very sparse vegetation (Acceptable), facing northeast (ATT11_Photo11.jpg)	492500.80	7642810.60	19-Aug-2016
176	FOX-2 – West Landfill Lobe E – Northwest slope – Feature B – minor self-armouring erosion (Acceptable), facing southeast (ATT12_Photo12.jpg)	492499.90	7642816.30	19-Aug-2016
177	FOX-2 – West Landfill Lobe E – Northwest slope – Feature B – minor self-armouring erosion (Acceptable), facing southwest (ATT13_Photo13.jpg)	492501.10	7642817.00	19-Aug-2016
178	FOX-2 – West Landfill Lobe E – Cover surface – Feature A – minor settlement (Acceptable) and Feature J – very sparse vegetation, facing west (ATT14_Photo14.jpg)	492515.10	7642812.20	19-Aug-2016
179	FOX-2 – West Landfill Lobe E – Southeast slope near toe – Feature M – linear depression (Acceptable), facing south (ATT15_Photo15.jpg)	492550.30	7642750.00	19-Aug-2016
180	FOX-2 – West Landfill Lobe E – South slope – Feature F – minor erosion channel on slope with no seepage or running water (Acceptable), facing southwest (ATT16_Photo16.jpg)	492547.20	7642754.10	19-Aug-2016
181	FOX-2 – West Landfill Lobe E – Southwest slope and toe – no ponded water observed (previous Feature L), facing southwest (ATT17_Photo17.jpg)	492491.30	7642771.50	19-Aug-2016
182	FOX-2 – West Landfill Lobe E – Southwest slope and toe – no seepage observed at toe (previous Feature L), facing southwest (ATT18_Photo18.jpg)	492485.50	7642779.40	19-Aug-2016
183	FOX-2 – West Landfill Lobe E – Southwest slope – Feature K – minor settlement (Acceptable), facing southwest (ATT19_Photo19.jpg)	492490.40	7642786.80	19-Aug-2016
184	FOX-2 – West Landfill Lobe E – Southwest slope – Feature D – minor self-armouring erosion (Acceptable), facing southwest (ATT20_Photo20.jpg)	492495.17	7642792.88	19-Aug-2016
185	FOX-2 – West Landfill Lobe E – Southwest slope – Feature J – sparse vegetation (Acceptable), facing southeast (ATT21_Photo21.jpg)	492484.50	7642799.10	19-Aug-2016
186	FOX-2 – West Landfill Lobe E – Feature J – sparse vegetation on surface cover (ATT22_Photo22.jpg)	491794.40	7643411.06	19-Aug-2016
187	FOX-2 – West Landfill Lobe E – Northwest crest – Feature C – minor self-armouring erosion (Acceptable), facing southeast (ATT10_Photo10.jpg)	492493.30	7642806.30	19-Aug-2016
188	FOX-2 – West Landfill Lobe E – Northwest crest – Feature C – minor self-armouring erosion (Acceptable), facing northeast (ATT9_Photo9.jpg)	492492.20	7642801.00	19-Aug-2016

4.3.4 Soil Sampling

Table 4-13 presents a summary of analytical results for soil samples collected at the West Landfill Lobe E. F2-1 and F2-2 represent upgradient sampling locations, whereas F2-3, F2-4 and F2-5 represent downgradient sampling locations. The deep soil samples at F2-1, F2-2, F2-4 and F2-5 could not be collected due to refusal on rock.

Table 4-13 lists the arithmetic mean background and baseline values for the site, in addition to the baseline plus 3σ limit. At the West Landfill Lobe E, the baseline arithmetic mean for chromium is slightly lower than the background arithmetic mean.

F2-1

Sampling location F2-1 is located upgradient of the landfill, approximately 15 m northeast of the toe. The estimated elevation of this sampling point is 23.5 masl. As shown in Photos 189 and 190, the area is sparsely vegetated and consists of boulders and rocks, infilled with stony sand and gravel. The soil in the area of the sample location consisted of brown sand, gravel and stone.

For the shallow sample at F2-1 (0-15 cm), the concentrations of most metals were reported at similar concentrations as in previous years; the reported concentration of copper was an historical high for this location. The concentration of arsenic (14 mg/kg) was lower than the concentration reported in 2015 (56.2 mg/kg) but similar to those reported in 2014 (12 mg/kg) and 2012 (7.0 mg/kg); it is concluded that the concentration reported in 2015 is likely anomalous. No cadmium, mercury, PHC or PCB were at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

F2-2

Sampling location F2-2 is located upgradient of the landfill, approximately 8 m northeast of the toe. The estimated elevation of this sampling point is 23.5 masl. As shown in Photos 192 and 193, the area is sparsely vegetated and consists of rocks, infilled with stony sand and gravel. The soil in the area of the sample location consisted of brown sand, gravel and stone.

For the shallow sample at F2-2 (0-15 cm, duplicate location), the concentrations of most metals were lower than those reported in 2012 (this location was not sampled in 2014 or 2015). It is noted that the calculated RPD values indicated the original and duplicate sample results differ by more than 30% for Cu, Ni and Co with lower concentrations reported in the duplicate sample. These results should therefore be interpreted with caution and are further discussed in Section 5. PHC were detected at this location for the first time in 2016 and the average concentration of modified TPH (83 mg/kg) marginally exceeded the baseline mean concentration plus 3σ (81 mg/kg); no other reported values exceeded their respective baseline mean concentrations plus 3σ. It is noted that no PHC were detected in the duplicate sample and this result should be therefore be interpreted with caution. The concentration of the PHC F4 fraction in 2016 was 64 mg/kg. No cadmium, mercury or PCB were detected at this location in 2016.

F2-3

Sampling location F2-3 is located downgradient of the landfill, approximately 12 m southwest of the toe. The estimated elevation of this sampling point is 18 masl. As shown in Photos 195 and 196, the area consists of sand and gravel with some rocks and established vegetation. The soil in the area of the sample location consisted of brown sand, gravel and stone.

For the shallow sample at F2-3 (0-15 cm), the concentration of copper was less than those observed in previous years, whereas the concentrations of all other metals were within the range of concentrations observed in previous years. No cadmium, mercury, PHC or PCB were detected at this location in 2016. It is noted that a modified TPH concentration of 370 mg/kg was reported for this location in 2014. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

For the deep sample at F2-3 (30-40 cm), most metal concentrations were less than those observed in the shallow sample. The concentrations of most metals were less than those observed in previous years. No cadmium, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

F2-4

Sampling location F2-4 is located downgradient of the landfill, approximately 10 m southwest of the toe. The estimated elevation of this sampling point is 17.5 masl. As shown in Photos 198 and 199, the area consists of sand and gravel with some rocks and established vegetation. The soil in the area of the sample location consisted of brown sand with some gravel and stone.

For the shallow sample at F2-4 (0-15 cm), the concentrations of all metals were less than or similar to those reported in previous years. No cadmium, mercury, PHC or PCB were detected at this location in 2016. It is noted that a modified TPH concentration of 160 mg/kg was reported for this location in 2014. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

F2-5

Sampling location F2-5 is located downgradient of the landfill, approximately 10 m west of the toe. The estimated elevation of this sampling point is 18 masl. As shown in Photos 201 and 202, the area consists of sand and gravel with some rocks and established vegetation. The soils consisted of brown sand with some organics and gravel.

For the shallow sample at F2-5 (0-15 cm), the concentrations of all metals were less than or similar to the concentrations reported in previous years. The modified TPH concentration (79 mg/kg) was similar to the concentration reported in 2015 (71 mg/kg) but less than the concentrations reported in 2014 and 2012 (110 mg/kg and 348 mg/kg, respectively). The concentration of the PHC F4 fraction in 2016 was 42 mg/kg. No cadmium, mercury or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

Table 4-13: Soil Chemical Analysis Results - West Landfill Lobe E

ID	Depth (cm)	Cu (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Cr (mg/kg)	As (mg/kg)	Hg (mg/kg)	Total PCB (mg/kg)	F1 (mg/kg)	F2 (mg/kg)	F3 (mg/kg)	F4 (mg/kg)
Background Mean		54.9	45.6	17.2	1.0	10.0	84.2	59.4	23.4	NA	NA	NA	NA	NA	NA
Baseline Mean		**118.1**	**93.1**	**34.5**	**1.0**	**10.0**	**165.4**	**57.2**	**29.8**	**0.10**	**0.10**	**NA**	**NA**	**NA**	**NA**
Baseline + 3σ		476.8	282.4	105.5	1.0	29.6	479.4	101.3	86.4	0.10	0.16	NA	NA	NA	NA
Upgradient															
F2-1a	0-15	75	63	22	<0.5	10	97	**65**	14	<0.1	<0.05	<7	<4	<8	<6
F2-1 (deep) [1]															
F2-2a	0-15	99	40	17	<0.5	**12**	93	**84**	5	<0.1	<0.05	<7	<4	101	78
F2-2a dup	0-15	68	21	8.5	<0.5	10	90	**75**	4	<0.10	<0.05	<5	<10	<50	<50
F2-2a (Dup Avg)	0-15	84	31	13	<0.5	**11**	92	**80**	5	<0.1	<0.05	<6	<7	76	64
F2-2 (deep) [1]															
Downgradient															
F2-3b	0-15	54	65	18	<0.5	10	124	**70**	27	<0.1	<0.05	<7	<4	<8	<6
F2-3a	30-40	57	56	16	<0.5	9	90	52	27	<0.1	<0.05	<7	<4	<8	<6
F2-4a	0-15	80	39	13	<0.5	8	76	41	17	<0.1	<0.05	<7	<4	<8	<6
F2-4 (deep) [1]															
F2-5a	0-10	37	39	12	<0.5	7	93	**59**	**71**	<0.1	<0.05	<7	<4	73	42
F2-5 (deep) [1]															

Notes:

NA: Not available; ID: Soil sample location ID.

Underlined values: Results exceed Background arithmetic mean.

Bold Values: Results exceed Baseline arithmetic mean.

1: No deep sample was collected at F2-1, F2-2, F2-4 and F2-5 due to refusal on rock.

4.3.5 Conclusions and Overall Performance of the West Landfill Lobe E

Based on the visual inspection, there is no significant erosion, settlement, cracking, exposed waste or indications of instability at the West Landfill Lobe E. There was some minor settlement and self-armouring erosion on the cover surface and slope of the landfill that are not considered a concern. Overall the West Landfill Lobe E appears to be performing well and did not have any features of concern. The Preliminary Stability Assessment conducted based on the visual inspection suggests that the West Landfill Lobe E has an “Acceptable” overall performance.

Two soil samples were collected at one of the five designated locations in 2016; deep samples could not be collected at F2-1, F2-2, F2-4 and F2-5 as a result of refusal (on rock). Nickel and Zinc concentrations were highest at F2-3 (shallow sample), located near the southwestern toe of the landfill whereas copper, lead and chromium concentrations were highest at F2-2 (shallow sample), located near the northeastern toe. At F2-2 and F2-3, the concentrations of most metals were less than or similar to those observed in previous years. Similarly, at the other sampling locations, 2016 metals concentrations were lower than or similar to concentrations reported in earlier years.

Concentrations of petroleum hydrocarbons slightly above or near the baseline mean concentration plus 3σ (81 mg/kg) were noted in the shallow samples at F2-2 (average 83 mg/kg) and in the shallow sample at F2-5 (79 mg/kg). No PHC were detected in the duplicate sample and therefore this result should be interpreted with caution. No cadmium, mercury or PCB were detected in any of the samples in 2016.

Given that the environmental sampling results are largely the same as the previous sampling events, there appears to be no evident impact of the landfill on soil quality.

4.3.6 Recommendations for West Landfill Lobe E

No modifications to the ongoing monitoring program at this landfill are recommended.

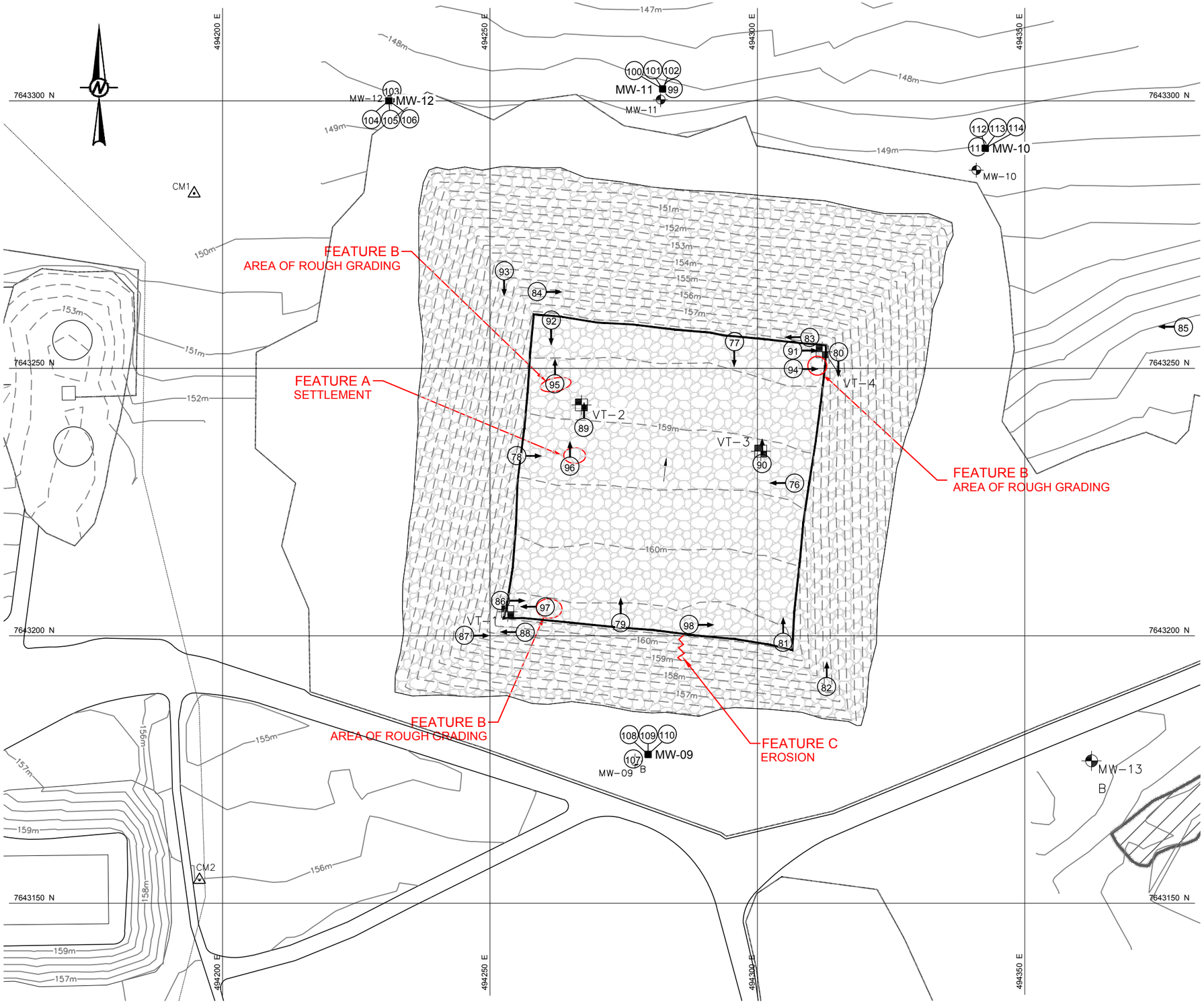
4.4 Tier II Disposal Facility

4.4.1 Landfill Description

The Tier II Disposal Facility was constructed in the Station Area approximately 200 m east of the nearest station buildings and immediately west of the Upper Site Landfill. The containment cell is for Tier II contaminated soil. Local elevations range from approximately 155 masl south of the landfill to approximately 149 masl to the north. The landfill is accessed by a road leading east from the station.

The landfill cell construction included low-permeability, saturated, compacted berms, the installation of a liner system over the berms and landfill base, and the placement of a cover liner system over the landfill contents, overlain by a thick granular fill to promote freeze-back of landfill contents. The landfill is approximately 8,900 m^2 in area, including the sideslopes.

The long term monitoring plan consists of visual monitoring, the collection of soil and groundwater samples, and monitoring of subsurface ground temperatures below the landfill. Approximate locations for the collection of soil and groundwater samples, and thermistor installation locations are identified on Figure FOX-2.5. Four groundwater monitoring wells, MW-09 through MW-12, were installed around the landfill perimeter. Four thermistors, VT-1 through VT-4, were installed within the landfill.



LEGEND

- CM1 — SURVEY CONTROL MONUMENT
- MONITORING WELL LOCATION
- B — BACKGROUND MONITORING WELL LOCATION
- GROUND TEMPERATURE CABLE LOCATION
- SOIL SAMPLING LOCATION
- 88 — PHOTOGRAPH VIEWPOINT LOCATION
- SETTLING (NTS)
- EROSION (NTS)
- 149m — GROUND SURFACE CONTOUR

NOTES

GRID PROJECTION IS NAD83 ZONE 18N.
ELEVATIONS ARE GEODETIC.

REFERENCE

PREVIOUS INSPECTION FIGURE PROVIDED BY BIOGENIE, A DIVISION OF ENGLOBE CORPORATION, PROJECT NO.CD2655_400_403, DATED JUNE 2015.

0 12.5 25
1:750 METRES

CLIENT
DEPARTMENT OF NATIONAL DEFENCE CANADA

PROJECT
2016 FOX-2 MONITORING REPORT

TITLE
TIER II DISPOSAL FACILITY

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-03
DESIGNED	RM
PREPARED	TDR
REVIEWED	DCJ
APPROVED	DP

PROJECT NO.	PHASE	REV.	FIGURE
1530908	2000	A	FOX-2.5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25 mm

Path: \\golder.gds\gal\Mississauga\SIM\Clients\Public_Works_Canada\Canada\99_PROJ\1530908_PWGSC_Dew_Line_Mon_Program_2015_2018\40_PROD\0008_Fox_2_Field_Summary_Report_2016\ | File Name: 1530908-0008-CM-0010.dwg

4.4.2 Summary of Scope Deviations

The field work was conducted as per the TOR with the following exceptions:

- The deep soil samples at MW-09 and MW-10 could not be collected due to refusal on rock.
- The groundwater sample at MW-11 (downgradient location) could not be collected because the groundwater in the well was frozen.

4.4.3 Visual Inspection

The Tier II Disposal Facility exhibited some minor settlement and self-armouring erosion. No seepage, ponded water, cracking or exposed waste were observed. Table 4-14 presents a summary of observed visual inspection features and Table 4-15 presents the Preliminary Stability Assessment results. This landfill was assessed to have an “Acceptable” overall performance because all observed features were assessed as “Acceptable”. Table 4-16 is a log of photographs taken during the 2016 visual inspection.

There is some previously observed minor settlement on the landfill cover surface (Feature A). Some rough grading was previously observed in the southwest corner, in the northeast corner and west end of the cover (Feature B). There was some minor self-armouring erosion on the south crest edge (previous Feature C). None of the observed features are considered to be significant or of concern.

Table 4-14: Visual Inspection Checklist – Tier II Disposal Facility

SITE NAME: FOX-2 Longstaff Bluff
LANDFILL DESIGNATION: Tier II Disposal Facility
DATE OF INSPECTION: August 19, 2016
DATE OF PREVIOUS INSPECTION: August 21, 2015
INSPECTED BY: Reza Moghaddam
REPORT PREPARED BY: Reza Moghaddam
MONITORING EVENT NUMBER: 5
The inspector/reporter represents to the best of his/her knowledge that the following statements and observations are true and correct and to the best of the preparer's actual knowledge, no material facts have been suppressed or misstated.

Table 4-14: Visual Inspection Checklist – Tier II Disposal Facility

Checklist Item	Present (Y/N)	Feature ID (A, B, etc.)	Location Description	Easting	Northing	Length (m)	Width (m)	Depth (m)	Extent of Landfill Area (%)	Description (Severity Rating)	Comparison to Historical Observations	Photos
Settlement	Y	A	West cover surface	494264.9	7643231.7	2.0	1.0	0.15	0.02%	Minor settlement (Acceptable)	Unchanged since previous inspection	96
		B	Northeast corner	494303.2	7643250.7	5.0	3.0	-	0.17%	Rough grading (Acceptable)	Unchanged since previous inspection	94
			West cover surface	494262.1	7643247.1	2.0	3.0	-	0.07%	Rough grading (Acceptable)	Unchanged since previous inspection	95
			Southwest corner	494260.3	7643205.4	2.0	3.0	-	0.07%	Rough grading (Acceptable)	Unchanged since previous inspection	97
Erosion	Y	C	South crest edge	494287.2	7643202.1	3.0	1.0	0.15	0.03%	Minor self-armouring erosion (Acceptable)	Unchanged since previous inspection	98
Lateral Movement	N											
Frost Action	N											
Sloughing	N											
Cracking	N											
Animal Burrows	N											
Vegetation	N											
Staining	N											
Vegetation Stress	N											
Seepage or Ponded Water	N											

Table 4-14: Visual Inspection Checklist – Tier II Disposal Facility

Checklist Item	Present (Y/N)	Feature ID (A, B, etc.)	Location Description	Easting	Northing	Length (m)	Width (m)	Depth (m)	Extent of Landfill Area (%)	Description (Severity Rating)	Comparison to Historical Observations	Photos
Debris and/or Liner Exposed	N											
Presence / Condition of Monitoring Instruments	Y	MW-09, 10,11,12, VT-1,2,3,4								All monitoring wells intact. All thermistors intact.	Reinstalled VT-2 datalogger	88, 89, 90, 91, 99,103,107,111
Features of Note / Other Observations	N											

Landfill Area = 8,900 m^2

Table 4-15: Preliminary Stability Assessment – Tier II Disposal Facility

Feature	Severity Rating	Extent
Settlement	Acceptable	Occasional
Erosion	Acceptable	Isolated
Lateral Movement	Not observed	-
Frost Action	Not observed	-
Sloughing	Not observed	-
Cracking	Not observed	-
Animal Burrows	Not observed	-
Vegetation Establishment	Not observed	-
Staining	Not observed	-
Vegetation Stress	Not observed	-
Seepage/Ponded Water	Not observed	-
Debris and/or Liner Exposure	Not observed	-
Other	Not observed	-
Overall Landfill Performance	**Acceptable**	

Table 4-16: Summary Table of Photographic Log – Tier II Disposal Facility Visual Inspection

Photo	Description	Easting	Northing	Date
76	FOX-2 – Tier II Disposal Facility – Cover surface, facing west (ATT4_Photo4.jpg)	494306.94	7643228.52	19-Aug-2016
77	FOX-2 – Tier II Disposal Facility – Cover surface, facing south (ATT9_Photo9.jpg)	494295.70	7643254.97	19-Aug-2016
78	FOX-2 – Tier II Disposal Facility – Cover surface, facing east (ATT13_Photo13.jpg)	494254.97	7643233.67	19-Aug-2016
79	FOX-2 – Tier II Disposal Facility – Cover surface, facing north (ATT16_Photo16.jpg)	494274.39	7643202.42	19-Aug-2016
80	FOX-2 – Tier II Disposal Facility – East crest and slope, facing south (ATT6_Photo6.jpg)	494310.85	7643252.76	19-Aug-2016
81	FOX-2 – Tier II Disposal Facility – East crest, facing north (ATT17_Photo17.jpg)	494304.76	7643198.77	19-Aug-2016
82	FOX-2 – Tier II Disposal Facility – East slope and toe, facing north (ATT18_Photo18.jpg)	494312.92	7643190.48	19-Aug-2016
83	FOX-2 – Tier II Disposal Facility – North crest, facing west (ATT7_Photo7.jpg)	494309.52	7643253.73	19-Aug-2016
84	FOX-2 – Tier II Disposal Facility – North slope and toe, facing east (ATT11_Photo11.jpg)	494258.77	7643264.33	19-Aug-2016
85	FOX-2 – Tier II Disposal Facility – Overview east slope, facing west (ATT19_Photo19.jpg)	494390.15	7643257.72	19-Aug-2016
86	FOX-2 – Tier II Disposal Facility – South crest, facing east (ATT14_Photo14.jpg)	494251.92	7643206.60	19-Aug-2016
87	FOX-2 – Tier II Disposal Facility – South slope and toe, facing east (ATT15_Photo15.jpg)	494245.18	7643200.08	19-Aug-2016
88	FOX-2 – Tier II Disposal Facility – VT-1, facing west (ATT2_Photo2.jpg)	494256.55	7643200.66	19-Aug-2016

Table 4-16: Summary Table of Photographic Log – Tier II Disposal Facility Visual Inspection

Photo	Description	Easting	Northing	Date
89	FOX-2 – Tier II Disposal Facility – VT-2, facing north (ATT8_Photo8.jpg)	494267.53	7643238.96	19-Aug-2016
90	FOX-2 – Tier II Disposal Facility – VT-3, facing north (ATT3_Photo3.jpg)	494300.85	7643232.17	19-Aug-2016
91	FOX-2 – Tier II Disposal Facility – VT-4, facing east (ATT5_Photo5.jpg)	494309.22	7643253.41	19-Aug-2016
92	FOX-2 – Tier II Disposal Facility – West crest, facing south (ATT10_Photo10.jpg)	494261.46	7643259.02	19-Aug-2016
93	FOX-2 – Tier II Disposal Facility – West slope and toe, facing south (ATT12_Photo12.jpg)	494252.67	7643268.23	19-Aug-2016
94	FOX-2 – Tier II Disposal Facility – Northeast corner – Feature B – rough grading area (Acceptable), facing east (ATT2_Photo2.jpg)	494303.20	7643250.70	19-Aug-2016
95	FOX-2 – Tier II Disposal Facility – West cover surface – Feature B – rough grading area (Acceptable), facing north (ATT3_Photo3.jpg)	494262.10	7643247.10	19-Aug-2016
96	FOX-2 – Tier II Disposal Facility – West cover surface – Feature A – minor settlement (Acceptable), facing north (ATT4_Photo4.jpg)	494264.90	7643231.70	19-Aug-2016
97	FOX-2 – Tier II Disposal Facility – Southwest corner – Feature B – rough grading area (Acceptable), facing west (ATT5_Photo5.jpg)	494260.30	7643205.40	19-Aug-2016
98	FOX-2 – Tier II Disposal Facility – South crest edge – Feature C – minor self-armouring erosion (Acceptable), facing east (ATT6_Photo6.jpg)	494287.20	7643202.10	19-Aug-2016

4.4.4 Thermal Monitoring

Thermistor dataloggers VT-1, -3 and -4 located at the Tier II Disposal Facility were downloaded using Lakewood Systems Ltd. Prolog software and a laptop computer. The repaired thermistor datalogger at VT-2 was reinstalled and the initial data were downloaded. Thermistor inspection and data downloading details were recorded on field record sheets included in Appendix B.

4.4.5 Soil Sampling

Table 4-17 presents a summary of analytical results for soil samples collected at the Tier II Disposal Facility. MW-09 represents an upgradient sampling location, whereas MW-10, MW-11 and MW-12 represent downgradient sampling locations. The deep soil samples at MW-09 and MW-10 could not be collected due to refusal on rock.

Table 4-17 also lists the arithmetic mean background and baseline values for the site, in addition to the baseline plus 3σ limit. At the Tier II Disposal Facility the baseline arithmetic means for copper, nickel, cobalt, lead, zinc and chromium are lower than the background arithmetic means.

MW-09

Sampling location MW-09 is located upgradient of the landfill, approximately 8 m south of the toe. The estimated elevation of this sampling point is 156.5 masl. As shown in Photos 108 and 109 the area is covered with sand, gravel and stone and sparse vegetation. The soil in the area of the sample location consisted of brown sand and gravel with some organics.

For the shallow sample at MW-09 (0-15 cm), the concentration of arsenic was greater than those observed in previous years and represents a new historical maximum concentration. The concentrations of all other metals were similar to those reported in previous years. No cadmium, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

MW-10

Sampling location MW-10 is located downgradient of the landfill, approximately 8 m northeast of the toe. The estimated elevation of this sampling point is 149.5 masl. As shown in Photos 112 and 113, the sampling area is covered with sand, gravel with some stone and established vegetation. The soil in the area of the sample location consisted of brown sand and gravel with some organics.

The shallow sample at MW-10 (0-15 cm) has historically exhibited elevated concentrations of metals compared to other locations at the Tier II Disposal Facility. The concentrations of copper, nickel, lead and chromium exceeded the baseline mean concentration plus 3σ and the concentrations of copper, cobalt and lead represent new historical maxima. The concentrations of most other metals were similar to those observed in previous years. The concentration of modified TPH (100 mg/kg) exceeded the baseline mean concentration plus 3σ (73 mg/kg) and was greater the concentration observed in 2015 (88 mg/kg) but less than those observed in 2012 and 2013 (148 mg/kg and 170 mg/kg, respectively). The concentration of the PHC F4 fraction in 2016 was 46 mg/kg. No cadmium, mercury or PCB were detected at this location in 2016.

MW-11

Sampling location MW-11 is located downgradient of the landfill, approximately 12 m north of the toe. The estimated elevation of this sampling point is 148.5 masl. As shown in Photos 100 and 101, the sampling area is covered with sand, gravel with some stone and well-established vegetation. The soil in the area of the sample location consisted of yellow-brown sand with some gravel and stone.

For the shallow sample at MW-11 (0-15 cm), metal concentrations were observed in previous years at similar concentrations. No cadmium, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

The deep sample at MW-11 (30-40 cm) exhibited similar metals concentrations to those in the shallow sample. Metal concentrations were less than or similar to those observed in previous years. No cadmium, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

MW-12

Sampling location MW-12 is located downgradient of the landfill, approximately 15 m north of the toe. The estimated elevation of this sampling point is 148.5 masl. As shown in Photos 104 and 105, the area is covered with sand, gravel and stone with some established vegetation. The soil in the area of the sample location consisted of yellow-brown sand, gravel and stone.

For the shallow (0-15 cm) sample at MW-12, metals concentrations were less than or similar to those observed in previous years. In 2016, the modified TPH concentration was 67 mg/kg whereas the concentration of the PHC F4 fraction in 2016 was 38 mg/kg. No PHC were detected in 2014 or 2015, however a TPH concentration of 24 mg/kg was reported in 2013. No cadmium, mercury or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

For the deep (30-40 cm) sample at MW-12, metals concentrations were similar to those reported in the shallow sample and less than or similar to those observed in previous years. No cadmium, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

Table 4-17: Soil Chemical Analysis Results – Tier II Disposal Facility

ID	Depth (cm)	Cu (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Cr (mg/kg)	As (mg/kg)	Hg (mg/kg)	Total PCB (mg/kg)	F1 (mg/kg)	F2 (mg/kg)	F3 (mg/kg)	F4 (mg/kg)
Background Mean		54.9	45.6	17.2	1.0	10.0	84.2	59.4	23.4	NA	NA	NA	NA	NA	NA
Baseline Mean		**52.0**	**35.4**	**12.0**	**1.0**	**9.8**	**64.7**	**44.2**	**37.9**	**0.10**	**0.10**	**NA**	**NA**	**NA**	**NA**
Baseline + 3σ		130.9	56.7	18.7	1.0	26.0	93.6	61.8	77.5	0.10	0.16	NA	NA	NA	NA
Upgradient															
MW-09a	0-15	34	31	10	<0.5	**11**	50	34	**64**	<0.1	<0.05	<7	<4	<8	<6
MW-09 (deep) [1]															
Downgradient															
MW-10a	0-15	**132**	**59**	**15**	<0.5	**29**	**82**	**66**	**68**	<0.1	<0.05	<7	<4	94	46
MW-10 (deep) [1]															
MW-11b	0-15	**64**	**46**	**13**	<0.5	**11**	62	43	37	<0.1	<0.05	<7	<4	<8	<6
MW-11a	30-40	**64**	**40**	11	<0.5	**12**	53	39	33	<0.1	<0.05	<7	<4	<8	<6
MW-12b	0-15	**54**	**36**	10	<0.5	**11**	48	39	32	<0.1	<0.05	<7	<4	61	38
MW-12a	30-40	**54**	**39**	11	<0.5	**11**	55	41	34	<0.1	<0.05	<7	<4	<8	<6

Notes:
NA: Not available; ID: Soil sample location ID.
Underlined values: Results exceed Background arithmetic mean.
Bold Values: Results exceed Baseline arithmetic mean.
Shaded Values: Results exceed the Baseline arithmetic mean plus 3σ.
1: No deep sample was collected at MW-09 and MW-10 due to refusal on rock.

4.4.6 Groundwater Sampling

Groundwater sampling and monitoring well inspection field records are included in Appendix B. Table 4-18 presents a summary of groundwater levels and analytical results for groundwater samples collected at the Tier II Disposal Facility. The groundwater sample at MW-11 could not be collected because the groundwater in the well was frozen.

MW-09

The depth to groundwater measured at MW-09 (duplicate location) in 2016 was 1.57 m below grade. The concentrations of all metals were less than or similar to those observed in previous years. No arsenic, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

MW-10

The depth to groundwater measured at MW-10 in 2016 was 2.23 m below grade. The concentrations of all metals were less than or similar to those observed in previous years. No chromium, arsenic, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

MW-12

The depth to groundwater measured at MW-12 in 2016 was 2.07 m below grade. The concentrations of all metals were less than or similar to those observed in previous years. No lead, chromium, arsenic, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

Table 4-18: Monitoring Well Groundwater Levels and Groundwater Chemical Analysis Results – Tier II Disposal Facility

ID	GW Depth BGS (m)	Cu (mg/L)	Ni (mg/L)	Co (mg/L)	Cd (mg/L)	Pb (mg/L)	Zn (mg/L)	Cr (mg/L)	As (mg/L)	Hg (mg/L)	Total PCBs (mg/L)	F1 (mg/L)	F2 (mg/L)	F3 (mg/L)	F4 (mg/L)
Baseline Mean		**0.16**	**0.27**	**0.06**	**0.0010**	**0.033**	**0.19**	**0.09**	**0.046**	**0.0004**	**0.003**	**NA**	**NA**	**NA**	**NA**
Baseline + 3σ		0.60	0.68	0.145	0.0032	0.15	0.55	0.31	0.19	0.00040	0.0053	NA	NA	NA	NA
Upgradient															
MW-09	1.57	0.0079	0.102	0.0243	0.0002	<0.0001	0.043	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	<0.100
MW-09 dup	1.57	0.014	0.137	0.0295	0.0003	0.0009	0.057	0.003	<0.001	<0.0001	<0.00005	<0.025	<0.1	<0.1	<0.1
MW-09 (Dup Avg)	1.57	0.011	0.12	0.0269	0.0003	0.0005	0.05	0.002	<0.001	<0.0001	<0.00005	<0.025	<0.1	<0.1	<0.1
Downgradient															
MW-10	2.23	0.0613	0.256	**0.0673**	0.0007	0.0003	0.119	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	<0.100
MW-11 [1]															
MW-12	2.07	0.0082	0.097	0.0244	0.0003	<0.0001	0.037	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	<0.100

Notes:
ID: Monitoring well location ID.
GW: Groundwater.
NA: Not Available
BGS: Below ground surface.
Bold Values: Results exceed Baseline arithmetic mean.
1: The groundwater sample at MW-11 could not be collected because the groundwater in the well was frozen.

4.4.7 Conclusions and Overall Performance of the Tier II Disposal Facility

Based on the visual inspection, there is no significant erosion, settlement, cracking, exposed waste or indications of instability at the Tier II Disposal Facility. Some minor settlement and self-armouring erosion was observed. Overall the Tier II Disposal Facility appears to be performing well and did not exhibit any features of concern. The Preliminary Stability Assessment conducted based on the visual inspection suggests that the Tier II Disposal Facility has an “Acceptable” overall performance.

Two soil samples were collected at two of the four designated locations in 2016; deep samples could not be collected at MW-09 and MW-10 as a result of refusal (boulders). Metal concentrations in soil were highest at MW-10 (shallow sample), located near the northeastern toe of the landfill. At this location, the concentrations of copper, nickel, lead and chromium exceeded the baseline mean concentration plus 3σ and the concentrations of copper, cobalt and lead represent new historical maxima. At MW-09, MW-11 and MW-12, the concentrations of most metals were less than or similar to those observed in previous years.

Concentrations of petroleum hydrocarbons slightly above or near the baseline mean concentration plus 3σ (73 mg/kg) were noted in the shallow sample at MW-10 (100 mg/kg) and in the shallow sample at MW-12 (67 mg/kg). The concentration of modified TPH at MW-10 was greater than the concentration observed in 2015 (88 mg/kg) but less than those observed in 2012 and 2013 (148 mg/kg and 170 mg/kg, respectively). No cadmium, mercury or PCB were detected in any of the soil samples in 2016.

In 2016, groundwater samples were collected from three of four monitoring wells adjacent to the landfill, no sample was collected at MW-11 as the groundwater in the well was frozen. The concentrations of all metals at MW-09, MW-10 and MW-12 were less than or similar to those reported in previous years. No detectable concentrations of arsenic, mercury, PHC or PCB were noted in any of the groundwater samples in 2016.

Comparison of groundwater elevations based on estimated grade elevation and the measured water depth in the wells indicates that the groundwater elevation was higher at MW-09, and lowest towards the north at MW-10 and MW-12, which is consistent with the topography in the area.

The data from this site are not indicative of increasing influence from the landfill, with the possible exception of location MW-10, where the shallow sample soil sampling results may be reflective of a potential influence from the landfill; insufficient data are currently available to confirm this. Based on the groundwater monitoring results, there does not appear to be significant impact to groundwater quality from the landfill at the monitoring wells adjacent to the landfill.

4.4.8 Recommendations for Tier II Disposal Facility

No modifications to the ongoing monitoring program at this landfill are recommended.

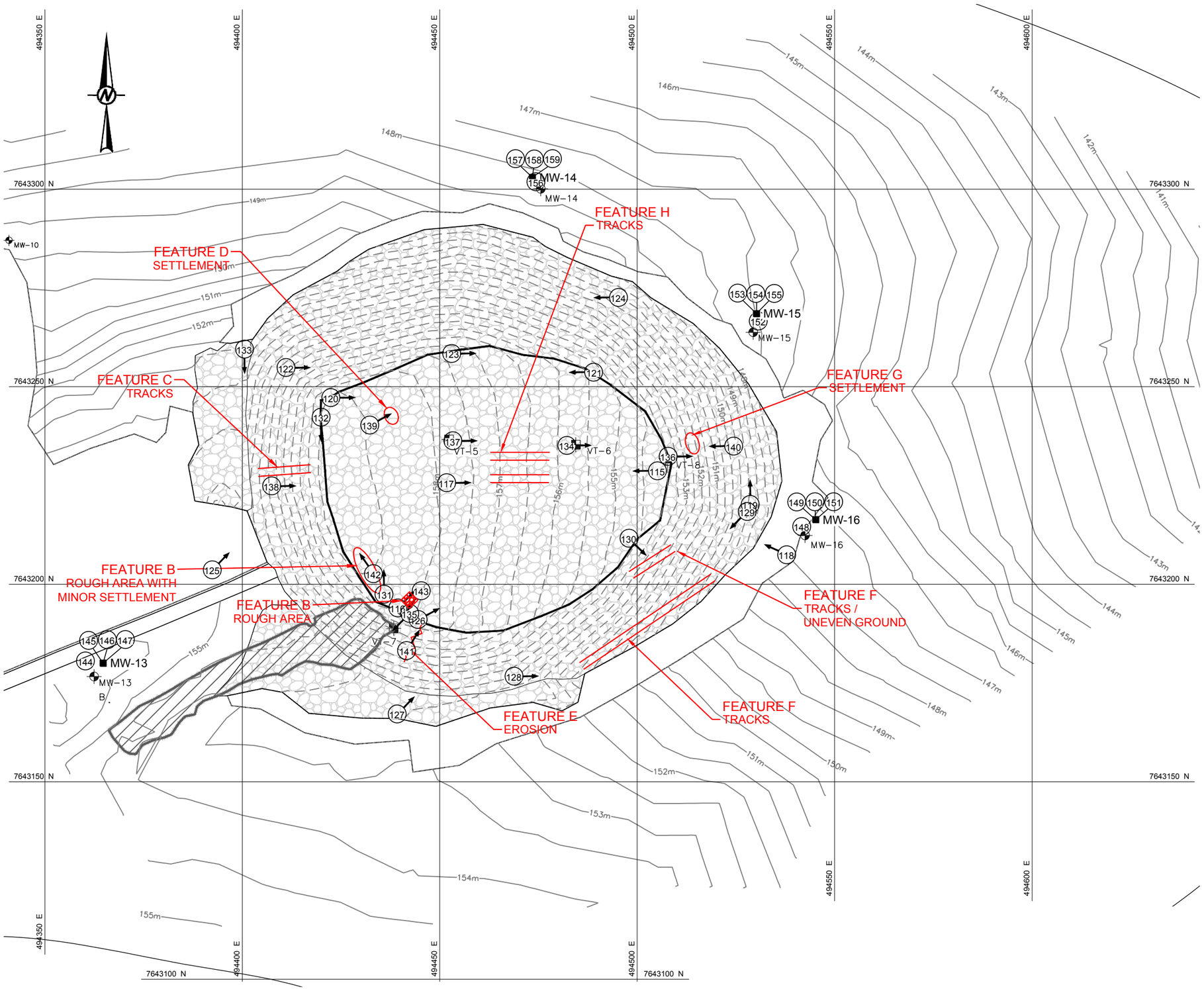
4.5 Upper Site Landfill Lobe A

4.5.1 Landfill Description

The Upper Site Landfill is located in the Station Area, approximately 270 m east of the nearest station buildings and immediately east of the Tier II Disposal Facility. It was the main disposal area for station operations, beginning in the 1950s. Local elevations at Lobe A of this landfill range from approximately 155 masl southwest of the lobe to approximately 145 masl to the northeast. The landfill is accessed by a road leading east from the station.

The area and approximate depth of buried waste materials in Lobe A is 4,040 m^2 and up to 2 m deep; the re-grading extends over an area of about 13,600 m^2. Remediation of this landfill included excavation of surficial hazardous soils and the construction of a leachate containment system.

Approximate locations for the collection of soil and groundwater samples, and thermistor installation locations are identified on Figure FOX-2.6. Four groundwater monitoring wells, MW-13 through MW-16, were installed around the landfill perimeter. Four thermistors, VT-5 through VT-8, were installed within the landfill.



LEGEND

- MONITORING WELL LOCATION
- BACKGROUND MONITORING WELL LOCATION
- GROUND TEMPERATURE CABLE LOCATION
- SOIL SAMPLING LOCATION
- PHOTOGRAPH VIEWPOINT LOCATION
- SETTLEMENT (NTS)
- TRACKS (NTS)
- EROSION
- ROUGH AREA
- GROUND SURFACE CONTOUR

NOTES

GRID PROJECTION IS NAD83 ZONE 18N.
ELEVATIONS ARE GEODETIC.

REFERENCE

PREVIOUS INSPECTION FIGURE PROVIDED BY BIOGENIE, A DIVISION OF ENGLOBE CORPORATION, PROJECT NO.CD2655_400_403, DATED JUNE 2015.

0 25 50
1:1,000 METRES

CLIENT
DEPARTMENT OF NATIONAL DEFENCE CANADA

PROJECT
2016 FOX-2 MONITORING REPORT

TITLE
UPPER SITE LANDFILL LOBE A

CONSULTANT
Golder Associates

YYYY-MM-DD	2017-02-06
DESIGNED	RM
PREPARED	TDR
REVIEWED	DCJ
APPROVED	DP

PROJECT NO.	PHASE	REV.	FIGURE
1530908	2000	A	FOX-2.6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25mm

Path: \\golder.gds\gal\Mississauga\SIM\Clients\Public_Works_Canada\Canada\99_PRO\A1530908_PWGSC_Dev_Line_Mon_Program_2015_2018\40_PROD\0008_Fox_2_Field_Summary_Report_2016\ | File Name: 1530908-0008-CM-0011.dwg

4.5.2 Summary of Scope Deviations

The field work was conducted as per the TOR with the following exceptions:

- The deep soil samples at MW-13, MW-14 and MW-15 could not be collected due to refusal on rock;
- PHC F2-F4 and PCB could not be analyzed from the groundwater sample at MW-13 due to insufficient recovery of water; and,
- PCB could not be analyzed from the groundwater sample at MW-16 due to insufficient recovery of water.

4.5.3 Visual Inspection

The Upper Site Landfill exhibits some observed minor settlement and self-armouring erosion. No seepage, ponded water, cracking or exposed waste were observed. Table 4-19 presents a summary of observed visual inspection features; Table 4-20 presents the Preliminary Stability Assessment results. This landfill was assessed to have an “Acceptable” overall performance as all observed features were assessed as “Acceptable”. Table 4-21 is a log of photographs taken during the 2016 visual inspection.

Previously observed minor settlement on the southwest cover surface (Feature B), the northwest crest (Feature D) and east slope (Feature G) were observed in 2016 with no significant changes. Previously observed minor settlement on the south slope (Feature A) was not observed during the 2016 visual inspection. There was some minor self-armouring erosion on the southwest slope (previous Feature E) that also remained unchanged since the previous inspection. Tire tracks were observed on the cover surface, south toe and west slope (previous Features C, F, H), however they are not deep and do not appear to be causing problematic erosion. None of the observed features are considered to be significant or of concern.

Table 4-19: Visual Inspection Checklist – Upper Site Landfill Lobe A

SITE NAME: FOX-2 Longstaff Bluff
LANDFILL DESIGNATION: Upper Site Landfill Lobe A
DATE OF INSPECTION: August 19, 2016
DATE OF PREVIOUS INSPECTION: August 21, 2015
INSPECTED BY: Reza Moghaddam
REPORT PREPARED BY: Reza Moghaddam
MONITORING EVENT NUMBER: 5
The inspector/reporter represents to the best of his/her knowledge that the following statements and observations are true and correct and to the best of the preparer's actual knowledge, no material facts have been suppressed or misstated.

Table 4-19: Visual Inspection Checklist – Upper Site Landfill Lobe A

Checklist Item	Present (Y/N)	Feature ID (A, B, etc.)	Location Description	Easting	Northing	Length (m)	Width (m)	Depth (m)	Extent of Landfill Area (%)	Description (Severity Rating)	Comparison to Historical Observations	Photos
Settlement	Y	B	Southwest crest	494432.5	7643203.7	15.0	3.0	-	0.33%	Rough area with minor settlement (Acceptable)	Unchanged since previous inspection	142
			Southwest crest	494445.3	7643198.3	3.0	2.0	-	0.04%	Rough area (Acceptable)	Expanded area	143
		D	Northwest crest	494432.1	7643240.5	0.5	0.3	0.1	<0.01%	Minor settlement (Acceptable)	Unchanged since previous inspection	139
		G	East slope	494518.7	7643236.0	1.0	0.5	0.2	<0.01%	Minor settlement (Acceptable)	Unchanged since previous inspection	140
Erosion	Y	E	Southwest slope	494438.5	7643176.5	8.0	0.3	-	0.02%	Minor self-armouring erosion channel (Acceptable)	Unchanged since previous inspection	141
Lateral Movement	N											
Frost Action	N											
Sloughing	N											
Cracking	N											
Animal Burrows	N											
Vegetation	N											
Staining	N											
Vegetation Stress	N											

Table 4-19: Visual Inspection Checklist – Upper Site Landfill Lobe A

Checklist Item	Present (Y/N)	Feature ID (A, B, etc.)	Location Description	Easting	Northing	Length (m)	Width (m)	Depth (m)	Extent of Landfill Area (%)	Description (Severity Rating)	Comparison to Historical Observations	Photos
Seepage or Ponded Water	N											
Debris and/or Liner Exposed	N											
Presence / Condition of Monitoring Instruments	Y	MW-13,14, 15,16 VT-5, 6, 7, 8								All monitoring wells and thermistors intact.		134, 135, 136, 137, 144, 148, 152, 156
Features of Note / Other Observations	Y	C	West slope	494397.7	7643228.0	15.0	3.0	0.1	0.33%	Tire tracks (Acceptable)	Unchanged since previous observation	125, 138
		F	South toe	494467.3	7643180.3	40.0	3.0	0.1	0.88%	Tire tracks (Acceptable)	Unchanged since previous observation	128, 130
		H	Cover surface	494479.1	7643230.3	15.0	6.0	0.1	0.66%	Tire tracks (Acceptable)	Unchanged since previous observation	117

Landfill Area = 13,600 m^2.

Table 4-20: Preliminary Stability Assessment – Upper Site Landfill Lobe A

Feature	Severity Rating	Extent
Settlement	Acceptable	Occasional
Erosion	Acceptable	-Isolated
Lateral Movement	Not observed	-
Frost Action	Not observed	-
Sloughing	Not observed	-
Cracking	Not observed	-
Animal Burrows	Not observed	-
Vegetation Establishment	Not observed	-
Staining	Not observed	-
Vegetation Stress	Not observed	-
Seepage/Ponded Water	Not observed	-
Debris and/or Liner Exposure	Not observed	-
Other	Acceptable	Occasional
Overall Landfill Performance	**Acceptable**	

Table 4-21: Summary Table of Photographic Log – Upper Site Landfill Lobe A Visual Inspection

Photo	Description	Easting	Northing	Date
115	FOX-2 – Upper Site Landfill Lobe A – Cover surface, facing west (ATT24_Photo24.jpg)	494505.10	7643228.68	19-Aug-2016
116	FOX-2 – Upper Site Landfill Lobe A – Cover surface, facing northeast (ATT26_Photo26.jpg)	494441.32	7643193.42	19-Aug-2016
117	FOX-2 – Upper Site Landfill Lobe A – Cover surface, Feature H – tire tracks and rough area near VT-5, facing east (ATT28_Photo28.jpg)	494451.72	7643225.68	19-Aug-2016
118	FOX-2 – Upper Site Landfill Lobe A – East slope and toe, facing northwest (ATT33_Photo33.jpg)	494541.91	7643215.98	19-Aug-2016
119	FOX-2 – Upper Site Landfill Lobe A – East slope and toe, facing north (ATT102_Photo102.jpg)	494528.62	7643220.19	20-Aug-2016
120	FOX-2 – Upper Site Landfill Lobe A – North crest, facing east (ATT36_Photo36.jpg)	494422.42	7643247.23	19-Aug-2016
121	FOX-2 – Upper Site Landfill Lobe A – North slope, facing west (ATT34_Photo34.jpg)	494488.96	7643253.66	19-Aug-2016
122	FOX-2 – Upper Site Landfill Lobe A – North slope and toe, facing east (ATT21_Photo21.jpg)	494411.06	7643254.83	19-Aug-2016
123	FOX-2 – Upper Site Landfill Lobe A – North slope and toe, facing east (ATT35_Photo35.jpg)	494452.99	7643258.42	19-Aug-2016
124	FOX-2 – Upper Site Landfill Lobe A – North slope and toe, facing west (ATT101_Photo101.jpg)	494495.23	7643272.58	20-Aug-2016
125	FOX-2 – Upper Site Landfill Lobe A – West slope and toe, Feature C – tire tracks, facing northeast (ATT38_Photo38.jpg)	494392.37	7643203.64	19-Aug-2016
126	FOX-2 – Upper Site Landfill Lobe A – South crest, facing northeast (ATT29_Photo29.jpg)	494443.42	7643191.54	19-Aug-2016

Table 4-21: Summary Table of Photographic Log – Upper Site Landfill Lobe A Visual Inspection

Photo	Description	Easting	Northing	Date
127	FOX-2 – Upper Site Landfill Lobe A – South slope, facing northeast (ATT30_Photo30.jpg)	494439.22	7643167.13	19-Aug-2016
128	FOX-2 – Upper Site Landfill Lobe A – South slope and toe, Feature F – tracks, facing east (ATT31_Photo31.jpg)	494468.81	7643176.71	19-Aug-2016
129	FOX-2 – Upper Site Landfill Lobe A – Southeast slope, facing southwest (ATT103_Photo103.jpg)	494527.85	7643218.39	20-Aug-2016
130	FOX-2 – Upper Site Landfill Lobe A – Feature F – tracks on south slope, facing southeast (ATT32_Photo32.jpg)	494497.91	7643211.62	19-Aug-2016
131	FOX-2 – Upper Site Landfill Lobe A – West crest, facing north (ATT27_Photo27.jpg)	494435.85	7643197.45	19-Aug-2016
132	FOX-2 – Upper Site Landfill Lobe A – West crest, facing south (ATT37_Photo37.jpg)	494419.95	7643242.29	19-Aug-2016
133	FOX-2 – Upper Site Landfill Lobe A – West toe and slope, facing south (ATT20_Photo20.jpg)	494400.56	7643259.52	19-Aug-2016
134	FOX-2 – Upper Site Landfill Lobe A – VT-6, facing east (ATT22_Photo22.jpg)	494482.19	7643235.14	19-Aug-2016
135	FOX-2 – Upper Site Landfill Lobe A – VT-7, facing southwest (ATT25_Photo25.jpg)	494442.38	7643192.56	19-Aug-2016
136	FOX-2 – Upper Site Landfill Lobe A – VT-8, facing east (ATT23_Photo23.jpg)	494507.84	7643232.35	19-Aug-2016
137	FOX-2 – Upper Site Landfill Lobe A – Feature VT-5, facing east –tracks (Feature H) (ATT7_Photo7.jpg)	494453.29	7643236.30	19-Aug-2016
138	FOX-2 – Upper Site Landfill Lobe A – West crest – Feature C – Tracks, facing east (ATT44_Photo44.jpg)	494407.40	7643224.87	20-Aug-2016
139	FOX-2 – Upper Site Landfill Lobe A – Feature D – minor settlement, facing northeast (ATT45_Photo45.jpg)	494432.28	7643240.29	20-Aug-2016
140	FOX-2 – Upper Site Landfill Lobe A – Feature G –settlement on east slope, facing west (ATT46_Photo46.jpg)	494513.84	7643238.31	20-Aug-2016
141	FOX-2 – Upper Site Landfill Lobe A – Feature E – self-armouring erosion, facing northeast (ATT47_Photo47.jpg)	494441.58	7643183.19	20-Aug-2016
142	FOX-2 – Upper Site Landfill Lobe A – West crest – Feature B – rough area with minor settlement, facing northwest (ATT48_Photo48.jpg)	494433.19	7643202.67	20-Aug-2016
143	FOX-2 – Upper Site Landfill Lobe A – Feature B - rough area, facing southwest (ATT8_Photo8.jpg)	494445.31	7643198.35	19-Aug-2016

4.5.4 Thermal Monitoring

Thermistor dataloggers VT-5, -6, -7 and -8 were downloaded using Lakewood Systems Ltd. Prolog software and a laptop computer. Thermistor inspection and data downloading details were recorded on field record sheets included in Appendix B.

4.5.5 Soil Sampling

Table 4-22 presents a summary of analytical results for soil samples collected at the Upper Site Landfill Lobe A. MW-13 represents an upgradient sampling location, whereas MW-14, MW-15 and MW-16 represent downgradient sampling locations. The deep soil samples at MW-13, MW-14 and MW-15 could not be collected due to refusal on rock.

Table 4-22 also lists the arithmetic mean background and baseline values for the site, in addition to the baseline plus 3σ limit. At the Upper Site Landfill Lobe A, the baseline arithmetic mean for nickel, cobalt, zinc and chromium are lower than the background arithmetic mean.

MW-13

Sampling location MW-13 is located upgradient of the landfill, approximately 50 m southwest of the toe. The estimated elevation of this sampling point is 155.5 masl. As shown in Photos 145 and 146, the area is sparsely vegetated and is largely covered with sand and gravel with some stone. The soil in the area of the sample location consisted of yellow-brown sand and gravel.

For the shallow sample at MW-13 (0-15 cm), the concentration of arsenic was greater than those observed in previous years and represents a new historical maximum concentration. All other metals concentrations were similar to those observed in previous years. The concentration of modified TPH (24 mg/kg) remained well below the concentrations reported in 2012 and 2013 (178 mg/kg and 34 mg/kg, respectively). The concentration of the PHC F4 fraction in 2016 was 11 mg/kg. No cadmium, mercury or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

MW-14

Sampling location MW-14 is located downgradient of the landfill, approximately 10 m northeast of the toe. The estimated elevation of this sampling point is 148.5 masl. As shown in Photos 157 and 158, the area is largely covered with sand and gravel with some stone and the sandier areas are vegetated. The soil in the area of the sample location consisted of brown sand and gravel.

For the shallow sample at MW-14 (0-15 cm, duplicate location), metals concentrations were similar to those observed in previous years. No cadmium, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

MW-15

Sampling location MW-15 is located downgradient of the landfill, approximately 8 m northeast of the toe. The estimated elevation of this sampling point is 147.5 masl. As shown in Photos 153 and 154, the area is largely covered with sand and gravel with some stone and the sandier areas are vegetated. The soil in the area of the sample location consisted of brown sand and gravel with some organics.

For the shallow sample at MW-15 (0-15 cm), the concentration of copper was greater than those observed in previous years and represents a new historical maximum concentration. The concentrations of all other metals were less than or similar to those observed in previous years. No cadmium, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

MW-16

Sampling location MW-16 is located downgradient of the landfill, approximately 12 m east of the toe. The estimated elevation of this sampling point is 147.5 masl. As shown in Photos 149 and 150, the area is sparsely vegetated and is largely covered with sand and gravel with some stone. The soil in the area of the sample location consisted of brown sand and gravel.

For the shallow sample at MW-16 (0-15 cm), the concentrations of most metals were less than those observed in previous years. No cadmium, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

For deep sample at MW-16 (30-40 cm), metal concentrations were marginally lower than those in the shallow sample. The concentrations of most metals were less than those observed in previous years. No cadmium, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

Table 4-22: Soil Chemical Analysis Results – Upper Site Landfill Lobe A

ID	Depth (cm)	Cu (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Cr (mg/kg)	As (mg/kg)	Hg (mg/kg)	Total PCBs (mg/kg)	F1 (mg/kg)	F2 (mg/kg)	F3 (mg/kg)	F4 (mg/kg)
Background Mean		54.9	45.6	17.2	1.0	10.0	84.2	59.4	23.4	NA	NA	NA	NA	NA	NA
Baseline Mean		**55.5**	**39.7**	**13.7**	**1.0**	**10.0**	**82.8**	**46.2**	**33.7**	**0.05**	**0.10**	**NA**	**NA**	**NA**	**NA**
Baseline + 3σ		121.2	66.8	22.3	1.0	198.3	160.8	64.3	64.8	0.05	5.1	NA	NA	NA	NA
Upgradient															
MW-13a	0-15	54	**44**	**14**	<0.5	**12**	66	45	**41**	<0.1	<0.05	<7	<4	18	11
MW-13 (deep) [1]															
Downgradient															
MW-14a	0-15	44	36	12	<0.5	8	50	37	27	<0.1	<0.05	<7	<4	<8	<6
MW-14a dup	0-15	42	36	12.2	<0.5	8	64	36	**36**	<0.10	<0.05	<5	<10	<50	<50
MW-14a (Dup Avg)	0-15	43	36	12	<0.5	8	57	37	32	<0.1	<0.05	<6	<7	<29	<28
MW-14 (deep) [1]															
MW-15a	0-15	**86**	**42**	12	<0.5	**11**	59	43	**34**	<0.1	<0.05	<7	<4	<8	<6
MW-15 (deep) [1]															
MW-16b	0-15	**56**	**42**	9	<0.5	**11**	60	43	32	<0.1	<0.05	<7	<4	<8	<6
MW-16a	30-40	51	39	9	<0.5	10	59	40	31	<0.1	<0.05	<7	<4	<8	<6

Notes:
NA: Not available
ID: Soil sample location ID.
Underlined values: Results exceed Background arithmetic mean.
Bold Values: Results exceed Baseline arithmetic mean.
1: The deep soil samples at MW-13, MW-14 and MW-15 could not be collected due to refusal on rock.

4.5.6 Groundwater Sampling

Groundwater sampling and monitoring well inspection field records are included in Appendix B. Table 4-23 presents a summary of groundwater levels and analytical results for groundwater samples collected at the Upper Site Landfill Lobe A.

MW-13

The depth to groundwater measured at MW-13 in 2016 was 2.54 m below grade. The concentrations of all metals were less than those observed in 2012 and 2015. No cadmium, lead, arsenic, mercury or PHC F1 fraction were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ. PHC F2-F4 and PCB could not be analyzed from the groundwater sample at MW-13 due to insufficient recovery of water.

MW-14

The depth to groundwater measured at MW-14 in 2016 was 2.03 m below grade. The concentrations of most metals were less than those observed in previous years. No lead, chromium, arsenic, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

MW-15

The depth to groundwater measured at MW-15 in 2016 was 2.75 m below grade. The concentrations of most metals were less than those observed in previous years. No lead, chromium, arsenic, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

MW-16

The depth to groundwater measured at MW-16 in 2016 was 1.56 m below grade. The concentrations of all metals were less than those reported in previous years. No cadmium, lead, chromium, arsenic, mercury or PHC were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ. PCB could not be analyzed from the groundwater sample at MW-16 due to insufficient recovery of water.

Table 4-23: Monitoring Well Groundwater Levels and Groundwater Chemical Analysis Results – Upper Site Landfill Lobe A

ID	GW Depth BGS (m)	Cu (mg/L)	Ni (mg/L)	Co (mg/L)	Cd (mg/L)	Pb (mg/L)	Zn (mg/L)	Cr (mg/L)	As (mg/L)	Hg (mg/L)	Total PCBs (mg/L)	F1 (mg/L)	F2 (mg/L)	F3 (mg/L)	F4 (mg/L)
Baseline Mean		**0.095**	**0.21**	**0.044**	**0.0010**	**0.001**	**0.20**	**0.16**	**0.019**	**0.0004**	**0.003**	**NA**	**NA**	**NA**	**NA**
Baseline + 3σ		0.42	0.36	0.116	0.0016	0.054	1.0	0.50	0.12	0.00040	0.0054	NA	NA	NA	NA
Upgradient															
MW-13	2.54	0.0141	0.069	0.012	<0.0001	<0.0001	0.012	0.001	<0.001	<0.0001	NA [1]	<0.025	NA [1]	NA [1]	NA [1]
Downgradient															
MW-14	2.03	0.0078	0.042	0.0133	0.0001	<0.0001	0.025	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	<0.100
MW-15	2.75	0.0056	0.036	0.0094	0.0003	<0.0001	0.024	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	<0.100
MW-16	1.56	0.0031	0.033	0.0128	<0.0001	<0.0001	**0.759**	<0.001	<0.001	<0.0001	NA [2]	<0.025	<0.216	<0.216	<0.216

Notes:
ID: Monitoring well location ID.
GW: Groundwater.
BGS: Below ground surface.
NA: Not Available.
Underlined values: Results exceed Background arithmetic mean.
Bold Values: Results exceed Baseline arithmetic mean.
1: PHC F2-F4 and PCB could not be analyzed from the groundwater sample at MW-13 due to insufficient recovery of water.
2: PCB could not be analyzed from the groundwater sample at MW-16 due to insufficient recovery of water.

4.5.7 Conclusions and Overall Performance of the Upper Site Landfill Lobe A

Based on the visual inspection, there is no significant erosion, settlement, seepage, cracking, exposed waste or indications of instability at the Upper Site Landfill Lobe A. Some minor settlement and self-armouring erosion was observed. Overall the Upper Site Landfill Lobe A appears to be performing well and did not have any features of concern. The Preliminary Stability Assessment conducted based on the visual inspection suggests that the Upper Site Landfill Lobe A has an “Acceptable” overall performance.

Two soil samples were collected at one of the four designated locations in 2016; deep samples could not be collected at MW-13, MW-14 and MW-15 as a result of refusal (on boulders). Similar metal concentrations in soil were observed at all sampling locations. In some cases, the 2016 concentrations were slightly higher than in earlier years, however, in most cases they were less than or similar to previous monitoring results. For the shallow samples at MW-13 and MW-15 (0-15 cm at both locations), the concentrations of arsenic and copper, respectively, were greater than those observed in previous years and represent new historical maximum concentrations at those locations. The concentration of modified TPH (24 mg/kg) observed at MW-13 remained well below the concentrations reported in 2012 and 2013 (178 mg/kg and 34 mg/kg, respectively). No PHC were detected at the remaining sampling locations and no detectable concentrations of cadmium, mercury or PCB were noted in any of the soil samples in 2016. None of the reported soil values exceeded their respective baseline mean concentrations plus 3σ.

In 2016, groundwater samples were collected from all four monitoring wells adjacent to the landfill, however low recovery limited the analyses at MW-13 and MW-16. At all four monitoring locations, the concentrations of most metals were less than or similar to those reported in previous years. No detectable concentrations of lead, arsenic, mercury, PHC or PCB were noted in any of the groundwater samples in 2016.

Comparison of groundwater elevations based on estimated grade elevation and the measured water depth in the wells indicates that the highest groundwater elevation was highest at MW-13 and lowest towards the northeast at MW-14, MW-15 and MW-16, which follows the topography in the area.

Based on the results, there does not appear to be significant impact from the landfill at the soil sampling locations or groundwater monitoring wells adjacent to the landfill.

4.5.8 Recommendations for Upper Site Landfill Lobe A

No modifications to the ongoing monitoring program at this landfill are recommended.

5.0 QA/QC RESULTS

The results of the QA/QC program described in Section 3.3 are discussed herein. The results are described in terms of accuracy, reliability (blank analysis) and reproducibility (duplicate analysis).

The five DEW Line sites visited in 2016 were executed as a single field program using standard operating procedures which were consistent for all sites in the field program. The QA/QC analysis below contains both program-level (applicable to all five sites) and site-level discussions, which focus on the FOX-2 site. The laboratory reports related to the QA/QC discussion are contained in Appendix C.

5.1 Sample Hold Times

The generally accepted hold times for the parameters analyzed in this program are:

- Metals in soil: 180 days, metals in water: 60 days;
- Mercury in soil and water: 28 days;
- PCB in soil: 365 days, PCB in water: 14 days;
- PHC-F1 in soil: 48 hours (if unpreserved), PHC-F1 in water: 7 days; and,
- PHC F2-F4 in soil: 14 days, PHC F2-F4 in water: 7 days.

At FOX-2, the soil and groundwater sampling was carried out on August 19-21, 2016 and the samples were received at Paracel and AGAT on August 26, 2016 but extraction for PHC F1 in water commenced on August 29, which was ten days post sampling for those collected on August 19th.

Maximum hold times were exceeded for PHC-F1 (soil) by 8 to 10 days due to its very short hold time of 48 hours. The very short hold time for unpreserved PHC-F1 in soil is a known issue but it has been decided to not preserve this parameter in order to maintain consistency with earlier years and data in the program. The hold times for PHC F2-F4 were all met for soil.

For groundwater, the 7 day maximum hold time for PHC F1-F4 was exceeded for all of the water samples because extraction didn't commence until August 29th Paracel makes mention of that in their report but AGAT does not. Given no PHC was detected in any fraction in groundwater at FOX-2, it is unlikely that exceeding the PHC hold time has masked any significant presence of this parameter.

For soil, there is one sample where the exceeded hold time for PHC-F1 may be masking the presence of that parameter; sample F2-9b reported detectable concentrations of PHC-F2, F3 and F4, but no PHC-F1 was detected. Given the presence of PHC in each of the other ranges, the non-detect result for PHC-F1 may be due to losses over time, as opposed to indicating an absence of that parameter.

5.2 Accuracy

Accuracy is a measure of how close a measured value is to the true value. The accuracy of the laboratory data is generally evaluated by the laboratory through the use of matrix spikes or surrogate recoveries. For the FOX-2 samples, Paracel performed a spike analysis on water and one on soil. The spike recoveries were well within the acceptable ranges and therefore met the acceptable data quality objectives. AGAT also performed a matrix spike on the batch that included FOX-2 soil and water samples and all of their results were within their own data quality objectives.

Paracel performed lab blanks for soil and water, and all results were all non-detect. AGAT also performed lab blanks in the batches that included FOX-2 soil and water samples and all of their results were non-detect.

Paracel Labs qualified the soil samples MW-10a, MW-12b, MW-13a and F2-2a stating that the chromatograph peaks for the sample were not typical of petroleum hydrocarbon distillates.

5.3 Reliability

Reliability is a measure of certainty that the concentrations reported by the labs are reliable indicators of field conditions and have not been affected other sources of contamination such as ambient air or cross-contamination from other samples. The analysis of blanks provides a measure of reliability. A set of bottles of deionized water from Paracel accompanied the team on the entire 2016 monitoring program as a Trip Blank. These bottles were not opened at the sites. The analytical reports from Paracel indicate that no parameters were detected in the Trip Blank. One Field Blank was prepared on the 2016 program. Sample bottles were filled with distilled water in the field at FOX-2. No parameters were detected in the Field Blank.

Two Equipment Blanks were prepared: one to test the decontamination of the groundwater probe, and the other to test the decontamination of the soil sample trowel. No parameters were detected in the Shovel Blank. Zinc was the only parameter detected in the Probe Blank, at a concentration (0.006 mg/L) marginally above the MDL of 0.005 mg/L. The Trip Blank, Field Blank and two Equipment Blank sample results are summarized in the table below.

Blank Samples

ID	Cu (mg/L)	Ni (mg/L)	Co (mg/L)	Cd (mg/L)	Pb (mg/L)	Zn (mg/L)	Cr (mg/L)	As (mg/L)	Hg (mg/L)	Total PCB (mg/L)	F1 (mg/L)	F2 (mg/L)	F3 (mg/L)	F4 (mg/L)
Trip Blank	<0.0005	<0.001	<0.0005	<0.0001	<0.0001	<0.005	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	<0.100
Field Blank	<0.0005	<0.001	<0.0005	<0.0001	<0.0001	<0.005	<0.001	<0.001	<0.0001	<0.00005	<0.025	NA	NA	NA
Shovel Blank	<0.0005	<0.001	<0.0005	<0.0001	<0.0001	<0.005	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	<0.100
Probe Blank	<0.0005	<0.001	<0.0005	<0.0001	<0.0001	0.006	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	<0.100

Note: NA – Not analyzed.

The Trip Blank, Field Blank and two Equipment Blank sample results indicate that the laboratory results from the 2016 monitoring program were not affected by external influences associated with sampling, storage and transport.

5.4 Reproducibility (Duplicate Analysis)

The reproducibility of lab results was measured through the testing of field duplicate samples. Duplicate soil samples were prepared in the field by mixing up a homogeneous batch of soil in the test pit being sampled, and taking portions of soil and alternately filling the sample jars for the two labs. Duplicate groundwater samples were prepared by alternately filling bottles for each lab for each parameter type.

The labs also performed internal duplicate analysis. Paracel's internal duplicate analysis of soil indicated all duplicate pairs met the program's targets. Paracel also completed a duplicate analysis of metals and PHC F1 in groundwater; all duplicate pairs met the program's targets. AGAT performed a duplicate analysis of parameters in soil; a maximum RPD of 13.3% was achieved. AGAT also performed a duplicate analysis of parameters in groundwater, in which the only detected parameters with concentrations great enough to calculate an RPD achieved an RPD of 0.0%, and thus their duplicates met the program requirements.

The total number of original soil samples collected for the 2016 program was 213, for which 21 duplicate soil samples were prepared and analyzed, providing a duplicate ratio of approximately 10%. A total of 41 groundwater samples were collected and six duplicates were analyzed, which is a duplicate ratio of greater than 10% for each site and for the program. The distribution of duplicate soil and groundwater samples over the five sites is provided in the table below.

Four soil duplicates and one groundwater duplicate were prepared at FOX-2.

Soil Samples and Duplicates

	DEW Line Site					Totals
	DYE-M	FOX-2	FOX-3	FOX-4	FOX-5	
Soil Samples Collected	93	31	31	34	24	213
Duplicate Soil Samples	7	4	4	4	2	21
Percent	8%	13%	13%	12%	8%	10%

Groundwater Samples and Duplicates

	DEW Line Site					Totals
	DYE-M	FOX-2	FOX-3	FOX-4	FOX-5	
Monitoring Well Sampled	9	9	7	7	9	41
Duplicate Groundwater Samples	2	1	1	1	1	6
Percent	22%	11%	14%	14%	11%	15%

To determine the reproducibility of the original and duplicate sample results, the RPD was calculated according to the following equation:

$$RPD = \frac{|x_2 - x_1|}{\left(\frac{x_1 + x_2}{2}\right)} \times 100\%$$

Where, x_1 and x_2 are the original and duplicate concentrations of a given parameter in a pair. RPD can only be calculated if concentrations of given parameters are greater than the analytical method detection

limits (MDL) in both the duplicate and original samples of the pair. Additionally, the RPD calculation is less meaningful when the reported concentrations are less than five (5) times the MDL. RPD have been calculated wherever the concentrations of a parameter were five (5) times greater than the MDL in both the original and duplicate samples. Sample RPD were calculated by taking the average of the parameter RPD for a given sample-duplicate pair, and a program-level RPD was calculated by taking the average of all sample RPD to arrive at a program-wide indication of repeatability.

The TOR sets a data quality objective (DQO) for the RPD in soil and groundwater between a sample and its blind field duplicate of 30%. A discussion or the RPD for the program and at FOX-2 is provided below.

5.4.1 Soil Samples

Organics and PCB

Program Level Interpretation

The PCB concentrations were below the detection limit for all of the duplicate pairs of soil samples in the program.

PHC F3 was detected in five of the duplicate pairs in the program and PHC F2 was detected in one of those five pairs. In each case it was the sample analyzed by Paracel that reported the detections, whereas the duplicate samples analyzed by AGAT did not. Paracel's MDL was equal to the program's requirement whereas AGAT's MDL was higher and they showed no exceedance of their MDL. None of the above are at concentrations that are greater than five times the program MDL, therefore RPD were not calculated.

Metals

Program Level Interpretation

Mercury and cadmium concentrations were below detection limits for all 21 original and duplicate pairs in the program.

RPD calculations were undertaken for the seven remaining metals (copper, nickel, cobalt, lead, zinc, chromium and arsenic) for the 21 pairs of duplicate soil samples. The program-level average RPD for the soil sample duplicate analysis was 18%, which met the specified data quality objective for field duplicates for inorganics of 30%.

Two of the 21 soil sample pairs in the program had a sample average RPD of over 30%; one of which was collected at FOX-2. Fifteen parameter pairs exhibited an RPD of over 30%; three of them were at FOX-2. Overall, the most frequent metals to have an RPD over 30% were zinc, copper and nickel. The results for the samples analyzed by AGAT exhibited generally higher metals concentrations in 15 cases; Paracel's overall concentrations were higher in four cases, and in two cases it was evenly spilt. There appears to be a bias, in that results from AGAT were generally higher than those of Paracel but this does not impact interpretation of the results.

Site Level Interpretation

From the four soil sample duplicates taken at FOX-2 there were 28 potential parameter pairs for RPD analysis (7 metals for a total of 4 samples). Mercury and cadmium were not detectable in all samples. As shown in the table below, all of the 28 potential metal parameter pairs, with the exception of zinc in all 4 samples, arsenic at F2-2a and lead at MW-07a, exhibited concentrations greater than five times the (lab dependant) MDL in both the original and duplicate, and therefore 22 individual RPD were calculated. Three RPD exceeded 30% (copper, nickel and cobalt at F2-2a); these were attributed to inhomogeneity of the soil sample material. The individual RPD

ranged from 0% to 67%. Cobalt exhibited the highest RPD, from 2% to 67% and chromium was the lowest, from 1% to 13%. The average of the 22 RPD calculations from the four samples was just 15%, which was on the low side of the range of RPD in the program and met the field data quality objective of less than 30%. The table below shows the metals results and RPD calculations for soil at FOX-2.

All of the individual RPDs at FOX-2 were below 30%, with the exceptions of copper (37%), nickel (62%) and cobalt (67%) at F2-2a, and the site average RPD was 15%. In light of the relatively low average RPD, it is concluded that the reproducibility of the soil sample results at FOX-2 was acceptable.

Relative Percent Difference Analysis of Soil Data at FOX-2

		Parameter Concentrations (mg/kg)								
Sample ID	**Lab**	**Cu**	**Ni**	**Co**	**Pb**	**Zn**	**Cr**	**As**	**Sample Average RPD**	**Any Over 30%?**
Paracel MDL		<5	<5	<1	<1	<20	<5	<1		
AGAT MDL		<1	<1	<0.5	<1	<1	<1	<1		
F2-2a	Paracel	99	40	17	12	**93**	84	5	36%	3 (Cu, Ni and Co)
F2-2a (duplicate)	AGAT	68	21	8.5	10	90	75	**4**		
RPD		**37%**	**62%**	**67%**	18%		11%			
F2-7a	Paracel	48	54	15	11	**77**	58	33	11%	no
F2-7a (duplicate)	AGAT	41	47	13.9	10	87	51	35		
RPD		16%	14%	8%	10%		13%	6%		
MW-07a	Paracel	31	38	13	**4**	**82**	71	29	6%	no
MW-07a (duplicate)	AGAT	26	36	12.2	**4**	86	72	28		
RPD		18%	5%	6%			1%	4%		
MW-14a	Paracel	44	36	12	8	**50**	37	27	6%	no
MW-14a (duplicate)	AGAT	42	36	12.2	8	64	36	36		
RPD		5%	0%	2%	0%		3%	29%		
									15%	3

Note: Parameters with concentrations <5 x MDL are **bold and highlighted yellow**.

5.4.2 Groundwater Samples

Organics and PCB

The PHC F1-F4 results for all six of the duplicate pairs of groundwater samples in the program were below the detection limit and all PCB concentrations were below the detection limit. The reliability of these results is therefore considered acceptable.

Metals

Program Level Interpretation

Mercury was not detected in any original-duplicate groundwater pair; the reproducibility of the results is therefore considered acceptable. Six groundwater duplicate samples for a total of eight metals detected at greater than the MDL in one or more samples, resulted in 48 potential parameter pairs for duplicate analysis via RPD calculation. The metals concentrations were very low overall; in fact 33 of the possible 48 pairs exhibited one or both values less than five times the MDL and therefore, in addition to analyzing the QC by RPD analysis it is noted that of the 48 parameter pairs, there were:

- 22 pairs where both labs reported non-detect for the same metals in the parameter pair (good repeatability);
- 10 pairs where one lab reported non-detect and the other lab reported a value less than five times the MDL for the pair (good repeatability);
- 1 pair where both labs reported values that were less than five times the MDL (good repeatability);
- 10 pairs where both labs reported values that were greater than five times the MDL, so an RPD could be calculated. Of those:
    - 6 were under 30% (good repeatability)
    - 4 were over 30% (poor repeatability); and,
- 5 pairs where one lab reported a value less than five times the MDL and the other lab reported a value over five times the MDL and the RPD was over 30% (poor repeatability).

The average of the 10 RPD calculated for analysis of metals in water was 50%, which exceeds the data quality objective of 30%. This however omits the 38 other parameter pairs. A broader representation of program level RPD can be achieved by including all parameter pairs which either had values reported or were non-detect in both parameters. This leaves out only the 10 pairs where one member was non-detect. An RPD of zero has been assigned to pairs for which both members were non-detect. Using this metric, the program level RPD is 26%.

Site Level Interpretation

At FOX-2, the duplicate groundwater sample was collected at MW-09. Mercury and arsenic were non-detect in both samples collected at this monitoring location, therefore they were excluded from the RPD calculations. As shown in the table below, there were only three groundwater parameter pairs for which the concentrations in the original and duplicate were over five times their respective (lab dependent) MDL: nickel, cobalt, zinc; thus, only three RPDs were calculated for the groundwater duplicate at FOX-2. The average of the four RPDs is 19% which meets the field data quality objective of 30%. The table below shows the metals results and RPD calculations for groundwater at FOX-2.

Relative Percent Difference Analysis of Groundwater Data at FOX-2

		Parameter Concentrations (mg/L)								
Sample ID	**Lab**	**Cu**	**Ni**	**Co**	**Cd**	**Pb**	**Zn**	**Cr**	**Average RPD**	**Any Over 30%?**
Paracel MDL		<0.0005	<0.001	<0.0005	<0.0001	<0.0001	<0.005	<0.001		
AGAT MDL		<0.005	<0.001	<0.0005	<0.0001	<0.0001	<0.005	<0.001		
MW-09	Paracel	0.0079	0.102	0.0243	**0.0002**	**<0.0001**	0.043	**<0.001**	19%	No
MW-09 (Duplicate)	AGAT	**0.014**	0.137	0.0295	**0.0003**	0.0009	0.057	**0.003**		
RPD			29%	19%			28%			

Note: Parameters with concentrations <5 x MDL are **bold and highlighted yellow**.

5.4.3 Overall Lab Data Reproducibility

Based on a sample average of the field RPD for soil of 15% and considering that only three individual soil parameter pairs exhibited an RPD slightly over 30%, it is concluded that that the lab data is acceptable. The reproducibility of groundwater data was slightly higher (average field RPD of 19%) and also met the data quality objective.

5.5 QA/QC Conclusions

The QA/QC analysis has shown that:

- Achieving maximum hold times of PHC is not possible given the logistics of transport from the remote site location unless samples are field preserved;
- With the exception of zinc detected marginally over the MDL in the Probe Blank, the concentrations of parameters in the two Equipment Blanks and one Field Blank were non-detect, as they should be to indicate that no spurious contaminates were biasing the samples while in transit;
- The duplicate analyses for soil met the program field data quality objectives; and,
- The duplicate analyses for groundwater also met the data quality objectives.

Report Signature Page

We trust that this Monitoring Report meets the project requirements of the Department of National Defence. Please direct any questions to the undersigned.

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APPENDIX A

Report Limitations

REPORT LIMITATIONS

This report has been prepared as an assessment of the environmental condition and visual inspection of the subject site. The monitoring program described in this report was conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practising under similar conditions, subject to the time limits and financial and physical constraints applicable to the services. The scope of work was carried out in accordance with the agreement between Golder Associates Ltd. and the client.

The assessment of environmental conditions at this Site has been made using the results of chemical analysis of soil and groundwater from a limited number of locations. The Site conditions between sampling locations have been inferred based on conditions observed at sampling locations. Subsurface conditions may vary from those encountered at the sample locations. Additional study, including further subsurface investigation, can reduce the inherent uncertainties associated with this type of study. However, it is never possible, even with exhaustive sampling and testing, to dismiss the possibility that part of a Site may be contaminated and remain undetected. Visual inspection comments are based on observed conditions at the time of the inspection and may change with time.

Any use which a third party makes of this report, or any reliance on, or decisions to be made based on it, are the responsibility of such third parties. Golder Associates Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on the information contained in this report.

The content of this report is based on information collected during our monitoring program, our present understanding of the Site conditions, and our professional judgement in light of such information at the time of writing this report. This report provides a professional opinion and therefore no warranty is expressed, implied, or made as to the conclusions and recommendations offered in this report. This report does not provide a legal opinion regarding compliance with applicable laws. With respect to regulatory compliance issues, it should be noted that regulatory statutes and the interpretation of regulatory statutes are subject to change.

The findings and conclusions of this report are valid only as of the date of this report. If new information is discovered, Golder Associates Ltd. should be requested to re-evaluate the conclusions of this report, and to provide amendments as required.

APPENDIX B

Field Records

Thermistor Inspection Record Sheets

Monitoring Well Sampling Logs

Soil Sampling Record Sheets

Appendix B1

FOX-2 Thermistor Sheets

ANNEX M: Thermistor Inspection Template

Inspector Name:	Reza Moghaddam	Inspection Date:	August 19 , 2016
Inspector Signature / Prepared By:			

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name:	**FOX-2**	Landfill:	Tier II Disposal Facility		
Thermistor Number:	**VT-1**	Inclination:	Vertical		
Datalogger model no:		Datalogger cable download model:			
*Install Date:	**Unknown**	First Date Event	**2012**	Last Date Event	**19-Aug-16**
*Coordinates and Elevation	N **7643202**	E **494254**		Elev	**153 m**
Length of Cable (m)		Cable Lead Above Ground (m)	1.3		
Datalogger Serial #	**7110002**	Nodal Points	14		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Lock condition	X	☐	

Battery Installation Date: 2011

Battery Levels: Main 11.34 Aux 13.38

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	0.958	0.5073
2	0.9338	-0.2957
3	0.9078	-1.1618
4	0.8863	-1.8846
5	0.8493	-3.1416
6	0.8278	-3.8759
7	0.8108	-4.463
8	0.7913	-5.1396

Bead	ohms	Degrees C
9	0.7803	-5.5271
10	0.7649	-6.0676
11	0.7557	-6.3950
12	0.7449	-6.7813
13	0.7398	-6.9616
14	0.7327	-7.2193

Battery Information

Batteries changed ? Yes [ ] No [x] Monitoring Year: 2016

Battery model number installed: Existing ULB1 and ULB15

Expected battery life (years): 2018

Datalogger Programming (Describe programming completed; beads and frequency)

Observations and Proposed Maintenance

Memory 80% used.

ANNEX M: Thermistor Inspection Template

Inspector Name:	Reza Moghaddam	Inspection Date:	August 20 , 2016
Inspector Signature / Prepared By:			

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name:	**FOX-2**	Landfill:	Tier II Disposal Facility		
Thermistor Number:	**VT-2**	Inclination:	Vertical		
Datalogger model no:		Datalogger cable download model:			
*Install Date:	**20-Aug-16**	First Date Event	**2012**	Last Date Event	**20-Aug-16**
*Coordinates and Elevation	N **7643245**	E **494267**		Elev	**153 m**
Length of Cable (m)		Cable Lead Above Ground (m)	1.3		
Datalogger Serial #	**7110006**	Nodal Points	11		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Lock condition	X	☐	

Battery Installation Date: 2016

Battery Levels: Main 11.34 Aux 13.69

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	1.3058	11.9683
2	1.1866	8.0087
3	1.1116	5.5482
4	1.0263	2.7566
5	0.9365	-0.2066
6	0.9132	-0.983
7	0.8878	-1.835
8	0.8603	-2.7649

Bead	ohms	Degrees C
9	0.8651	-2.6017
10	0.8191	-4.1755
11	0.7859	-5.3291

Battery Information

Batteries changed ? Yes [x] No [ ] Monitoring Year: 2016

Battery model number installed: New ULB1 and ULB15

Expected battery life (years): 2019

Datalogger Programming (Describe programming completed; beads and frequency)

The datalogger was installed and programmed with 12 hr sampling rate.

Observations and Proposed Maintenance

ANNEX M: Thermistor Inspection Template

Inspector Name:	Reza Moghaddam	Inspection Date:	August 19 , 2016
Inspector Signature / Prepared By:			

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name:	**FOX-2**	Landfill:	Tier II Disposal Facility		
Thermistor Number:	**VT-3**	Inclination:	Vertical		
Datalogger model no:		Datalogger cable download model:			
*Install Date:	**Unknown**	First Date Event	**2012**	Last Date Event	**19-Aug-16**
*Coordinates and Elevation	N **7643233**	E **494299**		Elev	**161 m**
Length of Cable (m)		Cable Lead Above Ground (m)	2.12		
Datalogger Serial #	**7110008**	Nodal Points	11		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Lock condition	X	☐	
Battery Installation Date	2011		
Battery Levels	Main 11.34	Aux 13.63	

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	1.2031	8.5512
2	1.1756	7.6477
3	1.075	4.3531
4	0.9471	0.1456
5	0.9241	-0.6185
6	0.8987	-1.4688
7	0.8766	-2.2142
8	0.8381	-3.5224

Bead	ohms	Degrees C
9	0.8194	-4.1650
10	0.7943	-5.0358
11	0.7776	-5.6209

Battery Information

Batteries changed ? Yes [ ] No [x] Monitoring Year: 2016

Battery model number installed: Existing ULB1 and ULB15

Expected battery life (years): 2018

Datalogger Programming (Describe programming completed; beads and frequency)

Observations and Proposed Maintenance

Memory 80% used.

ANNEX M: Thermistor Inspection Template

Inspector Name:	Reza Moghaddam	Inspection Date:	August 19 , 2016
Inspector Signature / Prepared By:			

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name:	**FOX-2**	Landfill:	Tier II Disposal Facility		
Thermistor Number:	**VT-4**	Inclination:	Vertical		
Datalogger model no:		Datalogger cable download model:			
*Install Date:	**Unknown**	First Date Event	**2012**	Last Date Event	**19-Aug-16**
*Coordinates and Elevation	N **7643254**	E **494311**		Elev	**157 m**
Length of Cable (m)		Cable Lead Above Ground (m)	2.75		
Datalogger Serial #	**7110007**	Nodal Points	16		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	☐	X	Beads 11 and 12 appear damaged
Lock condition	X	☐	
Battery Installation Date	2011		
Battery Levels	Main 11.34	Aux 13.26	

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	1.1310	6.1847
2	1.0295	2.8617
3	0.9451	0.0797
4	0.9317	-0.3668
5	0.9095	-1.1055
6	0.8732	-2.3277
7	0.8487	-3.1598
8	0.8298	-3.8077

Bead	ohms	Degrees C
9	0.8097	-4.5
10	0.7903	-5.177
11	-	
12	-	
13	0.7492	-6.6286
14	0.7405	-6.9397
15	0.7313	-7.2687
16	0.7253	-7.4835

Battery Information

Batteries changed ? Yes [ ] No [x] Monitoring Year: 2016

Battery model number installed: Existing ULB1 and ULB15

Expected battery life (years): 2018

Datalogger Programming (Describe programming completed; beads and frequency)

Observations and Proposed Maintenance

Memory 80% used.

ANNEX M: Thermistor Inspection Template

Inspector Name:	Reza Moghaddam	Inspection Date:	August 19 , 2016
Inspector Signature / Prepared By:			

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name:	**FOX-2**	Landfill:	Upper Site Landfill		
Thermistor Number:	**VT-5**	Inclination:	Vertical		
Datalogger model no:		Datalogger cable download model:			
*Install Date:	**Unknown**	First Date Event	**2012**	Last Date Event	**19-Aug-16**
*Coordinates and Elevation	N **7643240**	E **494454**		Elev	**160 m**
Length of Cable (m)		Cable Lead Above Ground (m)	2.6		
Datalogger Serial #	**7110033**	Nodal Points	11		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Lock condition	X	☐	
Battery Installation Date	2011		
Battery Levels	Main 11.34	Aux 13.50	

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	1.1728	7.5525
2	1.1232	5.9300
3	0.9709	0.9338
4	0.9253	-0.5778
5	0.9025	-1.3408
6	0.8786	-2.1446
7	0.8536	-2.9333
8	0.8322	-3.7264

Bead	ohms	Degrees C
9	0.8029	-4.7356
10	0.7852	-5.3958
11	0.7674	-5.9812

Battery Information

Batteries changed ? Yes [ ] No [x] Monitoring Year: 2016

Battery model number installed: Existing ULB1 and ULB15

Expected battery life (years): 2018

Datalogger Programming (Describe programming completed; beads and frequency)

Observations and Proposed Maintenance

Memory 80% used.

ANNEX M: Thermistor Inspection Template

Inspector Name:	Reza Moghaddam	Inspection Date:	August 19 , 2016
Inspector Signature / Prepared By:			

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name:	**FOX-2**	Landfill:	Upper Site Landfill		
Thermistor Number:	**VT-6**	Inclination:	Vertical		
Datalogger model no:		Datalogger cable download model:			
*Install Date:	**Unknown**	First Date Event	**2012**	Last Date Event	**19-Aug-16**
*Coordinates and Elevation	N **7643238**	E **494484**	Elev	**154 m**	
Length of Cable (m)		Cable Lead Above Ground (m)			
Datalogger Serial #	**7110035**	Nodal Points	10		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Lock condition	X	☐	

Battery Installation Date: 2011

Battery Levels: Main 11.34 Aux 13.26

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	1.1788	7.7504
2	1.1390	6.4469
3	1.0544	3.6791
4	0.9338	-0.2957
5	0.9090	-1.1234
6	0.8858	-1.9026
7	0.8051	-2.6017
8	0.8407	-3.4335

Bead	ohms	Degrees C
9	0.8146	-4.331
10	0.7037	-5.0571

Battery Information

Batteries changed ? Yes [ ] No [x] Monitoring Year: 2016

Battery model number installed: Existing ULB1 and ULB15

Expected battery life (years): 2018

Datalogger Programming (Describe programming completed; beads and frequency)

Observations and Proposed Maintenance

Memory 80% used.

ANNEX M: Thermistor Inspection Template

Inspector Name:	Reza Moghaddam	Inspection Date:	August 20 , 2016
Inspector Signature / Prepared By:			

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name:	**FOX-2**	Landfill:	Upper Site Landfill		
Thermistor Number:	**VT-7**	Inclination:	Vertical		
Datalogger model no:		Datalogger cable download model:			
*Install Date:	**Unknown**	First Date Event	**2012**	Last Date Event	**20-Aug-16**
*Coordinates and Elevation	N **7643190**	E **494440**		Elev	**157.1 m**
Length of Cable (m)		Cable Lead Above Ground (m)	1.63		
Datalogger Serial #	**7110034**	Nodal Points	13		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Lock condition	X	☐	

Battery Installation Date: 2011

Battery Levels: Main 11.34 Aux 13.63

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	0.9511	0.2797
2	0.9338	-0.2957
3	0.9090	-1.1234
4	0.8875	-1.8460
5	0.8635	-2.6561
6	0.8396	-3.4727
7	0.8225	-4.0597
8	0.8083	-4.5502

Bead	ohms	Degrees C
9	0.7949	-5.0171
10	0.7776	-5.6209
11	0.7620	-6.1729
12	0.7533	-6.4791
13	0.7492	-6.6286

Battery Information

Batteries changed ? Yes [ ] No [x] Monitoring Year: 2016

Battery model number installed: Existing ULB1 and ULB15

Expected battery life (years): 2018

Datalogger Programming (Describe programming completed; beads and frequency)

Observations and Proposed Maintenance

Memory 80% used.

ANNEX M: Thermistor Inspection Template

Inspector Name:	Reza Moghaddam	Inspection Date:	August 19 , 2016
Inspector Signature / Prepared By:			

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name:	**FOX-2**	Landfill:	Upper Site Landfill		
Thermistor Number:	**VT-8**	Inclination:	Vertical		
Datalogger model no:		Datalogger cable download model:			
*Install Date:	**Unknown**	First Date Event	**2012**	Last Date Event	**19-Aug-16**
*Coordinates and Elevation	N **7643234**	E **494506.7**		Elev	**153.9 m**
Length of Cable (m)		Cable Lead Above Ground (m)	1.98		
Datalogger Serial #	**7110010**	Nodal Points	14		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Lock condition	X	☐	

Battery Installation Date: 2011

Battery Levels: Main 11.34 Aux 13.50

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	0.9812	1.2738
2	0.9982	0.1836
3	0.9205	-0.7382
4	0.9005	-1.4073
5	0.8786	-2.1446
6	0.8584	-2.8298
7	0.8357	-3.6034
8	0.8213	-4.1018

Bead	ohms	Degrees C
9	0.8046	-4.6773
10	0.7888	-5.2276
11	0.7752	-5.7068
12	0.7601	-6.2243
13	0.7511	-6.5579
14	0.742	-6.8850

Battery Information

Batteries changed ? Yes [ ] No [x] Monitoring Year: 2016

Battery model number installed: Existing ULB1 and ULB15

Expected battery life (years): 2018

Datalogger Programming (Describe programming completed; beads and frequency)

Observations and Proposed Maintenance

Memory 80% used.

Appendix B2

FOX-2 Monitoring Well Data

Annex J: Monitoring Wells Sampling Log

Site Name: FOX2 Landfill Name: Non-Hazardous
Monitoring Well ID: MW-05
Sample Number(s) include dups.: -
Bottles filled (by parameter type) -
Date of Sampling Event: 19 August 2016 Time: 16:15
Weather Sunny with 60% cloud, 15km/h north wind, +4
Names of Samplers KB, JEB
Description of well condition and surrounding ground conditions (note ponding of water):
Dry, no ponding water, well and casing are perfect
Lock (condition, presence, model, manufacturer): Present and in good condition

Pre-Measured Data (from water well record log)

Depth of well installation (cm): - Diameter of well (cm): 4.4
Depth to top of screen (cm): - Length of screened section (cm): -

Field Measurements

Measurement method (interface probe, tape, etc): Interface Probe
Well pipe height above ground (cm) (to top of pipe): 38
Static water level (cm) from top of pipe: -
Static water level (cm) (below ground surface) calculated: -
Measured well refusal depth (cm) (measured after sampling from top of pipe): 186
Thickness of water column (cm): - Static Volume of water in well (mL): -
Free product thickness (mm): - Evidence of Sludge or siltation: -

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N): - Recharge Rate: -
Volume Purged (L) (note multiple purging events): -

Parameter	Initial	Stablized	Final	Notes
pH	-	-	-	
Conductivity (mS/cm)	-	-	-	
Turbidity (NTU)	-	-	-	
Temperature (degC)	-	-	-	

Visual/olfactory observations:
Well frozen at bottom

Decontamination of sampling equipment

Type of decontamination fluid(s): Methyl hydrate, soap
Number of washes: - Number of rinses: -

Other relevant comments: Frozen at bottom.

Annex J: Monitoring Wells Sampling Log

Site Name:	FOX2	Landfill Name:	Non-Hazardous
Monitoring Well ID:	MW-06		
Sample Number(s) include dups.:	1		
Bottles filled (by parameter type)	All		
Date of Sampling Event:	19 August 2016	Time:	15:45
Weather	Sunny, 15km/h north wind, +5		
Names of Samplers	KB, JEB		

Description of well condition and surrounding ground conditions (note ponding of water):
Well and casing are in good condition, dry ground, some ponding

Lock (condition, presence, model, manufacturer): Present and in good condition

Pre-Measured Data (from water well record log)

Depth of well installation (cm):	-	Diameter of well (cm):	4.4
Depth to top of screen (cm):	-	Length of screened section (cm):	-

Field Measurements

Measurement method (interface probe, tape, etc):	Interface Probe		
Well pipe height above ground (cm) (to top of pipe):			25
Static water level (cm) from top of pipe:			250
Static water level (cm) (below ground surface) calculated:			225
Measured well refusal depth (cm) (measured after sampling from top of pipe):			322
Thickness of water column (cm):	72	Static Volume of water in well (mL):	1095
Free product thickness (mm):	-	Evidence of Sludge or siltation:	-

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N):	-	Recharge Rate:	250ml / 3min
Volume Purged (L) (note multiple purging events):	-		

Parameter	Initial	Stablized	Final	Notes
pH	6.98	7.13	7.17	
Conductivity (mS/cm)	0.561	0.512	0.533	
Turbidity (NTU)	0	0	0	
Temperature (degC)	7.15	8.26	5.92	

Visual/olfactory observations:
Clear, no sheen or odour

Decontamination of sampling equipment

Type of decontamination fluid(s):	Methyl hydrate, soap, water		
Number of washes:	1	Number of rinses:	1

Other relevant comments:

Annex J: Monitoring Wells Sampling Log

Site Name:	FOX2	Landfill Name:	Non-Hazardous
Monitoring Well ID:	MW-07		
Sample Number(s) include dups.:	1		
Bottles filled (by parameter type)	All		
Date of Sampling Event:	19 August 2016	Time:	14:50
Weather	Sunny, 15km/h north wind, +5		
Names of Samplers	KB, JEB		

Description of well condition and surrounding ground conditions (note ponding of water):
Casing and well in good condition, dry ground, well cracked around 2 m down.

Lock (condition, presence, model, manufacturer): Present and in good condition

Pre-Measured Data (from water well record log)

Depth of well installation (cm):	-	Diameter of well (cm):	4.4
Depth to top of screen (cm):	-	Length of screened section (cm):	-

Field Measurements

Measurement method (interface probe, tape, etc):	Interface Probe
Well pipe height above ground (cm) (to top of pipe):	31
Static water level (cm) from top of pipe:	323
Static water level (cm) (below ground surface) calculated:	292
Measured well refusal depth (cm) (measured after sampling from top of pipe):	400

Thickness of water column (cm):	77	Static Volume of water in well (mL):	1171
Free product thickness (mm):	-	Evidence of Sludge or siltation:	-

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N):	-	Recharge Rate:	250ml / 3min
Volume Purged (L) (note multiple purging events):	-		

Parameter	Initial	Stablized	Final	Notes
pH	6.56	6.80	6.77	
Conductivity (mS/cm)	0.669	0.698	0.659	
Turbidity (NTU)	0	0	0	
Temperature (degC)	8.83	7.18	6.12	

Visual/olfactory observations:
Clear, no sheen, no odour

Decontamination of sampling equipment

Type of decontamination fluid(s):	Methyl hydrate, soap, water		
Number of washes:	1	Number of rinses:	1

Other relevant comments:

Annex J: Monitoring Wells Sampling Log

Site Name: FOX2 Landfill Name: Non - Hazardous
Monitoring Well ID: MW-08
Sample Number(s) include dups.: -
Bottles filled (by parameter type) -
Date of Sampling Event: 19 August 2016 Time: 14:30
Weather Sunny, north wind about 10km/h, +5
Names of Samplers KB, JEB
Description of well condition and surrounding ground conditions (note ponding of water):
Casing and well in good condition, ponding in casing, dry ground.
Lock (condition, presence, model, manufacturer): Present and in good condition

Pre-Measured Data (from water well record log)

Depth of well installation (cm): - Diameter of well (cm): 4.4
Depth to top of screen (cm): - Length of screened section (cm): -

Field Measurements

Measurement method (interface probe, tape, etc): Interface Probe
Well pipe height above ground (cm) (to top of pipe): 38
Static water level (cm) from top of pipe: -
Static water level (cm) (below ground surface) calculated: -
Measured well refusal depth (cm) (measured after sampling from top of pipe): 237
Thickness of water column (cm): - Static Volume of water in well (mL): -
Free product thickness (mm): - Evidence of Sludge or siltation: -

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N): - Recharge Rate: Dry well
Volume Purged (L) (note multiple purging events): -

Parameter	Initial	Stablized	Final	Notes
pH	-	-	-	
Conductivity (mS/cm)	-	-	-	
Turbidity (NTU)	-	-	-	
Temperature (degC)	-	-	-	

Visual/olfactory observations:
Dry well, frozen

Decontamination of sampling equipment

Type of decontamination fluid(s): Methyl hydrate, soap, water
Number of washes: 1 Number of rinses: 1

Other relevant comments:

Annex J: Monitoring Wells Sampling Log

Site Name: FOX2 Landfill Name:
Monitoring Well ID: MW-09 Tier II Landfill
Sample Number(s) include dups.: 2
Bottles filled (by parameter type) All
Date of Sampling Event: 20 August 2016 Time: 17:00
Weather Slight wind, sunny, +8
Names of Samplers ICB, JEB
Description of well condition and surrounding ground conditions (note ponding of water):
Casing and well in good condition, ponding in casing, dry ground
Lock (condition, presence, model, manufacturer): Present rusted

Pre-Measured Data (from water well record log)

Depth of well installation (cm): - Diameter of well (cm): 4.4
Depth to top of screen (cm): - Length of screened section (cm): -

Field Measurements

Measurement method (interface probe, tape, etc): Interface Probe
Well pipe height above ground (cm) (to top of pipe): 30
Static water level (cm) from top of pipe: 187
Static water level (cm) (below ground surface) calculated: 157
Measured well refusal depth (cm) (measured after sampling from top of pipe): 315
Thickness of water column (cm): 128 Static Volume of water in well (mL): 1946
Free product thickness (mm): - Evidence of Sludge or siltation: -

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N): - Recharge Rate: 250ml / 3min
Volume Purged (L) (note multiple purging events): -

Parameter	Initial	Stablized	Final	Notes
pH	5.55	5.67	5.69	
Conductivity (mS/cm)	0.153	0.148	0.146	
Turbidity (NTU)	0	0	0	
Temperature (degC)	9.78	9.87	8.29	

Visual/olfactory observations:
Clear, no sheen, no odour

Decontamination of sampling equipment

Type of decontamination fluid(s): Methyl hydrate, soap, water
Number of washes: 1 Number of rinses: 1

Other relevant comments:

Annex J: Monitoring Wells Sampling Log

Site Name: FOX2 Landfill Name:
Monitoring Well ID: MW-10 Tier 2
Sample Number(s) include dups.: 1
Bottles filled (by parameter type) All
Date of Sampling Event: 20 August 2016 Time: 14:00
Weather Sunny, slight wind, +9
Names of Samplers KB, JEB
Description of well condition and surrounding ground conditions (note ponding of water):
Casing and well in good condition, dry ground, ponding water inside of casing.
Lock (condition, presence, model, manufacturer): Present and in good condition

Pre-Measured Data (from water well record log)

Depth of well installation (cm): - Diameter of well (cm): 4.4
Depth to top of screen (cm): - Length of screened section (cm): -

Field Measurements

Measurement method (interface probe, tape, etc): Interface Probe
Well pipe height above ground (cm) (to top of pipe): 28
Static water level (cm) from top of pipe: 251
Static water level (cm) (below ground surface) calculated: 223
Measured well refusal depth (cm) (measured after sampling from top of pipe): 306
Thickness of water column (cm): 55 Static Volume of water in well (mL): 836
Free product thickness (mm): - Evidence of Sludge or siltation: -

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N): - Recharge Rate: 250ml / 3min
Volume Purged (L) (note multiple purging events): -

Parameter	Initial	Stablized	Final	Notes
pH	4.91	4.60	4.43	
Conductivity (mS/cm)	0.32	0.317	0.328	
Turbidity (NTU)	16.40	0	0	
Temperature (degC)	7.75	6.37	5.77	

Visual/olfactory observations:
Clear, no odour, no sheen

Decontamination of sampling equipment

Type of decontamination fluid(s): Methyl hydrate, soap, water
Number of washes: 1 Number of rinses: 1

Other relevant comments:

Annex J: Monitoring Wells Sampling Log

Site Name: FOX2 Landfill Name:
Monitoring Well ID: MW-11 Tier II Landfill
Sample Number(s) include dups.: -
Bottles filled (by parameter type) -
Date of Sampling Event: 20 August 2016 Time: 15:00
Weather Slight wind, 20% cloud, sunny, +8
Names of Samplers ICB, JEB
Description of well condition and surrounding ground conditions (note ponding of water):
Well and casing in good condition. Ponding inside casing, dry ground.
Lock (condition, presence, model, manufacturer): present and in good condition

Pre-Measured Data (from water well record log)

Depth of well installation (cm): - Diameter of well (cm): 4.4
Depth to top of screen (cm): - Length of screened section (cm): -

Field Measurements

Measurement method (interface probe, tape, etc): Interface Probe
Well pipe height above ground (cm) (to top of pipe): 49
Static water level (cm) from top of pipe: 283
Static water level (cm) (below ground surface) calculated: 234
Measured well refusal depth (cm) (measured after sampling from top of pipe): 286
Thickness of water column (cm): 3 Static Volume of water in well (mL): 46
Free product thickness (mm): - Evidence of Sludge or siltation: -

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N): - Recharge Rate: Frozen - limited recharge
Volume Purged (L) (note multiple purging events): -

Parameter	Initial	Stablized	Final	Notes
pH	-	-	-	
Conductivity (mS/cm)	-	-	-	
Turbidity (NTU)	-	-	-	
Temperature (degC)	-	-	-	

Visual/olfactory observations:
Ice present at the bottom, unable to capture water for initial reading.

Decontamination of sampling equipment

Type of decontamination fluid(s): Methyl hydrate, soap, water
Number of washes: 1 Number of rinses: 1

Other relevant comments:

Annex J: Monitoring Wells Sampling Log

Site Name: FOX2 Landfill Name:
Monitoring Well ID: MW-12 Tier II Landfill
Sample Number(s) include dups.: 1
Bottles filled (by parameter type) All
Date of Sampling Event: 20 August 2016 Time: 16:00
Weather Sunny, slight wind, +9
Names of Samplers ICB, JEB
Description of well condition and surrounding ground conditions (note ponding of water):
Casing and well in good condition, no ponding, dry ground
Lock (condition, presence, model, manufacturer): present and good

Pre-Measured Data (from water well record log)

Depth of well installation (cm): - Diameter of well (cm): 4.4
Depth to top of screen (cm): - Length of screened section (cm): -

Field Measurements

Measurement method (interface probe, tape, etc): Interface Probe
Well pipe height above ground (cm) (to top of pipe): 43
Static water level (cm) from top of pipe: 250
Static water level (cm) (below ground surface) calculated: 207
Measured well refusal depth (cm) (measured after sampling from top of pipe): 340
Thickness of water column (cm): 90 Static Volume of water in well (mL): 1368
Free product thickness (mm): - Evidence of Sludge or siltation: -

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N): - Recharge Rate: 250ml / 3min
Volume Purged (L) (note multiple purging events): -

Parameter	Initial	Stablized	Final	Notes
pH	5.06	5.01	5	
Conductivity (mS/cm)	0.269	0.276	0.273	
Turbidity (NTU)	1.6	0	0	
Temperature (degC)	8.26	6.31	5.85	

Visual/olfactory observations:
Clear, no sheen or odour

Decontamination of sampling equipment

Type of decontamination fluid(s): Methyl hydrate, soap, water
Number of washes: 1 Number of rinses: 1

Other relevant comments:

Annex J: Monitoring Wells Sampling Log

Site Name:	FOX2	Landfill Name:	Upper Site Lobe A
Monitoring Well ID:	MW-13		
Sample Number(s) include dups.:	1		
Bottles filled (by parameter type)	F1/VOC and metal bottles only		
Date of Sampling Event:	20 August 2016	Time:	10:00
Weather	Slight wind, sunny with 20% cloud, +8		
Names of Samplers	ICB, JEB		

Description of well condition and surrounding ground conditions (note ponding of water):
Well and casing in great condition, no ponding water, dry ground

Lock (condition, presence, model, manufacturer): Present and in good condition

Pre-Measured Data (from water well record log)

Depth of well installation (cm):	-	Diameter of well (cm):	4.4
Depth to top of screen (cm):	-	Length of screened section (cm):	-

Field Measurements

Measurement method (interface probe, tape, etc):	Interface Probe		
Well pipe height above ground (cm) (to top of pipe):			38
Static water level (cm) from top of pipe:			292
Static water level (cm) (below ground surface) calculated:			254
Measured well refusal depth (cm) (measured after sampling from top of pipe):			301
Thickness of water column (cm):	9	Static Volume of water in well (mL):	137
Free product thickness (mm):	-	Evidence of Sludge or siltation:	-

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N):	-	Recharge Rate:	< 100ml / 10min
Volume Purged (L) (note multiple purging events):	-		

Parameter	Initial	Stablized	Final	Notes
pH	7.43	-	-	Well would not recover,
Conductivity (mS/cm)	0.081	-	-	only reacting
Turbidity (NTU)	0	-	-	
Temperature (degC)	9.16	-	-	

Visual/olfactory observations:
Clear, no odour, no sheen

Decontamination of sampling equipment

Type of decontamination fluid(s):	Methyl hydrate, soap, water		
Number of washes:	1	Number of rinses:	1

Other relevant comments:

Annex J: Monitoring Wells Sampling Log

Site Name:	FOX2	Landfill Name:	Upper Site
Monitoring Well ID:	MW-14		Lobe A
Sample Number(s) include dups.:	1		
Bottles filled (by parameter type)	All		
Date of Sampling Event:	20 August 2016		Time: 1:00
Weather	Slight wind, sunny, 20% cloud, +8		
Names of Samplers	KB, JEB		

Description of well condition and surrounding ground conditions (note ponding of water):
Casing and well in good condition, dry ground, no ponding.

Lock (condition, presence, model, manufacturer): Present and in good condition

Pre-Measured Data (from water well record log)

Depth of well installation (cm):	-	Diameter of well (cm):	4.4
Depth to top of screen (cm):	-	Length of screened section (cm):	-

Field Measurements

Measurement method (interface probe, tape, etc):	Interface Probe		
Well pipe height above ground (cm) (to top of pipe):			33
Static water level (cm) from top of pipe:			236
Static water level (cm) (below ground surface) calculated:			203
Measured well refusal depth (cm) (measured after sampling from top of pipe):			316
Thickness of water column (cm):	80	Static Volume of water in well (mL):	1216
Free product thickness (mm):	-	Evidence of Sludge or siltation:	-

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N):	-	Recharge Rate:	250ml / 3min
Volume Purged (L) (note multiple purging events):	-		

Parameter	Initial	Stablized	Final	Notes
pH	6.35	6.23	5.96	
Conductivity (mS/cm)	0.123	0.126	0.127	
Turbidity (NTU)	0	0	0	
Temperature (degC)	8.19	7.62	6.72	

Visual/olfactory observations:
Clear, no sheen, no odour

Decontamination of sampling equipment

Type of decontamination fluid(s):	Methyl hydrate, soap, water		
Number of washes:	1	Number of rinses:	1

Other relevant comments:

Annex J: Monitoring Wells Sampling Log

Site Name:	FOX2	Landfill Name:	Upper Side Lobe A
Monitoring Well ID:	MW-15		
Sample Number(s) include dups.:	1		
Bottles filled (by parameter type)	All		
Date of Sampling Event:	20 August 2016		Time: 12:00
Weather	Slight wind, 20% cloud, sunny, +8		
Names of Samplers	KB, JEB		

Description of well condition and surrounding ground conditions (note ponding of water):
Well and casing in good condition, no ponding, dry ground

Lock (condition, presence, model, manufacturer): Present and in good condition

Pre-Measured Data (from water well record log)

Depth of well installation (cm):	-	Diameter of well (cm):	4.4
Depth to top of screen (cm):	-	Length of screened section (cm):	-

Field Measurements

Measurement method (interface probe, tape, etc):	Interface Probe		
Well pipe height above ground (cm) (to top of pipe):			42
Static water level (cm) from top of pipe:			317
Static water level (cm) (below ground surface) calculated:			275
Measured well refusal depth (cm) (measured after sampling from top of pipe):			386
Thickness of water column (cm):	69	Static Volume of water in well (mL):	1049
Free product thickness (mm):	-	Evidence of Sludge or siltation:	-

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N):	-	Recharge Rate:	250ml / 3min
Volume Purged (L) (note multiple purging events):	-		

Parameter	Initial	Stablized	Final	Notes
pH	6.91	6.70	6.52	
Conductivity (mS/cm)	0.149	0.146	0.149	
Turbidity (NTU)	0	2.80	0	
Temperature (degC)	7.95	8.26	6.99	

Visual/olfactory observations:
Clear, no sheen, no odour

Decontamination of sampling equipment

Type of decontamination fluid(s):	Methyl hydrate, soap, water		
Number of washes:	1	Number of rinses:	1

Other relevant comments:

Annex J: Monitoring Wells Sampling Log

Site Name:	FOX2	Landfill Name:	Upper Site
Monitoring Well ID:	MW-16		Lobe A
Sample Number(s) include dups.:	1		
Bottles filled (by parameter type)	All (except half PHC, no PCBs)		
Date of Sampling Event:	20 August 2016		Time: 11:00
Weather	Slight wind, sun with 20% cloud, +8		
Names of Samplers	KB, JEB		

Description of well condition and surrounding ground conditions (note ponding of water):
Well and casing in good condition, no ponding, dry ground

Lock (condition, presence, model, manufacturer): Present and in good condition

Pre-Measured Data (from water well record log)

Depth of well installation (cm):	-	Diameter of well (cm):	4.4
Depth to top of screen (cm):	-	Length of screened section (cm):	-

Field Measurements

Measurement method (interface probe, tape, etc):	Interface Probe		
Well pipe height above ground (cm) (to top of pipe):			37
Static water level (cm) from top of pipe:			193
Static water level (cm) (below ground surface) calculated:			156
Measured well refusal depth (cm) (measured after sampling from top of pipe):			229
Thickness of water column (cm):	36	Static Volume of water in well (mL):	547
Free product thickness (mm):	-	Evidence of Sludge or siltation:	-

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N):	-	Recharge Rate:	< 100ml / 10min
Volume Purged (L) (note multiple purging events):	-		

Parameter	Initial	Stablized	Final	Notes
pH	6.86	-	-	
Conductivity (mS/cm)	0.183	-	-	
Turbidity (NTU)	0	-	-	
Temperature (degC)	7.68	-	-	

Visual/olfactory observations:
Clear, no odour, no sheen

Decontamination of sampling equipment

Type of decontamination fluid(s):	Methyl hydrate, soap, water		
Number of washes:	1	Number of rinses:	1

Other relevant comments:

Appendix B3

FOX-2 Thermistor Inspection Sheets

ANNEX M: Thermistor Inspection Template

Inspector Name: Reza Hojaddam	Inspection Date: 19 Aug 2016
Inspector Signature / Prepared By:	

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name: FOX 2		Landfill: Tier II	
Thermistor Number: [redacted]		Inclination:	
Datalogger model no: [redacted]		Datalogger cable download model: [redacted]	
*Install Date:		First Date Event 21 Aug 15	Last Date Event 19 Aug 2016
*Coordinates and Elevation	N 7643202 E 494254		Elev 153
Length of Cable (m)		Cable Lead Above Ground (m) 1.3	
Datalogger Serial # 7110002		Nodal Points 14	

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☑	☐	
Beads	☑	☐	
Lock condition	☑	☐	
Battery Installation Date			
Battery Levels	Main ~~11.34~~	Aux ~~13.38~~	

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	~~0.9580~~	0.5073
2	0.9338	-0.2957
3	0.9078	-1.1618
4	0.8863	-1.8946
5	0.8493	-3.1416
6	0.8278	-3.8759
7	0.8108	-4.4630
8	0.7913	-5.1396

Bead	ohms	Degrees C
9	0.7803	-5.5271
10	0.7649	-6.0676
11	0.7557	-6.3950
12	0.7449	-6.7813
13	0.7398	-6.9616
14	0.7327	-7.2193

Battery Information

Batteries changed ? Yes ☐ No ☑ Monitoring Year: _____

Battery model number installed: _____

Expected battery life (years): _____

Datalogger Programming (Describe programming completed; beads and frequency)

80% Memory

Observations and Proposed Maintenance

ANNEX M: Thermistor Inspection Template

Inspector Name: Reza Moghaddam	Inspection Date: 20 Aug 2016
Inspector Signature / Prepared By:	

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name: FOX 1		Landfill: Tier II Disposal Facility	
Thermistor Number: 172		Inclination: vertical	
Datalogger model no:		Datalogger cable download model:	
*Install Date: 20 AUG 2016		First Date Event	Last Date Event
*Coordinates and Elevation	N 7643245 E 494267		Elev 153
Length of Cable (m)		Cable Lead Above Ground (m) 1.3	
Datalogger Serial # 711 0006		Nodal Points 11	

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☑	☐	
Beads	☑	☐	
Lock condition	☑	☐	
Battery Installation Date			
Battery Levels	Main 11.34	Aux 13.69	

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	1.3058	11.9683
2	1.1966	8.0087
3	1.1116	5.5482
4	1.0263	2.7566
5	0.9365	-0.2068
6	0.9132	-0.9830
7	0.9078	-1.8359
8	0.8603	-2.7649

Bead	ohms	Degrees C
9	0.8651	-2.6017
10	0.8191	-4.1755
11	0.7859	-5.3291

Battery Information

Batteries changed ? Yes ☐ No ☐ Monitoring Year: _____

Battery model number installed: _____

Expected battery life (years): _____

Datalogger Programming (Describe programming completed; beads and frequency)

Set up at 12:39
Aug 20/2016

Sampling Rate 12:00:00

Observations and Proposed Maintenance

ANNEX M: Thermistor Inspection Template

Inspector Name: Reza	Inspection Date: Aug 19, 2016
Inspector Signature / Prepared By:	

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name: FON1		Landfill: Tier 1	
Thermistor Number: VT1		Inclination:	
Datalogger model no:		Datalogger cable download model:	
*Install Date:		First Date Event 21-Aug 15	Last Date Event 19 Aug 16
*Coordinates and Elevation	N 7643233 E 494299		Elev 161
Length of Cable (m)	Cable Lead Above Ground (m) 2.12		
Datalogger Serial # 7110008	Nodal Points 11		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☑	☐	
Beads	☑	☐	
Lock condition	☑	☐	
Battery Installation Date			
Battery Levels	Main 11.34	Aux 13.63	

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	1.2031	8.5512
2	1.1756	7.6477
3	1.0750	4.3531
4	0.9471	0.1456
5	0.9241	-0.6195
6	0.8987	-1.46 88
7	0.8766	-2.2142
8	0.8381	-3.5224

Bead	ohms	Degrees C
9	0.8194	-4.150
10	0.7943	-5.0358
11	0.7776	-5.629

Battery Information

Batteries changed ? Yes ☐ No ☑ Monitoring Year: _____

Battery model number installed: _____

Expected battery life (years): _____

Datalogger Programming (Describe programming completed; beads and frequency)

8% memory

Observations and Proposed Maintenance

Tier II

ANNEX M: Thermistor Inspection Template

Inspector Name: Reza Moghaddam	Inspection Date: Aug 19, 2016
Inspector Signature / Prepared By:	

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name: Fox 2	Landfill: Tier II
Thermistor Number: VTH	Inclination: Vertical
Datalogger model no:	Datalogger cable download model:
*Install Date:	First Date Event 21 Aug 2015 Last Date Event 19 Aug 16
*Coordinates and Elevation	N 7643734 E 2494299 Elev 157
Length of Cable (m)	Cable Lead Above Ground (m) 2.75
Datalogger Serial # 211007	Nodal Points 16

VTH

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☑	☐	
Beads	☑	☐	
Lock condition	☑	☐	
Battery Installation Date			
Battery Levels	Main 11.34	Aux 13.26	

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	1.1310	6.1947
2	1.0295	2.8617
3	0.9451	0.0797
4	0.9317	-0.3668
5	0.9095	-1.1055
6	0.8732	-2.3277
7	0.8487	-3.1598
8	0.8298	-3.8077

Bead	ohms	Degrees C
9	0.8097	-4.5000
10	0.7903	-5.1770
11	—	—
12	—	—
13	0.7492	0.7 +6.6286
14	0.7405	-6.9397
15	0.7313	-7.2687
16	0.7253	-7.4835

Battery Information

Batteries changed ? Yes ☐ No ☑ Monitoring Year: _____

Battery model number installed: _____

Expected battery life (years): _____

Datalogger Programming (Describe programming completed; beads and frequency)

80% memory

Observations and Proposed Maintenance

ANNEX M: Thermistor Inspection Template

Inspector Name: Reza Moghaddam	Inspection Date: Aug 19, 2016
Inspector Signature / Prepared By:	

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name: FOR2		Landfill: Upper site Lobe A	
Thermistor Number: VT5		Inclination: U	
Datalogger model no:		Datalogger cable download model:	
*Install Date:		First Date Event May 2015	Last Date Event 19 Aug 20 16
*Coordinates and Elevation	N 7643240 E 494454		Elev 160
Length of Cable (m)		Cable Lead Above Ground (m) 2.6	
Datalogger Serial # 711033		Nodal Points 11	

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	☑	☐	
Cover	☐	☐	
Data Logger	☑	☐	
Cable	☐	☐	
Beads	☑	☐	
Lock condition	☑	☐	
Battery Installation Date			
Battery Levels	Main 11.34	Aux 13.50	

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	1.1728	7.5525
2	1.1232	5.9300
3	0.9709	0.9338
4	0.9253	-0.5798
5	0.9025	-1.3408
6	0.8736	-2.1446
7	0.8536	-2.9333
8	0.8322	-3.7264

Bead	ohms	Degrees C
9	0.8029	-4.7356
10	0.7852	-5.3558
11	0.7674	-5.9812

Battery Information

Batteries changed ? Yes ☐ No ☑ Monitoring Year: _____

Battery model number installed: _____

Expected battery life (years): _____

Datalogger Programming (Describe programming completed; beads and frequency)

80% Memory

Observations and Proposed Maintenance

ANNEX M: Thermistor Inspection Template

Inspector Name: Reza Moghaddam	Inspection Date: Aug 19, 2016
Inspector Signature / Prepared By:	

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name: EOL2		Landfill: Upper site lobe A	
Thermistor Number: TT6		Inclination:	
Datalogger model no:		Datalogger cable download model:	
*Install Date:		First Date Event 21 Aug 2015	Last Date Event 19 Aug 16
*Coordinates and Elevation	N 7643238 E 494484		Elev 154
Length of Cable (m)		Cable Lead Above Ground (m) 1.6	
Datalogger Serial # 711003S		Nodal Points 10	

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☑	☐	
Beads	☑	☐	
Lock condition	☑	☐	
Battery Installation Date			
Battery Levels	Main 11.34	Aux 13.26	

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	1.1788	7.7504
2	1.1390	6.4469
3	1.0544	3.6791
4	0.9338	-0.2957
5	0.9090	-1.1234
6	0.8858	-1.9026
7	0.8651	-2.6017
8	0.8407	-3.4735

Bead	ohms	Degrees C
9	0.8146	-4.33 10
10	0.7937	-5.05 71

Battery Information

Batteries changed ? Yes ☐ No ☑ Monitoring Year: _____

Battery model number installed: _____

Expected battery life (years): _____

Datalogger Programming (Describe programming completed; beads and frequency)

80% Memory

Observations and Proposed Maintenance

ANNEX M: Thermistor Inspection Template

Inspector Name: Reza Moghaddam	Inspection Date: Aug 20, 2016
Inspector Signature / Prepared By:	

Thermistor Information (*Some information can be pre-populated from thermistor logs)

Site Name: BeK'2	Landfill: LaBe, A - Upper site Level 1
Thermistor Number: VT1	Inclination:
Datalogger model no:	Datalogger cable download model:
*Install Date:	First Date Event / Last Date Event
*Coordinates and Elevation	N 7643190 E 494440 Elev 157.1
Length of Cable (m)	Cable Lead Above Ground (m) 1.63
Datalogger Serial # 7110034	Nodal Points 13

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☑	☐	
Beads	☑	☐	
Lock condition	☑	☐	
Battery Installation Date			
Battery Levels	Main 11.34	Aux 13.63	

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	0.9511	0.2797
2	0.9338	-0.2957
3	0.9090	-1.1234
4	0.8875	-1.8460
5	0.8635	-2.6561
6	0.8396	-3.4727
7	0.8225	-4.0597
8	0.8083	-4.5502

Bead	ohms	Degrees C
9	0.7949	-5.0171
10	0.7736	-5.6209
11	0.7620	-6.1729
12	0.7533	-6.4791
13	0.7492	-6.6286

Battery Information

Batteries changed ? Yes ☐ No ☑ Monitoring Year:

Battery model number installed:

Expected battery life (years):

Datalogger Programming (Describe programming completed; beads and frequency)

80% memory

Observations and Proposed Maintenance

ANNEX M: Thermistor Inspection Template

Inspector Name: Reza	Inspection Date: Aug 19, 2016
Inspector Signature / Prepared By:	

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name: [redacted]		Landfill: Upper site Lunch Lobe #	
Thermistor Number: [redacted]		Inclination:	
Datalogger model no: [redacted]		Datalogger cable download model: [redacted]	
*Install Date:		First Date Event 21 Aug 15	Last Date Event 19 Aug 16
*Coordinates and Elevation	N 7643234 E 494506.7		Elev 153.9
Length of Cable (m)	Cable Lead Above Ground (m)	.93	
Datalogger Serial # 711oe10	Nodal Points	14	

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☑	☐	
Beads	☑	☐	
Lock condition	☑	☐	
Battery Installation Date			
Battery Levels	Main 11.34	Aux 13.50	

Manual Ground Temperature Readings

Bead	ohms	Degrees C
	0.9812	1.2732
	0.9937	0.1836
	0.9205	-0.7382
	0.9005	-1.4073
	0.8796	-2.1444
	0.8594	-2.8298
	0.8357	-3.6034
	0.8213	-4.1018

Bead	ohms	Degrees C
	6.8046	-4.6773
	0.7888	-5.2276
	0.7752	-5.7069
	0.7605	-6.2243
	0.7511	-6.5579
	0.7420	-6.8850

Battery Information

Batteries changed ? Yes ☐ No ☑ Monitoring Year: _____

Battery model number installed: _____

Expected battery life (years): _____

Datalogger Programming (Describe programming completed; beads and frequency)

85% Memory

Observations and Proposed Maintenance

Appendix B4

FOX-2 Monitoring Well Log Sheets

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: FOX-2 Landfill Name: NON-Haz waste

Monitoring Well ID: MW-05

Sample Number(s) include dups.: Ø

Bottles filled (by parameter type): Ø

Date of Sampling Event: 19 Aug 16 Time: ~~16~~ 16:15

Weather: 4°, 15 km/h N wind, Sunny & 60% cloud

Names of Samplers: KB/ JEB

Description of Well Condition and Surrounding ground conditions (note ponding of water): Dry, no ponding, well casing are perfect.

Lock (condition, presence, model, manufacturer): present & good

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= _____ Diameter of well (cm)= _____

*Depth to top of screen (cm)= _____ Length screened section (cm)= _____

*note: *depths are from ground surface*

Field Measurements

Measurement method (interface probe, tape, etc): Interface Probe

Well pipe height above ground (cm) (to top of pipe)= 38

Static water level (cm) from top of pipe = Ø

Static water level (cm) (below ground surface) calculated = _____

Measured well refusal depth (cm) (measure after sampling)= 186

Thickness of water column (cm)= _____ Static volume of water in well (mL)= _____

Free product thickness (mm)= _____ Evidence of sludge or siltation: _____

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information: _____

Well purged (Y/N): _____ Recharge Rate: Ø

Volume Purged (L) (note multiple purging events if applicable): _____

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH				
Conductivity (uS/cm)				
Turbidity (NTU)				
Temperature (degC)				

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...): well frozen @ bottom

Decontamination of sampling equipment

Type of decontamination fluid (s): methly hydrate, Soap

Number washes: _____ Number rinses: _____

Other Relevant Comments: Frozen @ bottom

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: Fox 2 Landfill Name: Non-Haz Waste

Monitoring Well ID: MW06

Sample Number(s) include dups.: 1

Bottles filled (by parameter type): All

Date of Sampling Event: 19 Aug 16 Time: 15:45

Weather: 5°, 15 km/h North wind, Sunny

Names of Samplers: KB/ JEB

Description of Well Condition and Surrounding ground conditions (note ponding of water):

Well e casing are good, dry ground, some ponding

Lock (condition, presence, model, manufacturer): present & good.

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= _____ Diameter of well (cm)= _____

*Depth to top of screen (cm)= _____ Length screened section (cm)= _____

*note: *depths are from ground surface*

Field Measurements

Measurement method (interface probe, tape, etc): Interface Probe.

Well pipe height above ground (cm) (to top of pipe)= 75

Static water level (cm) from top of pipe = 250

Static water level (cm) (below ground surface) calculated = _____

Measured well refusal depth (cm) (measure after sampling)= 322

Thickness of water column (cm)= _____ Static volume of water in well (mL)= _____

Free product thickness (mm)= _____ Evidence of sludge or siltation: _____

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information:

Well purged (Y/N): _____ Recharge Rate: 250 mL/3min

Volume Purged (L) (note multiple purging events if applicable):

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH	6.98	7.13	7.17	
Conductivity (uS/cm)	0.561	0.512	0.533	
Turbidity (NTU)	0.0	0.0	0.0	
Temperature (degC)	7.15	8.26	5.92	

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...): Clear, no sheen or odour

Decontamination of sampling equipment

Type of decontamination fluid (s): Methyl hydrate, Soap, water

Number washes: 1 Number rinses: 1

Other Relevant Comments:

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: Fox-2 Landfill Name: Non-Haz waste

Monitoring Well ID: MW-8

Sample Number(s) include dups.: 1

Bottles filled (by parameter type): ALL

Date of Sampling Event: 19 Aug 16 Time: 14:50

Weather: 5°c, Sunny, 15 km/h north wind

Names of Samplers: KB / JEB

Description of Well Condition and Surrounding ground conditions (note ponding of water):

Casing & Well in good condition, dry ground in Casing & Around well - well cracked 2m down

Lock (condition, presence, model, manufacturer): present & good

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= _____ Diameter of well (cm)= _____

*Depth to top of screen (cm)= _____ Length screened section (cm)= _____

*note: *depths are from ground surface*

Field Measurements

Measurement method (interface probe, tape, etc): Interface probe

Well pipe height above ground (cm) (to top of pipe)= 31 cm

Static water level (cm) from top of pipe = 323 cm

Static water level (cm) (below ground surface) calculated = 400 cm

Measured well refusal depth (cm) (measure after sampling)= 400cm

Thickness of water column (cm)= _____ Static volume of water in well (mL)= _____

Free product thickness (mm)= _____ Evidence of sludge or siltation: _____

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information:

Well purged (Y/N): _____ Recharge Rate: 250 mL/3 min

Volume Purged (L) (note multiple purging events if applicable):

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH	6.56	6.80	6.77	
Conductivity (uS/cm)	0.669	0.698	0.659	
Turbidity (NTU)	0.0	0.0	0.0	
Temperature (degC)	8.83	7.18	6.17	

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...): clear, no sheen or odour.

Decontamination of sampling equipment

Type of decontamination fluid (s): methyl hydrate, Soap, water

Number washes: 1 Number rinses: 1

Other Relevant Comments:

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: Fox-2 Landfill Name: Non-Haz Waste

Monitoring Well ID: MW-8

Sample Number(s) include dups.: Ø

Bottles filled (by parameter type): Ø

Date of Sampling Event: 19 Aug 16 Time: 14:30

Weather: North wind (~10 km/h), Sunny, ~5°C

Names of Samplers: KB/JEB

Description of Well Condition and Surrounding ground conditions (note ponding of water): Casing well good, ponding in casing, dry ground

Lock (condition, presence, model, manufacturer): present & good

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= _____ Diameter of well (cm)= _____

*Depth to top of screen (cm)= _____ Length screened section (cm)= _____

*note: *depths are from ground surface*

Field Measurements

Measurement method (interface probe, tape, etc): Interface probe.

Well pipe height above ground (cm) (to top of pipe)= 38

Static water level (cm) from top of pipe = Ø

Static water level (cm) (below ground surface) calculated = _____

Measured well refusal depth (cm) (measure after sampling)= 237

Thickness of water column (cm)= _____ Static volume of water in well (mL)= _____

Free product thickness (mm)= _____ Evidence of sludge or siltation: _____

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information: _____

Well purged (Y/N): _____ Recharge Rate: Dry well

Volume Purged (L) (note multiple purging events if applicable): _____

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH				
Conductivity (uS/cm)				
Turbidity (NTU)				
Temperature (degC)				

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...): Dry well, frozen

Decontamination of sampling equipment

Type of decontamination fluid (s): methyl hydrate, Soap, water

Number washes: 1 Number rinses: 1

Other Relevant Comments: _____

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: Fox-2 Landfill Name: Tier II Landfill

Monitoring Well ID: MW-09

Sample Number(s) include dups.: 2

Bottles filled (by parameter type): all

Date of Sampling Event: 20 Aug 16 Time: 17:00

Weather: 8°C, slight wind, sunny

Names of Samplers: ICB / JEB

Description of Well Condition and Surrounding ground conditions (note ponding of water): casing & well in good condition, ponding in casing, dry ground

Lock (condition, presence, model, manufacturer): present / rusted

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= _____ Diameter of well (cm)= _____

*Depth to top of screen (cm)= _____ Length screened section (cm)= _____

*note: *depths are from ground surface*

Field Measurements

Measurement method (interface probe, tape, etc): Interface Probe

Well pipe height above ground (cm) (to top of pipe)= 30

Static water level (cm) from top of pipe = 187

Static water level (cm) (below ground surface) calculated = _____

Measured well refusal depth (cm) (measure after sampling)= 315

Thickness of water column (cm)= _____ Static volume of water in well (mL)= _____

Free product thickness (mm)= _____ Evidence of sludge or siltation: _____

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information: _____

Well purged (Y/N): _____ Recharge Rate: 250 mL/3min

Volume Purged (L) (note multiple purging events if applicable): _____

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH	5.55	5.67	5.69	
Conductivity (uS/cm)	0.153	0.148	0.146	
Turbidity (NTU)	0.0	0.0	0.0	
Temperature (degC)	9.78	9.87	8.29	

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...): clear, no sheen, no odour

Decontamination of sampling equipment

Type of decontamination fluid (s): methyl hydrate, soap, water

Number washes: 1 Number rinses: 1

Other Relevant Comments: _____

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: Fox-2 Landfill Name: Tier II Landfill

Monitoring Well ID: MW-10

Sample Number(s) include dups.: 1

Bottles filled (by parameter type): ALL

Date of Sampling Event: 20 Aug 16 Time: 14:00

Weather: 9°, Sunny, Slight wind,

Names of Samplers: KB/ JEB

Description of Well Condition and Surrounding ground conditions (note ponding of water):

Casing Well in good condition, dry ground, ponding inside of casing

Lock (condition, presence, model, manufacturer): present & good

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= _____ Diameter of well (cm)= _____

*Depth to top of screen (cm)= _____ Length screened section (cm)= _____

*note: *depths are from ground surface*

Field Measurements

Measurement method (interface probe, tape, etc): Interface probe

Well pipe height above ground (cm) (to top of pipe)= 28

Static water level (cm) from top of pipe = 251

Static water level (cm) (below ground surface) calculated = _____

Measured well refusal depth (cm) (measure after sampling)= 306

Thickness of water column (cm)= _____ Static volume of water in well (mL)= _____

Free product thickness (mm)= _____ Evidence of sludge or siltation: _____

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information: _____

Well purged (Y/N): _____ Recharge Rate: 750 mL / 3 min

Volume Purged (L) (note multiple purging events if applicable): _____

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH	4.91	4.60	4.43	
Conductivity (uS/cm)	0.320	0.317	0.328	
Turbidity (NTU)	16.4	0.0	0.0	
Temperature (degC)	7.75	6.37	5.77	

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...): clear, no odour, no sheen.

Decontamination of sampling equipment

Type of decontamination fluid (s): methyl hydrate, soap, water

Number washes: 1 Number rinses: 1

Other Relevant Comments: _____

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: Fox-2 Landfill Name: Tier II Landfill

Monitoring Well ID: MW-11

Sample Number(s) include dups.: Ø

Bottles filled (by parameter type): Ø

Date of Sampling Event: 20 Aug 16 Time: 15:00

Weather: 8°c, Slight wind, 20% cloud & Sunny.

Names of Samplers: ICB / JEB

Description of Well Condition and Surrounding ground conditions (note ponding of water):

Well & casing in good condition. ponding inside casing, dry ground

Lock (condition, presence, model, manufacturer): present & good.

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= _____ Diameter of well (cm)= _____

*Depth to top of screen (cm)= _____ Length screened section (cm)= _____

*note: *depths are from ground surface*

Field Measurements

Measurement method (interface probe, tape, etc): Interface Probe

Well pipe height above ground (cm) (to top of pipe)= 49

Static water level (cm) from top of pipe = 283

Static water level (cm) (below ground surface) calculated = _____

Measured well refusal depth (cm) (measure after sampling)= 286

Thickness of water column (cm)= _____ Static volume of water in well (mL)= _____

Free product thickness (mm)= _____ Evidence of sludge or siltation: _____

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information:

Well purged (Y/N): _____ Recharge Rate: frozen - limited recharge.

Volume Purged (L) (note multiple purging events if applicable): _____

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH				
Conductivity (uS/cm)				
Turbidity (NTU)				
Temperature (degC)				

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...): ice present @ bottom, unable to capture water for initial reading

Decontamination of sampling equipment

Type of decontamination fluid (s): methyl hydrate, Soap, water

Number washes: 1 Number rinses: 1

Other Relevant Comments:

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: Fox-2 Landfill Name: Tier II Landfill

Monitoring Well ID: MW-12

Sample Number(s) include dups.: 1

Bottles filled (by parameter type): ALL

Date of Sampling Event: 20 Aug 16 Time: 16:00

Weather: 9°C, Sunny, Slight wind

Names of Samplers: ICB/JEB

Description of Well Condition and Surrounding ground conditions (note ponding of water):

Casing e well in good condition, no ponding, dry ground

Lock (condition, presence, model, manufacturer): present good

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= Diameter of well (cm)=

*Depth to top of screen (cm)= Length screened section (cm)=

*note: *depths are from ground surface*

Field Measurements

Measurement method (interface probe, tape, etc): Interface Probe

Well pipe height above ground (cm) (to top of pipe)= 43

Static water level (cm) from top of pipe = 250

Static water level (cm) (below ground surface) calculated =

Measured well refusal depth (cm) (measure after sampling)= 340

Thickness of water column (cm)= Static volume of water in well (mL)=

Free product thickness (mm)= Evidence of sludge or siltation:

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information:

Well purged (Y/N): Recharge Rate: 250 mL/3min.

Volume Purged (L) (note multiple purging events if applicable):

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH	5.06	5.01	5.00	
Conductivity (uS/cm)	0.269	0.276	0.273	
Turbidity (NTU)	1.6	0.0	0.0	
Temperature (degC)	8.26	6.31	5.85	

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...): clear, no sheen or odour

Decontamination of sampling equipment

Type of decontamination fluid (s): methyl hydrate, soap, water

Number washes: 1 Number rinses: 1

Other Relevant Comments:

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: Fox-2 Landfill Name: Upper Sik Landfill Lobe A

Monitoring Well ID: MW-13

Sample Number(s) include dups.: 1

Bottles filled (by parameter type): F1/Voc & metals bottles only

Date of Sampling Event: 20 Aug 16 Time: 10:00

Weather: 8°c, slight wind, sunny with 20% cloud

Names of Samplers: ICB / JEB

Description of Well Condition and Surrounding ground conditions (note ponding of water):

Casing c well in great condition, no ponding, dry ground

Lock (condition, presence, model, manufacturer): present & good

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= _____ Diameter of well (cm)= _____

*Depth to top of screen (cm)= _____ Length screened section (cm)= _____

*note: *depths are from ground surface*

Field Measurements

Measurement method (interface probe, tape, etc): Interface probe

Well pipe height above ground (cm) (to top of pipe)= 38

Static water level (cm) from top of pipe = 292

Static water level (cm) (below ground surface) calculated = _____

Measured well refusal depth (cm) (measure after sampling)= 301

Thickness of water column (cm)= _____ Static volume of water in well (mL)= _____

Free product thickness (mm)= _____ Evidence of sludge or siltation: _____

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information:

Well purged (Y/N): _____ Recharge Rate: < 100 mL / 10 min

Volume Purged (L) (note multiple purging events if applicable):

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH	7.43			well would
Conductivity (uS/cm)	0.081			not recover,
Turbidity (NTU)	0.0			only 1 reading
Temperature (degC)	9.16			

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...): ~~methyl hydr.~~ clear, no odour, no sheen

Decontamination of sampling equipment

Type of decontamination fluid (s): Methyl hydride, soap, water

Number washes: 1 Number rinses: 1

Other Relevant Comments:

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: Fox-2 Landfill Name: Upper Site Landfill Lobe A

Monitoring Well ID: MW-14

Sample Number(s) include dups.: 1

Bottles filled (by parameter type): ALL

Date of Sampling Event: 30 Aug 16 Time: 1:00

Weather: 8°. Slight wind, Sunny, 70% Cloud

Names of Samplers: KB / JGB

Description of Well Condition and Surrounding ground conditions (note ponding of water):

Casing well in good condition, dry ground, no ponding.

Lock (condition, presence, model, manufacturer): present & good

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= _____ Diameter of well (cm)= _____

*Depth to top of screen (cm)= _____ Length screened section (cm)= _____

*note: *depths are from ground surface*

Field Measurements

Measurement method (interface probe, tape, etc): Interface Probe

Well pipe height above ground (cm) (to top of pipe)= 33

Static water level (cm) from top of pipe = 236

Static water level (cm) (below ground surface) calculated = _____

Measured well refusal depth (cm) (measure after sampling)= 316

Thickness of water column (cm)= _____ Static volume of water in well (mL)= _____

Free product thickness (mm)= _____ Evidence of sludge or siltation: _____

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information:

Well purged (Y/N): _____ Recharge Rate: 250 ml/3min

Volume Purged (L) (note multiple purging events if applicable):

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH	6.35	6.23	5.96	
Conductivity (uS/cm)	0.123	0.126	0.127	
Turbidity (NTU)	0.0	0.0	0.0	
Temperature (degC)	8.19	7.62	6.72	

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...): clear, no sheen, no odour.

Decontamination of sampling equipment

Type of decontamination fluid (s): methyl hydrate, soap, water

Number washes: 1 Number rinses: 1

Other Relevant Comments:

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: Fox-2 Landfill Name: Upper Site Landfill Lobe A

Monitoring Well ID: MW-15

Sample Number(s) include dups.: 1

Bottles filled (by parameter type): ALL

Date of Sampling Event: 20 Aug 16 Time: 12:00

Weather: 8°C Slight wind, 20% cloud, Sun

Names of Samplers: KB/JEB

Description of Well Condition and Surrounding ground conditions (note ponding of water):

Well & Casing in good condition, no ponding, dry

Lock (condition, presence, model, manufacturer): present & good

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= _____ Diameter of well (cm)= _____

*Depth to top of screen (cm)= _____ Length screened section (cm)= _____

*note: *depths are from ground surface*

Field Measurements

Measurement method (interface probe, tape, etc): Interface Probe

Well pipe height above ground (cm) (to top of pipe)= 42

Static water level (cm) from top of pipe = 317

Static water level (cm) (below ground surface) calculated = _____

Measured well refusal depth (cm) (measure after sampling)= 386

Thickness of water column (cm)= _____ Static volume of water in well (mL)= _____

Free product thickness (mm)= _____ Evidence of sludge or siltation: _____

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information:

Well purged (Y/N): _____ Recharge Rate: 750 mL/3min

Volume Purged (L) (note multiple purging events if applicable):

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH	6.91	6.70	6.52	
Conductivity (uS/cm)	0.149	0.146	0.149	
Turbidity (NTU)	0.0	2.8	0.0	
Temperature (degC)	7.95	8.26	6.99	

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...): clear, no sheen, no odour

Decontamination of sampling equipment

Type of decontamination fluid (s): methyl hydrate, Soap, water

Number washes: 1 Number rinses: 1

Other Relevant Comments:

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: Fox-2 Landfill Name: Upper Site Landfill Lobe A

Monitoring Well ID: MW-16

Sample Number(s) include dups.: 1

Bottles filled (by parameter type): all (except half PHC, no PCBs)

Date of Sampling Event: 20 Aug 16 Time: 11:00

Weather: 8°, slight wind, sun w 20% cloud

Names of Samplers: KB/JEB

Description of Well Condition and Surrounding ground conditions (note ponding of water):

well & casing in good condition, no ponding, dry ground

Lock (condition, presence, model, manufacturer): present & good

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= _____ Diameter of well (cm)= _____

*Depth to top of screen (cm)= _____ Length screened section (cm)= _____

*note: *depths are from ground surface*

Field Measurements

Measurement method (interface probe, tape, etc): Interface probe

Well pipe height above ground (cm) (to top of pipe)= 39

Static water level (cm) from top of pipe = 193

Static water level (cm) (below ground surface) calculated = _____

Measured well refusal depth (cm) (measure after sampling)= 229

Thickness of water column (cm)= _____ Static volume of water in well (mL)= _____

Free product thickness (mm)= _____ Evidence of sludge or siltation: _____

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information: _____

Well purged (Y/N): _____ Recharge Rate: < 100 mL / 10 min.

Volume Purged (L) (note multiple purging events if applicable): _____

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH	6.86			
Conductivity (uS/cm)	0.183			
Turbidity (NTU)	0.0			
Temperature (degC)	7.68			

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...): clear, no odour, no sheen

Decontamination of sampling equipment

Type of decontamination fluid (s): methyl hydrate, soap, water

Number washes: 1 Number rinses: 1

Other Relevant Comments: _____

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

Appendix B5

FOX-2 Soil Field Notes

SITE NAME: [illegible]

RECORD OF [illegible] SAMPLING

[illegible] 19 Aug 16

SAMPLER NAME: KB/JEB

LANDFILL NAME	SOIL SAMPLE ID	DEPTH (m)	SOIL DESCRIPTION	GPS Northing	GPS Easting	GPS Elevation	Photographs	Backfilled (Y/N)
Airstrip Camp Landfill - LOBE A	F2-6 A	40	Grey Sand with gravel and cobble, dry with trace Organic	Refusal on Rock			3	Y
Airstrip Camp Landfill - LOBE A	F2-6 B	30	Dry grey Sand with gravel & small cobble with trace organic				3	Y
Airstrip Camp Landfill - LOBE A	F2-9 A	50	moist brown sand and gravel, some small cobble,				3	Y
Airstrip Camp landfill Lobe A	F2-9B	30	moist brown sand and gravel, some small cobble.				3	Y
Airstrip Camp Landfill - Lobe A	F2-7 A	50	grey Sandy Silt with trace gravel Starting around 20 cm	-Dup taken.			3	Y
Airstrip Camp Landfill - Lobe A	F2-7 B	30	grey Sand with Brown Sand on top 15cm, Some gravel	-Silt starts @ 20 cm			3	Y
Airstrip Camp Landfill Lobe A	F2-8 A	50	grey sandy silt trace gravel, wet.				3	Y
Airstrip Camp Landfill Lobe A	F2-8B	30	grey sand with brow sand on top 15 cm, wet,	-silt starts @ 20 cm -pond noted near location.			3	Y
Non-Haz waste Landfill	MW-08 A	30	moist brown Sand & gravel, with Cobble				3	Y
Non-Haz waste landfill	MW-07A	50	dry grey Sand, trace gravel, starting @ 20cm	DUP TAKEN			3	Y

SITE NAME: Fox-2

RECORD OF SOIL SAMPLING

DATE: Aug 19, 2016
SAMPLER NAME: RJB / JFB

LANDFILL NAME	SOIL SAMPLE ID	DEPTH (m)	SOIL DESCRIPTION	GPS Northing	GPS Easting	GPS Elevation	Photographs	Backfilled (Y/N)
Non-Haz waste landfill	MW-07B	30	-dry brown sand, with gravel & small cobble, trace organics				3	Y
Non-haz waste landfill	MW-06A	20	-dry brown sand and gravel, some small cobble, trace organics	refusal on rock			3	Y
Non-haz waste Landfill	MW-05A	40	brown Sand with gravel e small cobble - dry	refusal on Rock			3	Y
Non-haz waste Landfill	MW-05B	30	~~brown~~ Sand with gravel e small Cobble; dry				3	Y
Upper Site Landfill Lobe A.	MW-13A	20	Dry brown Sand, some gravel e cobble.	Refusal on Rock	← Start of Aug 20 Sampling		3	Y
Upper site Landfill Lobe A	MW-16A	40	brown moist Sand, Some gravel e cobble	Refusal on Rock			3	Y
Upper Site Landfill Lobe A	MW-16B	30	brown moist sand, Some gravel e cobble - trace organics.				3	Y
Upper Site Landfill Lobe A.	MW-15A	15	Brown Sand, moist with some gravel, Large cobble	refusal on Rock			3	Y
Upper site landfill lobe A	MW-14A	20	brown sand, moist, some gravel & small cobble	refusal on rock	Dup taken		3	Y
Upper Site (Tier II) Landfill Lobe A	MW-10A	30	moist brown Sand, Some gravel, Cobble trace organics	refusal on Rock			3	Y

ME: Fox - 2

RECORD OF SOIL SAMPLING

DATE: Aug 20, 2016
SAMPLER NAME: JKB/JEB

LANDFILL NAME	SOIL SAMPLE ID	DEPTH (m)	SOIL DESCRIPTION	GPS Northing	GPS Easting	GPS Elevation	Photographs	Backfilled (Y/N)
Tier II Disposal facility	MW-11A	40	moist brown sand, some gravel and small cobbles	refusal on rock			3	Y
Tier II Disposal facility	MW-11B	30	moist brown sand, some gravel and small cobble, trace organics				3	Y
Tier II Disposal facility	MW-12A	40	moist brown sand, some gravel and small cobble,	refusal on rock			3	Y
Tier II Disposal facility	MW-12B	30	moist brown sand, some gravel and small cobble, trace organics				3	Y
Tier II Disposal facility	MW-9A	20	moist brown sand, with gravel and small cobbles,	refusal on rock			3	Y

SITE NAME: FZ

Arrived FZ @ 11:30

RECORD OF , SAMPLING

SAMPLER NAME: Z Arnold, Kat

	LANDFILL NAME	SOIL SAMPLE ID	DEPTH (m)	SOIL DESCRIPTION	GPS Northing	GPS Easting	GPS Elevation	Photographs	Backfilled (Y/N)
11:40	West Landfill Lobe E	FZ-1A	15	Cobble e gravel with trace soil, some trace Organic on top 2cm. Dry	Refusal on Rock - Sample is highly concentrated with gravel				
12:00	West Landfill Lobe E	FZ-2A	20	Brown Sand with cobble (small) and gravel, Trace organics e dry.	-Refusal on Shale rock - Dup taken				
12:20	West Landfill Lobe E	FZ-3A	40	Brown Sand with ~~Some~~ gravel and Small Cobble - moist	refusal on rock				
	West Landfill Lobe E	FZ-3B	20	Brown Sand with some gravel and small cobble - dry					
13:00	West Landfill Lobe E	FZ-4A	30	Brown moist sand with cobble and some gravel - trace organics.	Refusal on rock.				
13:15	West Landfill Lobe E	FZ-5A	10	Brown moist Sand, root systems, with Cobble	Refusal on Rock				

6 + 1 dup

APPENDIX C

Laboratory Data

Appendix C1

Certificate of Analysis –
Paracel Laboratories Ltd.,
Sept. 2, 2016; Order #1635440

PARACEL LABORATORIES LTD.
TRUSTED. RESPONSIVE. RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Golder Associates Ltd. (Ottawa)

1931 Robertson Rd.
Ottawa, ON K2H 5B7
Attn: Alyssa Troke

Client PO:
Project: 1530908-2000
Custody: 21508/21509/21856/20409

Report Date: 2-Sep-2016
Order Date: 26-Aug-2016

Order #: 1635440

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1635440-01	MW-07a
1635440-02	MW-08a
1635440-03	MW-12a
1635440-04	F2-9b
1635440-05	F2-9a
1635440-06	F2-8b
1635440-07	MW-06a
1635440-08	MW-11a
1635440-09	MW-10a
1635440-10	F2-8a
1635440-11	MW-16a
1635440-12	MW-12b
1635440-13	F2-6a
1635440-14	MW-9a
1635440-15	MW-15a
1635440-16	MW-11b
1635440-17	MW-13a
1635440-18	MW-14a
1635440-19	MW-16b
1635440-20	MW-5a
1635440-21	F2-3b
1635440-22	F2-7a
1635440-23	F2-7b
1635440-24	MW-07b
1635440-25	F2-6b
1635440-26	MW-05b
1635440-27	F2-2a
1635440-28	F2-5a
1635440-29	F2-1a
1635440-30	F2-4a

Approved By:



Dale Robertson, BSc
Laboratory Director

Any use of these results implies your agreement that our total liabilty in connection with this work, however arising, shall be limited to the amount paid by you for this work, and that our employees or agents shall not under any circumstances be liable to you in connection with this work.

1635440-31	F2-3a

Certificate of Analysis
Client: Golder Associates Ltd. (Ottawa)
Client PO:

Report Date: 02-Sep-2016
Order Date: 26-Aug-2016
Project Description: 1530908-2000

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Mercury by CVAA	EPA 7471B - CVAA, digestion	31-Aug-16	31-Aug-16
Metals, ICP-MS	EPA 6020 - Digestion - ICP-MS	1-Sep-16	1-Sep-16
PCBs, total	SW846 8082A - GC-ECD	29-Aug-16	1-Sep-16
PHC F1	CWS Tier 1 - P&T GC-FID	31-Aug-16	2-Sep-16
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	30-Aug-16	31-Aug-16
Solids, %	Gravimetric, calculation	30-Aug-16	30-Aug-16

Certificate of Analysis

Client: Golder Associates Ltd. (Ottawa)

Client PO:

Report Date: 02-Sep-2016

Order Date: 26-Aug-2016

Project Description: 1530908-2000

	Client ID:	MW-07a	MW-08a	MW-12a	F2-9b
	Sample Date:	19-Aug-16	19-Aug-16	20-Aug-16	19-Aug-16
	Sample ID:	1635440-01	1635440-02	1635440-03	1635440-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	96.4	94.6	86.0	90.8
Metals					
Antimony	1 ug/g dry	1	<1	<1	<1
Arsenic	1 ug/g dry	29	24	34	33
Barium	1 ug/g dry	163	112	76	110
Beryllium	0.5 ug/g dry	<0.5	0.8	<0.5	0.6
Boron	5.0 ug/g dry	<5.0	<5.0	<5.0	<5.0
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5 ug/g dry	71	65	41	61
Cobalt	1 ug/g dry	13	30	11	17
Copper	5 ug/g dry	31	56	54	71
Lead	1 ug/g dry	4	10	11	26
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1 ug/g dry	3	2	2	2
Nickel	5 ug/g dry	38	96	39	57
Selenium	1 ug/g dry	3	<1	1	1
Silver	0.3 ug/g dry	0.3	<0.3	<0.3	<0.3
Thallium	1 ug/g dry	<1	<1	<1	<1
Tin	5 ug/g dry	<5	<5	<5	<5
Uranium	1 ug/g dry	2	3	3	3
Vanadium	10 ug/g dry	49	49	34	47
Zinc	20 ug/g dry	82	117	55	97
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	31
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	<8	318
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	36
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	96.8%	94.4%	69.4%	98.0%

Certificate of Analysis

Client: Golder Associates Ltd. (Ottawa)

Client PO:

Report Date: 02-Sep-2016

Order Date: 26-Aug-2016

Project Description: 1530908-2000

	Client ID:	F2-9a	F2-8b	MW-06a	MW-11a
	Sample Date:	19-Aug-16	19-Aug-16	19-Aug-16	20-Aug-16
	Sample ID:	1635440-05	1635440-06	1635440-07	1635440-08
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	93.4	88.5	91.3	86.3
Metals					
Antimony	1 ug/g dry	<1	<1	<1	<1
Arsenic	1 ug/g dry	32	42	16	33
Barium	1 ug/g dry	108	109	130	71
Beryllium	0.5 ug/g dry	0.6	0.7	0.7	<0.5
Boron	5.0 ug/g dry	<5.0	7.9	17.2	10.7
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5 ug/g dry	64	50	68	39
Cobalt	1 ug/g dry	16	16	16	11
Copper	5 ug/g dry	76	54	60	64
Lead	1 ug/g dry	14	11	8	12
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1 ug/g dry	3	2	1	2
Nickel	5 ug/g dry	60	58	51	40
Selenium	1 ug/g dry	2	1	<1	<1
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1 ug/g dry	<1	<1	<1	<1
Tin	5 ug/g dry	<5	<5	<5	<5
Uranium	1 ug/g dry	3	3	3	4
Vanadium	10 ug/g dry	49	45	51	32
Zinc	20 ug/g dry	112	81	78	53
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	<6
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	94.2%	94.6%	95.4%	84.9%

Certificate of Analysis
Client: Golder Associates Ltd. (Ottawa)
Client PO:

Report Date: 02-Sep-2016
Order Date: 26-Aug-2016
Project Description: 1530908-2000

	Client ID:	MW-10a	F2-8a	MW-16a	MW-12b
	Sample Date:	20-Aug-16	19-Aug-16	20-Aug-16	20-Aug-16
	Sample ID:	1635440-09	1635440-10	1635440-11	1635440-12
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	79.0	90.7	88.5	85.0
Metals					
Antimony	1 ug/g dry	<1	<1	<1	<1
Arsenic	1 ug/g dry	68	44	31	32
Barium	1 ug/g dry	95	97	72	67
Beryllium	0.5 ug/g dry	0.8	0.6	<0.5	<0.5
Boron	5.0 ug/g dry	9.8	11.5	5.2	5.1
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5 ug/g dry	66	47	40	39
Cobalt	1 ug/g dry	15	14	9	10
Copper	5 ug/g dry	132	48	51	54
Lead	1 ug/g dry	29	10	10	11
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1 ug/g dry	5	2	2	2
Nickel	5 ug/g dry	59	46	39	36
Selenium	1 ug/g dry	2	<1	<1	1
Silver	0.3 ug/g dry	0.3	<0.3	<0.3	<0.3
Thallium	1 ug/g dry	<1	<1	<1	<1
Tin	5 ug/g dry	<5	<5	<5	<5
Uranium	1 ug/g dry	7	2	3	3
Vanadium	10 ug/g dry	54	41	33	32
Zinc	20 ug/g dry	82	69	59	48
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	94 [1]	11	<8	61 [1]
F4 PHCs (C34-C50)	6 ug/g dry	46 [1]	<6	<6	38 [1]
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	67.2%	89.9%	80.0%	84.6%

Certificate of Analysis

Client: Golder Associates Ltd. (Ottawa)

Client PO:

Report Date: 02-Sep-2016

Order Date: 26-Aug-2016

Project Description: 1530908-2000

	Client ID:	F2-6a	MW-9a	MW-15a	MW-11b
	Sample Date:	19-Aug-16	20-Aug-16	20-Aug-16	20-Aug-16
	Sample ID:	1635440-13	1635440-14	1635440-15	1635440-16
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	96.4	85.7	87.1	88.0
Metals					
Antimony	1 ug/g dry	<1	<1	1	1
Arsenic	1 ug/g dry	17	64	34	37
Barium	1 ug/g dry	144	59	69	83
Beryllium	0.5 ug/g dry	<0.5	<0.5	0.6	0.6
Boron	5.0 ug/g dry	<5.0	<5.0	<5.0	<5.0
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5 ug/g dry	69	34	43	43
Cobalt	1 ug/g dry	12	10	12	13
Copper	5 ug/g dry	27	34	86	64
Lead	1 ug/g dry	7	11	11	11
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1 ug/g dry	<1	1	3	2
Nickel	5 ug/g dry	41	31	42	46
Selenium	1 ug/g dry	<1	<1	2	<1
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1 ug/g dry	<1	<1	<1	<1
Tin	5 ug/g dry	<5	<5	<5	<5
Uranium	1 ug/g dry	2	2	4	3
Vanadium	10 ug/g dry	49	27	36	35
Zinc	20 ug/g dry	76	50	59	62
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	<6
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	105%	74.3%	65.6%	92.5%

Certificate of Analysis

Client: Golder Associates Ltd. (Ottawa)

Client PO:

Report Date: 02-Sep-2016

Order Date: 26-Aug-2016

Project Description: 1530908-2000

	Client ID:	MW-13a	MW-14a	MW-16b	MW-5a
	Sample Date:	20-Aug-16	20-Aug-16	20-Aug-16	19-Aug-16
	Sample ID:	1635440-17	1635440-18	1635440-19	1635440-20
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	89.8	87.9	84.6	94.7
Metals					
Antimony	1 ug/g dry	1	<1	<1	2
Arsenic	1 ug/g dry	41	27	32	12
Barium	1 ug/g dry	96	77	79	237
Beryllium	0.5 ug/g dry	<0.5	<0.5	0.5	<0.5
Boron	5.0 ug/g dry	<5.0	<5.0	<5.0	<5.0
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5 ug/g dry	45	37	43	88
Cobalt	1 ug/g dry	14	12	9	14
Copper	5 ug/g dry	54	44	56	26
Lead	1 ug/g dry	12	8	11	4
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1 ug/g dry	2	2	2	3
Nickel	5 ug/g dry	44	36	42	42
Selenium	1 ug/g dry	<1	1	<1	3
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1 ug/g dry	<1	<1	<1	<1
Tin	5 ug/g dry	<5	<5	<5	<5
Uranium	1 ug/g dry	3	2	3	2
Vanadium	10 ug/g dry	38	31	36	67
Zinc	20 ug/g dry	66	50	60	81
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	18 [1]	<8	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	11 [1]	<6	<6	<6
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	82.8%	72.2%	92.0%	90.1%

Certificate of Analysis

Client: Golder Associates Ltd. (Ottawa)

Client PO:

Report Date: 02-Sep-2016

Order Date: 26-Aug-2016

Project Description: 1530908-2000

	Client ID:	F2-3b	F2-7a	F2-7b	MW-07b
	Sample Date:	21-Aug-16	19-Aug-16	19-Aug-16	19-Aug-16
	Sample ID:	1635440-21	1635440-22	1635440-23	1635440-24
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	82.7	87.1	90.6	97.5
Metals					
Antimony	1 ug/g dry	1	2	2	1
Arsenic	1 ug/g dry	27	33	53	19
Barium	1 ug/g dry	68	135	99	175
Beryllium	0.5 ug/g dry	1.0	0.6	0.5	<0.5
Boron	5.0 ug/g dry	<5.0	7.8	5.6	<5.0
Cadmium	0.5 ug/g dry	<0.5	0.5	<0.5	<0.5
Chromium	5 ug/g dry	70	58	48	80
Cobalt	1 ug/g dry	18	15	16	13
Copper	5 ug/g dry	54	48	57	20
Lead	1 ug/g dry	10	11	11	8
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1 ug/g dry	2	3	2	<1
Nickel	5 ug/g dry	65	54	52	39
Selenium	1 ug/g dry	2	2	1	<1
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1 ug/g dry	<1	<1	<1	<1
Tin	5 ug/g dry	<5	<5	<5	<5
Uranium	1 ug/g dry	3	2	2	2
Vanadium	10 ug/g dry	50	50	41	59
Zinc	20 ug/g dry	124	77	73	86
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	<6
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	60.3%	85.1%	69.1%	89.0%

Certificate of Analysis
Client: Golder Associates Ltd. (Ottawa)
Client PO:

Report Date: 02-Sep-2016
Order Date: 26-Aug-2016
Project Description: 1530908-2000

	Client ID:	F2-6b	MW-05b	F2-2a	F2-5a
	Sample Date:	19-Aug-16	19-Aug-16	21-Aug-16	21-Aug-16
	Sample ID:	1635440-25	1635440-26	1635440-27	1635440-28
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	96.8	94.4	90.8	93.0
Metals					
Antimony	1 ug/g dry	1	<1	<1	<1
Arsenic	1 ug/g dry	18	19	5	71
Barium	1 ug/g dry	121	189	119	105
Beryllium	0.5 ug/g dry	<0.5	<0.5	0.9	0.7
Boron	5.0 ug/g dry	<5.0	<5.0	<5.0	<5.0
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5 ug/g dry	64	86	84	59
Cobalt	1 ug/g dry	13	14	17	12
Copper	5 ug/g dry	27	24	99	37
Lead	1 ug/g dry	8	7	12	7
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1 ug/g dry	1	<1	1	1
Nickel	5 ug/g dry	44	40	40	39
Selenium	1 ug/g dry	<1	<1	<1	<1
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1 ug/g dry	<1	<1	<1	<1
Tin	5 ug/g dry	<5	<5	<5	<5
Uranium	1 ug/g dry	2	2	4	2
Vanadium	10 ug/g dry	48	62	57	42
Zinc	20 ug/g dry	78	103	93	93
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	101 [1]	73
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	78	42
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	92.5%	97.3%	65.3%	104%

Certificate of Analysis

Report Date: 02-Sep-2016

Client: Golder Associates Ltd. (Ottawa)

Order Date: 26-Aug-2016

Client PO:

Project Description: 1530908-2000

	Client ID:	F2-1a	F2-4a	F2-3a	-
	Sample Date:	21-Aug-16	21-Aug-16	21-Aug-16	-
	Sample ID:	1635440-29	1635440-30	1635440-31	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	95.3	85.3	91.0	-
Metals					
Antimony	1 ug/g dry	<1	<1	<1	-
Arsenic	1 ug/g dry	14	17	27	-
Barium	1 ug/g dry	75	42	71	-
Beryllium	0.5 ug/g dry	0.9	1.0	0.8	-
Boron	5.0 ug/g dry	<5.0	<5.0	<5.0	-
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	-
Chromium	5 ug/g dry	65	41	52	-
Cobalt	1 ug/g dry	22	13	16	-
Copper	5 ug/g dry	75	80	57	-
Lead	1 ug/g dry	10	8	9	-
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	-
Molybdenum	1 ug/g dry	<1	<1	2	-
Nickel	5 ug/g dry	63	39	56	-
Selenium	1 ug/g dry	1	<1	1	-
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	-
Thallium	1 ug/g dry	<1	<1	<1	-
Tin	5 ug/g dry	<5	<5	<5	-
Uranium	1 ug/g dry	2	2	3	-
Vanadium	10 ug/g dry	47	33	42	-
Zinc	20 ug/g dry	97	76	90	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	<8	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	-
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Decachlorobiphenyl	Surrogate	94.5%	88.2%	76.3%	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1	ug/g						
Arsenic	ND	1	ug/g						
Barium	ND	1	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium	ND	5	ug/g						
Cobalt	ND	1	ug/g						
Copper	ND	5	ug/g						
Lead	ND	1	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1	ug/g						
Nickel	ND	5	ug/g						
Selenium	ND	1	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1	ug/g						
Tin	ND	5	ug/g						
Uranium	ND	1	ug/g						
Vanadium	ND	10	ug/g						
Zinc	ND	20	ug/g						
PCBs									
PCBs, total	ND	0.05	ug/g						
Surrogate: Decachlorobiphenyl	*0.0964*		*ug/g*		*96.4*	*60-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND				30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND				30	
Metals									
Antimony	1.2	1	ug/g dry	1.4			9.5	30	
Arsenic	29.8	1	ug/g dry	29.5			1.2	30	
Barium	158	1	ug/g dry	163			2.9	30	
Beryllium	ND	0.5	ug/g dry	ND			0.0	30	
Boron	ND	5.0	ug/g dry	ND			0.0	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium	69.8	5	ug/g dry	70.9			1.5	30	
Cobalt	12.9	1	ug/g dry	13.1			1.3	30	
Copper	30.9	5	ug/g dry	31.3			1.1	30	
Lead	4.3	1	ug/g dry	4.2			0.2	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	3.3	1	ug/g dry	3.1			6.0	30	
Nickel	36.8	5	ug/g dry	37.6			2.1	30	
Selenium	2.9	1	ug/g dry	3.0			2.7	30	
Silver	0.40	0.3	ug/g dry	0.31			24.9	30	
Thallium	ND	1	ug/g dry	ND			0.0	30	
Tin	ND	5	ug/g dry	ND			0.0	30	
Uranium	2.1	1	ug/g dry	2.0			0.8	30	
Vanadium	49.0	10	ug/g dry	49.1			0.2	30	
Zinc	81.1	20	ug/g dry	82.2			1.4	30	
PCBs									
PCBs, total	ND	0.05	ug/g dry	ND				40	
Surrogate: Decachlorobiphenyl	*0.106*		*ug/g dry*		*103*	*60-140*			
Physical Characteristics									
% Solids	89.4	0.1	% by Wt.	86.6			3.2	25	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	167	7	ug/g		83.3	80-120			
F2 PHCs (C10-C16)	86	4	ug/g	ND	81.4	60-140			
F3 PHCs (C16-C34)	206	8	ug/g	ND	94.6	60-140			
F4 PHCs (C34-C50)	149	6	ug/g	ND	102	60-140			
Metals									
Antimony	48.7		ug/L	ND	96.3	70-130			
Arsenic	58.3		ug/L	11.8	92.9	70-130			
Barium	116		ug/L	65.0	101	70-130			
Beryllium	44.7		ug/L	ND	89.2	70-130			
Boron	43.7		ug/L	ND	85.8	70-130			
Cadmium	45.0		ug/L	ND	89.8	70-130			
Chromium	75.5		ug/L	28.3	94.3	70-130			
Cobalt	51.8		ug/L	5.2	93.2	70-130			
Copper	60.3		ug/L	12.5	95.6	70-130			
Lead	50.2		ug/L	1.7	96.9	70-130			
Mercury	1.32	0.1	ug/g	ND	88.1	70-130			
Molybdenum	45.7		ug/L	1.2	88.9	70-130			
Nickel	63.5		ug/L	15.0	96.9	70-130			
Selenium	44.4		ug/L	1.2	86.4	70-130			
Silver	58.0		ug/L	ND	116	70-130			
Thallium	48.5		ug/L	ND	96.4	70-130			
Tin	46.2		ug/L	ND	90.2	70-130			
Uranium	49.4		ug/L	ND	97.2	70-130			
Vanadium	63.1		ug/L	19.6	87.0	70-130			
Zinc	78.4		ug/L	32.9	91.1	70-130			
PCBs									
PCBs, total	0.468	0.05	ug/g	ND	113	60-140			
Surrogate: Decachlorobiphenyl	*0.0980*		*ug/g*		*94.5*	*60-140*			

Qualifier Notes:

Sample Qualifiers :

1 : Peak(s) in the GC-FID Chromatogram are not typical of petroleum hydrocarbon distillates. May be the result of high concentrations of non-mineral based compounds not completely removed by the method cleanup.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.
Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.

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Page 1 of 45

Client Name: Golder Associates	Project Reference: 1530908-2000	TAT: [✓] Regular [ ] 3 Day
Contact Name: Alyssa Troke	Quote # 16-010	[ ] 2 Day [ ] 1 Day
Address: 1931 Robertson Rd Ottawa	PO #	Date Required:
Telephone: 613-592-9600	Email Address: atroke@golder.com dplanderleith@golder.com	

Criteria: [ ] O. Reg. 153/04 (As Amended) Table __ [ ] RSC Filing [ ] O. Reg. 558/00 [ ] PWQO [X] CCME [ ] SUB (Storm) [ ] SUB (Sanitary) Municipality: _____ [ ] Other: _____

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm Sanitary Sewer) P (Paint) A (Air) O (Other)

Paracel Order Number: 1635440 - Soil, 1635445 - Water

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Required Analyses: see guide 16-010	
✓1	MW-07a	S		2	Aug 19/16		X	~60ml + 250ml~
✓2	MW-08a			2	Aug 19/16		X	
✓3	MW-12a			2	Aug 20/16		X	
✓4	F2-9b			2	Aug 19/16		X	
✓5	F2-9a			2	Aug 19/16		X	
✓6	F2-8b			2	Aug 19/16		X	
✓7	MW-06a			2	Aug 19/16		X	
✓8	MW-11a			2	Aug 20/16		X	
✓9	MW-10a			2	Aug 20/16		X	
✓10	F2-8a			2	Aug 19/16		X	

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
Alyssa Troke	A. Jeans	SUNEEP GRN DOR (MM)	Rachel Subject
Relinquished By (Print): Alyssa Troke	Date/Time: 26/08/16 12:00pm	Date/Time: AUG 26, 2016 11:57	Date/Time: Aug 26/16 3:54
Date/Time: Aug 26/16 10:00	Temperature: ____ °C	Temperature: 19.5 °C	pH Verified [X] By: N/A

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Page 2 of 45

Client Name: GAL	Project Reference: 1530908-2000	TAT: [✓] Regular [ ] 3 Day [ ] 2 Day [ ] 1 Day
Contact Name: see pg. 1	Quote # 16-010	
Address:	PO #	Date Required:
Telephone:	Email Address: see pg. 1	

Criteria: [ ] O. Reg. 153/04 (As Amended) Table __ [ ] RSC Filing [ ] O. Reg. 558/00 [ ] PWQO [✓] CCME [ ] SUB (Storm) [ ] SUB (Sanitary) Municipality: _____ [ ] Other: _____

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm Sanitary Sewer) P (Paint) A (Air) O (Other)

Paracel Order Number: 1635440 - soil, 1635445 - water

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Required Analyses: see Quote 16-010										
1	MW-16a	S		2	Aug 20/16		X					- 60ml + 250ml -					
2	MW-12b				Aug 20/16		X										
3	FZ-6a				Aug 19/16		✓										
4	MW-9a				Aug 20/16		X										
5	MW-15a				Aug 20/16		X										
6	MW-11b				Aug 20/16		X										
7	MW-13a				Aug 20/16		X										
8	MW-14a				Aug 20/16		X										
9	MW-16b				Aug 20/16		X										
10	MW-5a				Aug 19/16		X										

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
Alyssa Tonka	T. Traise	SUMEPORN DOKMAI	Rachel Subject
Relinquished By (Print): Alyssa Tonka	Date/Time: 26/08/16 12:00 PM	Date/Time: AUG 26 2016 01:51	Date/Time: Aug 26/16 3:54
Date/Time: Aug 26/16 10:00	Temperature: ____ °C	Temperature: 19.3 °C	pH Verified [X] By: N/A

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Page 3 of 5

Client Name: GAL	Project Reference: 1530908-2000	TAT: [X] Regular [ ] 3 Day [ ] 2 Day [ ] 1 Day
Contact Name: see pg. 1	Quote # 16-010	
Address:	PO #	Date Required:
Telephone:	Email Address: see pg. 1	

Criteria: [ ] O. Reg. 153/04 (As Amended) Table __ [ ] RSC Filing [ ] O. Reg. 558/00 [ ] PWQO [X] CCME [ ] SUB (Storm) [ ] SUB (Sanitary) Municipality: _____ [ ] Other: _____

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Paracel Order Number:
1635440 - Soil
1635445 - Water

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Required Analyses: See Quote 16-010	
1	F2-3b	S		2	Aug 21/16		X	~60ml + 250ml
2	~~F2-6a~~ ~~F2-8a~~ F2-7a				Aug 19/16		X	
3	F2-7b				Aug 19/16		X	
4	MW-07b				Aug 19/16		X	
5	F2-6b				Aug 19/16		X	
6	MW-05b				Aug 19/16		X	
7	F2-2a				Aug 21/16		X	
8	F2-5a				Aug 21/16		X	
9	F2-1a				Aug 21/16		X	
10	F2-4a				Aug 21/16		X	

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
Alyssa Trake	T Louse	Stittsville DOKMAI	Rachel Subject
Relinquished By (Print): Alyssa Trake	Date/Time: 26/08/16 12:00pm	Date/Time: AUG 26 2016 01:51	Date/Time: Aug 26/16 3:54
Date/Time: Aug 26/16 10:00	Temperature: ___ °C	Temperature: 19.3 °C	pH Verified [X] By: NA

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Page 1 of 45

Client Name: GAL	Project Reference: 1530908-2000	TAT: [X] Regular [ ] 3 Day [ ] 2 Day [ ] 1 Day
Contact Name: see pg. 1	Quote # 16-010	
Address:	PO #	
Telephone:	Email Address: see pg. 1	Date Required:

Criteria: [ ] O. Reg. 153/04 (As Amended) Table __ [ ] RSC Filing [ ] O. Reg. 558/00 [ ] PWQO [X] CCME [ ] SUB (Storm) [ ] SUB (Sanitary) Municipality: _____ [ ] Other: _____

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analyses

Paracel Order Number:
1635440 - Soil
1635445 - water

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	see Quote 16-010									
1	E2-3a	S		2	Aug 21/16		X						60 ml + 250 ml -			
2	MW-6	W		6	Aug 19/16	15:45	X									
3	MW-16	W		5	Aug 20/16	11:00	X	no PCBs, analyse PHCs if possible								
4	MW-12	W		6	Aug 20/16	16:00	X	no PCBs								
5	MW-13	W		4	Aug 20/16	10:00	X	no PCBs or PHCs								
6	MW-15	W		6	Aug 20/16	12:00	X									
7	MW-14	W		6	Aug 20/16	13:00	X									
8	MW-9	W		6	Aug 20/16	17:00	X									
9	MW-10	W		6	Aug 20/16	14:00	X									
10	Probe Blank	W		6	Aug 19/16	17:00	X									

Comments: MW-16: analyse PHCs if possible (low volume)
MW-13: no PCB or PHC

Method of Delivery: Paracel

Relinquished By (Sign): Alyssa Yake	Received by Driver/Depot: T. Flouse	Received at Lab: SUNSET PORN DOR MAL	Verified By: Rachel Subject
Relinquished By (Print): Alyssa Yake	Date/Time: Aug 26/16 12:00 PM	Date/Time: Aug 26/16 01:51	Date/Time: Aug 26/16 3:54
Date/Time: Aug 26/16 10:00	Temperature: ____ °C	Temperature: 7.3 °C	pH Verified [ ] By: RS

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Page 5 of 5

Client Name: GAL	Project Reference: 1530908	TAT: [X] Regular [ ] 3 Day [ ] 2 Day [ ] 1 Day
Contact Name: see page 1	Quote # 16-010	
Address:	PO #	Date Required:
Telephone:	Email Address: see page 1	

Criteria: [ ] O. Reg. 153/04 (As Amended) Table __ [ ] RSC Filing [ ] O. Reg. 558/00 [ ] PWQO [X] CCME [ ] SUB (Storm) [ ] SUB (Sanitary) Municipality: _____ [ ] Other: _____

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analyses

Paracel Order Number: 1635440-Soil 1635445-water.

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	see quote 16-010						
1	MW-7	W		6	Aug 19/16	14:350								X						
2	Field Blank	W		5	Aug 19/16	17:15								X	no PHC analysis					
3	Trip Blank	W		6	Aug 8/16									X						
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
Alyssa Tuke	T. Louise	SUMEPORN DOK MAI	Rachel Subject
Relinquished By (Print): Alyssa Tuke	Date/Time: Aug 26/16 12:00pm	Date/Time: Aug 26 2016 01:51	Date/Time: Aug 26/16 3:54
Date/Time: Aug 26/16 10:00	Temperature: ____ °C	Temperature: 19.3 °C	pH Verified [ ] By: RS

Appendix C2

Certificate of Analysis –
Paracel Laboratories Ltd.,
Sept. 2, 2016; Order #1635445

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Certificate of Analysis

Golder Associates Ltd. (Ottawa)

1931 Robertson Rd.
Ottawa, ON K2H 5B7
Attn: Alyssa Troke

Client PO:
Project: 1530908-2000
Custody: 20409/102554

Report Date: 2-Sep-2016
Order Date: 26-Aug-2016

Order #: 1635445

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1635445-01	MW-6
1635445-02	MW-16
1635445-03	MW-12
1635445-04	MW-13
1635445-05	MW-15
1635445-06	MW-14
1635445-07	MW-9
1635445-08	MW-10
1635445-09	Probe Blank
1635445-10	MW-7
1635445-11	Field Blank
1635445-12	Trip Blank

Approved By:



Dale Robertson, BSc
Laboratory Director

Any use of these results implies your agreement that our total liabilty in connection with this work, however arising, shall be limited to the amount paid by you for this work, and that our employees or agents shall not under any circumstances be liable to you in connection with this work.

Certificate of Analysis
Client: Golder Associates Ltd. (Ottawa)
Client PO:

Report Date: 02-Sep-2016
Order Date: 26-Aug-2016
Project Description: 1530908-2000

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Mercury by CVAA	EPA 245.1 - Cold Vapour AA	30-Aug-16	30-Aug-16
Metals, ICP-MS	EPA 200.8 - ICP-MS	1-Sep-16	2-Sep-16
PCBs, total	EPA 608 - GC-ECD	30-Aug-16	30-Aug-16
PHC F1	CWS Tier 1 - P&T GC-FID	26-Aug-16	29-Aug-16
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	29-Aug-16	30-Aug-16

Certificate of Analysis

Report Date: 02-Sep-2016

Client: Golder Associates Ltd. (Ottawa)

Order Date: 26-Aug-2016

Client PO:

Project Description: 1530908-2000

	Client ID:	MW-6	MW-16	MW-12	MW-13
	Sample Date:	19-Aug-16	20-Aug-16	20-Aug-16	20-Aug-16
	Sample ID:	1635445-01	1635445-02	1635445-03	1635445-04
	MDL/Units	Water	Water	Water	Water
Metals					
Mercury	0.0001 mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Arsenic	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Cadmium	0.0001 mg/L	<0.0001	<0.0001	0.0003	<0.0001
Chromium	0.001 mg/L	<0.001	<0.001	<0.001	0.001
Cobalt	0.0005 mg/L	0.0045	0.0128	0.0244	0.0120
Copper	0.0005 mg/L	0.0064	0.0031	0.0082	0.0141
Lead	0.0001 mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	0.001 mg/L	0.053	0.033	0.097	0.069
Zinc	0.005 mg/L	0.008	0.759	0.037	0.012
Hydrocarbons					
F1 PHCs (C6-C10)	0.025 mg/L	<0.025 [2]	<0.025 [2]	<0.025 [2]	<0.025 [2]
F2 PHCs (C10-C16)	0.100 mg/L	<0.100 [2]	<0.216 [1] [2]	<0.100 [2]	-
F3 PHCs (C16-C34)	0.100 mg/L	<0.100 [2]	<0.216 [1] [2]	<0.100 [2]	-
F4 PHCs (C34-C50)	0.100 mg/L	<0.100 [2]	<0.216 [1] [2]	<0.100 [2]	-
PCBs					
PCBs, total	0.00005 mg/L	<0.00005	-	<0.00005	-
Decachlorobiphenyl	Surrogate	85.5%	-	88.8%	-

Certificate of Analysis

Report Date: 02-Sep-2016

Client: Golder Associates Ltd. (Ottawa)

Order Date: 26-Aug-2016

Client PO:

Project Description: 1530908-2000

	Client ID:	MW-15	MW-14	MW-9	MW-10
	Sample Date:	20-Aug-16	20-Aug-16	20-Aug-16	20-Aug-16
	Sample ID:	1635445-05	1635445-06	1635445-07	1635445-08
	MDL/Units	Water	Water	Water	Water
Metals					
Mercury	0.0001 mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Arsenic	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Cadmium	0.0001 mg/L	0.0003	0.0001	0.0002	0.0007
Chromium	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Cobalt	0.0005 mg/L	0.0094	0.0133	0.0243	0.0673
Copper	0.0005 mg/L	0.0056	0.0078	0.0079	0.0613
Lead	0.0001 mg/L	<0.0001	<0.0001	<0.0001	0.0003
Nickel	0.001 mg/L	0.036	0.042	0.102	0.256
Zinc	0.005 mg/L	0.024	0.025	0.043	0.119
Hydrocarbons					
F1 PHCs (C6-C10)	0.025 mg/L	<0.025 [2]	<0.025 [2]	<0.025 [2]	<0.025 [2]
F2 PHCs (C10-C16)	0.100 mg/L	<0.100 [2]	<0.100 [2]	<0.100 [2]	<0.100 [2]
F3 PHCs (C16-C34)	0.100 mg/L	<0.100 [2]	<0.100 [2]	<0.100 [2]	<0.100 [2]
F4 PHCs (C34-C50)	0.100 mg/L	<0.100 [2]	<0.100 [2]	<0.100 [2]	<0.100 [2]
PCBs					
PCBs, total	0.00005 mg/L	<0.00005	<0.00005	<0.00005	<0.00005
Decachlorobiphenyl	Surrogate	90.7%	90.2%	97.1%	77.8%

Certificate of Analysis

Client: Golder Associates Ltd. (Ottawa)

Client PO:

Report Date: 02-Sep-2016

Order Date: 26-Aug-2016

Project Description: 1530908-2000

	Client ID:	Probe Blank	MW-7	Field Blank	Trip Blank
	Sample Date:	19-Aug-16	19-Aug-16	19-Aug-16	08-Aug-16
	Sample ID:	1635445-09	1635445-10	1635445-11	1635445-12
	MDL/Units	Water	Water	Water	Water
Metals					
Mercury	0.0001 mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Arsenic	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Cadmium	0.0001 mg/L	<0.0001	0.0003	<0.0001	<0.0001
Chromium	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Cobalt	0.0005 mg/L	<0.0005	0.0308	<0.0005	<0.0005
Copper	0.0005 mg/L	<0.0005	0.0097	<0.0005	<0.0005
Lead	0.0001 mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	0.001 mg/L	<0.001	0.201	<0.001	<0.001
Zinc	0.005 mg/L	0.006	0.059	<0.005	<0.005
Hydrocarbons					
F1 PHCs (C6-C10)	0.025 mg/L	<0.025 [2]	<0.025 [2]	<0.025 [2]	<0.025 [2]
F2 PHCs (C10-C16)	0.100 mg/L	<0.100 [2]	<0.100 [2]	-	<0.100 [2]
F3 PHCs (C16-C34)	0.100 mg/L	<0.100 [2]	<0.100 [2]	-	<0.100 [2]
F4 PHCs (C34-C50)	0.100 mg/L	<0.100 [2]	<0.100 [2]	-	<0.100 [2]
PCBs					
PCBs, total	0.00005 mg/L	<0.00005	<0.00005	<0.00005	<0.00005 [2]
Decachlorobiphenyl	Surrogate	74.8%	90.5%	93.1%	83.4% [2]

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	0.025	mg/L						
F2 PHCs (C10-C16)	ND	0.100	mg/L						
F3 PHCs (C16-C34)	ND	0.100	mg/L						
F4 PHCs (C34-C50)	ND	0.100	mg/L						
Metals									
Mercury	ND	0.0001	mg/L						
Arsenic	ND	0.001	mg/L						
Cadmium	ND	0.0001	mg/L						
Chromium	ND	0.001	mg/L						
Cobalt	ND	0.0005	mg/L						
Copper	ND	0.0005	mg/L						
Lead	ND	0.0001	mg/L						
Nickel	ND	0.001	mg/L						
Zinc	ND	0.005	mg/L						
PCBs									
PCBs, total	ND	0.00005	mg/L						
Surrogate: Decachlorobiphenyl	*.00019*		*mg/L*		*77.9*	*60-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	0.025	mg/L	ND				30	
Metals									
Mercury	ND	0.0001	mg/L	ND				20	
Arsenic	ND	0.001	mg/L	ND				20	
Cadmium	ND	0.0001	mg/L	ND				20	
Chromium	ND	0.001	mg/L	ND			0.0	20	
Cobalt	0.00083	0.0005	mg/L	0.00083			0.1	20	
Copper	0.00055	0.0005	mg/L	0.00062			12.0	20	
Lead	ND	0.0001	mg/L	ND				20	
Nickel	ND	0.001	mg/L	ND			0.0	20	
Zinc	ND	0.005	mg/L	ND			0.0	20	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1.93	0.025	mg/L		96.4	68-117			
F2 PHCs (C10-C16)	1.98	0.100	mg/L		110	60-140			
F3 PHCs (C16-C34)	4.07	0.100	mg/L		109	60-140			
F4 PHCs (C34-C50)	2.58	0.100	mg/L		104	60-140			
Metals									
Mercury	0.00292	0.0001	mg/L	ND	97.2	70-130			
Arsenic	44.0		ug/L		88.1	80-120			
Cadmium	47.0		ug/L		93.9	80-120			
Chromium	47.4		ug/L		94.7	80-120			
Cobalt	47.0		ug/L		94.0	80-120			
Copper	47.0		ug/L		94.0	80-120			
Lead	44.7		ug/L		89.4	80-120			
Nickel	46.4		ug/L		92.8	80-120			
Zinc	46		ug/L		91.9	80-120			
PCBs									
PCBs, total	0.00112	0.00005	mg/L		112	60-140			
Surrogate: Decachlorobiphenyl	*.00022*		*mg/L*		*89.3*	*60-140*			

Qualifier Notes:

Login Qualifiers :

Sample - One or more parameter received past hold time -
Applies to samples: MW-6, MW-7, Trip

Sample - Insufficient volume - low volume PHCs - if analysis possible run as per client
Applies to samples: MW-16

Sample Qualifiers :

1 : Elevated Reporting Limits due to limited sample volume.

2 : Holding time had been exceeded upon receipt of the sample at the laboratory.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.

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Ottawa, Ontario K1G 4J8
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www.paracellabs.com

Chain of Custody
(Lab Use Only)
№ 20409

Page 1 of 15

Client Name: GAL	Project Reference: 1530908-2000	TAT: [✓] Regular [ ] 3 Day
Contact Name: see pg. 1	Quote # 16-010	[ ] 2 Day [ ] 1 Day
Address:	PO #	Date Required:
Telephone:	Email Address: see pg. 1	

Criteria: [ ] O. Reg. 153/04 (As Amended) Table ___ [ ] RSC Filing [ ] O. Reg. 558/00 [ ] PWQO [X] CCME [ ] SUB (Storm) [ ] SUB (Sanitary) Municipality: _____ [ ] Other: _____

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Paracel Order Number: 1635440-Soil, 1635448-water

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	see quote 16-010	Required Analyses
✓1	F2-3a	S		2	Aug 21/16		X	60mL + 250mL
2	MW-6	W		6	Aug 19/16	15:45	X	
3	MW-16	W		5	Aug 20/16	11:00	X	no PCBs, analyse PHCs if poss. b/c
4	MW-12	W		6	Aug 20/16	16:00	X	no PCBs
5	MW-13	W		4	Aug 20/16	10:00	X	no PCBs or PHCs
6	MW-15	W		6	Aug 20/16	12:00	X	
7	MW-14	W		6	Aug 20/16	13:00	X	
8	MW-9	W		6	Aug 20/16	17:00	X	
9	MW-10	W		6	Aug 20/16	14:00	X	
10	Probe Blank	W		6	Aug 19/16	17:00	X	

Comments: MW-16: analyse PHCs if possible (low volume)
MW-13: no PCB or PHC

Method of Delivery: Paracel

Relinquished By (Sign): Alyssa Tudo	Received by Driver/Depot: T. LOUISE	Received at Lab: SUNNYBORN DOR MAL	Verified By: Rachel Subject
Relinquished By (Print): Alyssa Tudo	Date/Time: 26/08/16 12:00 PM	Date/Time: Aug 26/16 01:51	Date/Time: Aug 26/16 3:54
Date/Time: Aug 26/16 10:00	Temperature: ___ °C	Temperature: 9.3 °C	pH Verified [✓] By: RS

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OTTAWA ◉ KINGSTON ◉ NIAGARA ◉ MISSISSAUGA ◉ SARNIA

Chain of Custody
(Lab Use Only)
№ 102554

Page 5 of 5

Client Name: GAL
Contact Name: see page 1
Address:
Telephone:

Project Reference: 1530908
Quote # 16-010
PO #
Email Address: see page 1

TAT: [X] Regular [ ] 3 Day [ ] 2 Day [ ] 1 Day
Date Required:

Criteria: [ ] O. Reg. 153/04 (As Amended) Table _ [ ] RSC Filing [ ] O. Reg. 558/00 [ ] PWQO [X] CCME [ ] SUB (Storm) [ ] SUB (Sanitary) Municipality: _____ [ ] Other: _____

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analyses

Paracel Order Number:
1635440-Soil
1635445-water.

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	See quote 16-010						
1	MW-7	W		6	Aug 19/16	14:50								X						
2	Field Blank	W		5	Aug 19/16	17:15								X	no PHC analysis					
3	Trip Blank	W		6	Aug 8/16									X						
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
Alyssa Tuske	A. Louise	SUNNYBORN DOR MA	Rachel Subject
Relinquished By (Print): Alyssa Tuske	Date/Time: Aug 26/16 12:00 PM	Date/Time: Aug 26 2016 01:51	Date/Time: Aug 26/16 3:54
Date/Time: Aug 26/16 10:00	Temperature: ____ °C	Temperature: 19.3 °C	pH Verified [ ] By: RS

Appendix C3

Certificate of Analysis –
AGAT Laboratories Ltd.,
Sept. 15, 2016; Order #16Z131232

AGAT Laboratories

5835 COOPERS AVENUE
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http://www.agatlabs.com

CLIENT NAME: GOLDER ASSOCIATES LTD
1931 ROBERTSON ROAD
OTTAWA, ON K2H5B7
(613) 592-9600

ATTENTION TO: Alyssa Troke

PROJECT: 1530908-2000

AGAT WORK ORDER: 16Z131232

SOIL ANALYSIS REVIEWED BY: Mike Muneswar, BSc (Chem), Senior Inorganic Analyst

TRACE ORGANICS REVIEWED BY: Gyulhan Yalamova, Report Reviewer

WATER ANALYSIS REVIEWED BY: Mike Muneswar, BSc (Chem), Senior Inorganic Analyst

DATE REPORTED: Sep 15, 2016

PAGES (INCLUDING COVER): 9

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

Member of: Association of Professional Engineers, Geologists and Geophysicists of Alberta (APEGGA)
Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

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Results relate only to the items tested and to all the items tested
All reportable information as specified by ISO 17025:2005 is available from AGAT Laboratories upon request

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 16Z131232

PROJECT: 1530908-2000

CLIENT NAME: GOLDER ASSOCIATES LTD

ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line

SAMPLED BY:

CCME Metals Scan (Soil) (incl. Hg)

DATE RECEIVED: 2016-08-26

DATE REPORTED: 2016-09-15

Parameter	Unit	G / S	RDL	SAMPLE DESCRIPTION: F2-2a dup SAMPLE TYPE: Soil DATE SAMPLED: 8/21/2016 7808509	MW-14a dup Soil 8/20/2016 7808513	F2-7a dup Soil 8/19/2016 7808515	MW07a dup Soil 8/19/2016 7808517
Arsenic	mg/kg		1	4	36	35	28
Cadmium	mg/kg		0.5	<0.5	<0.5	<0.5	<0.5
Cobalt	mg/kg		0.5	8.5	12.2	13.9	12.2
Chromium	mg/kg		1	75	36	51	72
Copper	mg/kg		1	68	42	41	26
Lead	mg/kg		1	10	8	10	4
Mercury	mg/kg		0.10	<0.10	<0.10	<0.10	<0.10
Nickel	mg/kg		1	21	36	47	36
Zinc	mg/kg		1	90	64	87	86

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 16Z131232

PROJECT: 1530908-2000

CLIENT NAME: GOLDER ASSOCIATES LTD

ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line

SAMPLED BY:

PCBs (soil)

DATE RECEIVED: 2016-08-26

DATE REPORTED: 2016-09-15

		SAMPLE DESCRIPTION:		F2-2a dup	MW-14a dup	F2-7a dup	MW07a dup
		SAMPLE TYPE:		Soil	Soil	Soil	Soil
		DATE SAMPLED:		8/21/2016	8/20/2016	8/19/2016	8/19/2016
Parameter	Unit	G / S	RDL	7808509	7808513	7808515	7808517
PCBs	mg/kg		0.05	<0.05	<0.05	<0.05	<0.05
Surrogate	Unit	Acceptable Limits					
Decachlorobiphenyl	%	60-130		100	112	84	84

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

7808509-7808517 Results are based on the dry weight of soil extracted.

Certified By:



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Certificate of Analysis

AGAT WORK ORDER: 16Z131232

PROJECT: 1530908-2000

CLIENT NAME: GOLDER ASSOCIATES LTD

ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line

SAMPLED BY:

Petroleum Hydrocarbons F1 - F4 (C6 - C50) in Soil

DATE RECEIVED: 2016-08-26

DATE REPORTED: 2016-09-15

		SAMPLE DESCRIPTION:		F2-2a dup	MW-14a dup	F2-7a dup	MW07a dup
		SAMPLE TYPE:		Soil	Soil	Soil	Soil
		DATE SAMPLED:		8/21/2016	8/20/2016	8/19/2016	8/19/2016
Parameter	Unit	G / S	RDL	7808509	7808513	7808515	7808517
C6 - C10 (F1)	mg/kg		5	<5	<5	<5	<5
C>10 - C16 (F2)	mg/kg		10	<10	<10	<10	<10
C>16 - C34 (F3)	mg/kg		50	<50	<50	<50	<50
C>34 - C50 (F4)	mg/kg		50	<50	<50	<50	<50
Gravimetric Heavy Hydrocarbons	mg/kg		50	NA	NA	NA	NA
Moisture Content	%		0.1	8.5	23.1	12.1	6.6

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

7808509-7808517 Results are based on sample dry weight.
The C6-C10 fraction is calculated using toluene response factor.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6 - C50 results are corrected for BTEX contributions.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.
Quality Control Data is available upon request.
The soil sample was prepared in the lab using the Methanol extraction technique. The sample was not field preserved with methanol and an Encore was not provided for analysis.

Certified By:



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Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD

AGAT WORK ORDER: 16Z131232

PROJECT: 1530908-2000

ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line

SAMPLED BY:

Soil Analysis

RPT Date: Sep 15, 2016			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
CCME Metals Scan (Soil) (incl. Hg)															
Arsenic	7811293		3	3	NA	< 1	106%	70%	130%	103%	80%	120%	103%	70%	130%
Cadmium	7811293		<0.5	<0.5	NA	< 0.5	106%	70%	130%	109%	80%	120%	110%	70%	130%
Cobalt	7811293		4.5	4.3	4.5%	< 0.5	93%	70%	130%	101%	80%	120%	99%	70%	130%
Chromium	7811293		26	25	3.9%	< 1	86%	70%	130%	104%	80%	120%	90%	70%	130%
Copper	7811293		9	8	11.8%	< 1	98%	70%	130%	102%	80%	120%	99%	70%	130%
Lead	7811293		8	7	13.3%	< 1	106%	70%	130%	101%	80%	120%	99%	70%	130%
Mercury	7812256		<0.10	<0.10	NA	< 0.10	106%	70%	130%	94%	80%	120%	87%	70%	130%
Nickel	7811293		15	15	0.0%	< 1	98%	70%	130%	106%	80%	120%	103%	70%	130%
Zinc	7811293		31	30	3.3%	< 1	96%	70%	130%	104%	80%	120%	103%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By:

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Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD
AGAT WORK ORDER: 16Z131232

PROJECT: 1530908-2000
ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line
SAMPLED BY:

Trace Organics Analysis

RPT Date: Sep 15, 2016			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
PCBs (soil)															
PCBs	7809963		< 0.1	< 0.1	NA	< 0.1	111%	60%	140%	107%	60%	140%	100%	60%	140%
Petroleum Hydrocarbons F1 - F4 (C6 - C50) in Soil															
C6 - C10 (F1)	7805396		< 5	< 5	NA	< 5	71%	60%	130%	86%	60%	130%	102%	60%	130%
C>10 - C16 (F2)	7801675		< 10	< 10	NA	< 10	102%	70%	130%	80%	70%	130%	85%	70%	130%
C>16 - C34 (F3)	7801675		< 50	< 50	NA	< 50	103%	70%	130%	99%	70%	130%	89%	70%	130%
C>34 - C50 (F4)	7801675		< 50	< 50	NA	< 50	84%	70%	130%	96%	70%	130%	104%	70%	130%
PCBs (water)															
PCBs		TW	<0.05	<0.05	NA	<0.05	108%	60%	140%	113%	60%	140%	113%	60%	140%
Petroleum Hydrocarbon F1 - F4 in Water															
C6 - C10 (F1)	7807613		< 25	< 25	NA	< 25	111%	70%	130%	104%	70%	130%	76%	70%	130%
C>10 - C16 (F2)		TW	< 100	< 100	NA	< 100	100%	70%	130%	70%	70%	130%	70%	70%	130%
C>16 - C34 (F3)			< 100	< 100	NA	< 100	102%	70%	130%	84%	70%	130%	84%	70%	130%
C>34 - C50 (F4)			< 100	< 100	NA	< 100	100%	70%	130%	92%	70%	130%	88%	70%	130%

Comments: Tap water analysis has been performed as QC sample testing for duplicate and matrix spike due to insufficient sample volume.
When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

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FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD

AGAT WORK ORDER: 16Z131232

PROJECT: 1530908-2000

ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line

SAMPLED BY:

Water Analysis

RPT Date: Sep 15, 2016			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
CCME Metals - (Water) - (incl. Hg)															
Arsenic	7820788		< 0.001	< 0.001	NA	< 0.001	101%	90%	110%	105%	90%	110%	106%	70%	130%
Cadmium	7820788		< 0.0001	< 0.0001	NA	< 0.0001	100%	90%	110%	102%	90%	110%	110%	70%	130%
Chromium	7820788		< 0.001	< 0.001	NA	< 0.001	100%	90%	110%	100%	90%	110%	98%	70%	130%
Cobalt	7820788		< 0.0005	< 0.0005	NA	< 0.0005	97%	90%	110%	99%	90%	110%	95%	70%	130%
Copper	7820788		0.031	0.031	0.0%	< 0.005	100%	90%	110%	103%	90%	110%	83%	70%	130%
Lead	7820788		0.0001	0.0001	NA	< 0.0001	100%	90%	110%	102%	90%	110%	100%	70%	130%
Mercury	7805877		<0.0001	<0.0001	NA	< 0.0001	99%	90%	110%	103%	90%	110%	98%	80%	120%
Nickel	7820788		< 0.001	< 0.001	NA	< 0.001	101%	90%	110%	103%	90%	110%	97%	70%	130%
Zinc	7820788		0.005	0.005	NA	< 0.005	101%	90%	110%	103%	90%	110%	106%	70%	130%

Comments: .NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By:

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http://www.agatlabs.com

Method Summary

CLIENT NAME: GOLDER ASSOCIATES LTD

AGAT WORK ORDER: 16Z131232

PROJECT: 1530908-2000

ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Trace Organics Analysis			
PCBs	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD
Decachlorobiphenyl	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD
PCBs	ORG-91-5112	EPA SW-846 3510 & 8082	GC/ECD
Decachlorobiphenyl	ORG-91-5112	EPA SW-846 3510 & 8082	GC/ECD
C6 - C10 (F1)	VOL-91-5010	MOE PHC-E3421	(P&T)GC/FID
C>10 - C16 (F2)	VOL-91-5010	MOE PHC-E3421	GC/FID
C>16 - C34 (F3)	VOL-91-5010	MOE PHC-E3421	GC/FID
C>34 - C50 (F4)	VOL -91- 5010	MOE PHC-E3421	GC/FID
Gravimetric Heavy Hydrocarbons	VOL-91-5010	MOE PHC-E3421	BALANCE
C6 - C10 (F1)	VOL-91-5009	CCME Tier 1 Method	P & T GC/FID
C>10 - C16 (F2)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
C>16 - C34 (F3)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
C>34 - C50 (F4)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
Gravimetric Heavy Hydrocarbons	VOL - 5012	CCME Tier 1 Method	GRAVIMETRIC ANALYSIS
Moisture Content	VOL-91-5009	CCME Tier 1 Method	Balance
Water Analysis			
Arsenic	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cadmium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Chromium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Copper	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Lead	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Mercury	MET-93-6100	EPA SW-846 7470 & 245.1	CVAAS
Nickel	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Zinc	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS

Results relate only to the items tested and to all the items tested

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water intended for human consumption)

Report Information:

Company: Golder Associates
Contact: Alyssa Trake
Address: 1931 Robertson Rd
Ottawa
Phone: 613-592-9600 Fax:
Reports to be sent to:
1. Email: atrake@golder.com
2. Email: dplenderleith@golder.com

Project Information:

Project: 1536908-2000
Site Location:
Sampled By:
AGAT Quote #: 69566 PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☐ No ☐

Company:
Contact:
Address:
Email:

Regulatory Requirements:

☐ No Regulatory Requirement
(Please check all applicable boxes)

☐ Regulation 153/04
Table _____ *Indicate One*
☐ Ind/Com
☐ Res/Park
☐ Agriculture
Soil Texture *(Check One)*
☐ Coarse
☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm
Region _____ *Indicate One*

☐ Regulation 558
☒ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
_____ *Indicate One*

Is this submission for a **Record of Site Condition?** ☐ Yes ☑ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☑ No

Laboratory Use Only

Work Order #: 16713123 2
Cooler Quantity: 1
Arrival Temperatures: 6.7 | 6.9 | 6.5
6 | 5.9 | 5.8
Custody Seal Intact: ☐ Yes ☐ No ☐ N/A
Notes: on ice

Turnaround Time (TAT) Required:

Regular TAT ☒ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ 1 Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Metals and Inorganics	Metal Scan	Hydride Forming Metals	Client Custom Metals	(Check Applicable) ORPs: ☐ B-HWS ☐ Cl⁻ ☐ CN⁻ ☐ Cr^{6+} ☐ EC ☐ FOC ☐ NO_3/NO_2 ☐ Total N ☐ Hg ☐ pH ☐ SAR	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3/NO_2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	CCME Fractions 1 to 4	ABNs	PAHs	Chlorophenols	PCBs	Organochlorine Pesticides	TCLP Metals/Inorganics	Sewer Use	See Quote 69566							
MW-9 dup	Aug 2/16		4	GW																		X	X		- Missing 1 vial					
FZ-3a dup	Aug 21/16		2	S																		X	X							
MW-14a dup	Aug 20/16		↓	S																		X	X							
FZ-7a dup	Aug 19/16			S																		X	X							
MW-07a dup	Aug 19/16			S																		X								

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Alyssa Trake ~~Att~~ Alyssa Trake	Aug 26/16	10:30	CBerthelet DLLLLLL	26-Aug-16	12h05
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
			Simon	16/8/27	952

Page 1 of 1
N°: T017214

Document ID: DIV-78-1511.000

Pink Copy - Client | Yellow Copy - AGAT | White Copy - AGAT

Date Issued: Jan 8, 2015

Appendix C4

Certificate of Analysis –
AGAT Laboratories Ltd.,
Nov. 2, 2016; Order #16Z131232

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: GOLDER ASSOCIATES LTD
1931 ROBERTSON ROAD
OTTAWA, ON K2H5B7
(613) 592-9600

ATTENTION TO: Alyssa Troke

PROJECT: 1530908-2000

AGAT WORK ORDER: 16Z131232

SOIL ANALYSIS REVIEWED BY: Mike Muneswar, BSc (Chem), Senior Inorganic Analyst

TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor

WATER ANALYSIS REVIEWED BY: Mike Muneswar, BSc (Chem), Senior Inorganic Analyst

DATE REPORTED: Nov 02, 2016

PAGES (INCLUDING COVER): 9

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

Member of: Association of Professional Engineers, Geologists and Geophysicists of Alberta (APEGGA)
Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation.

Results relate only to the items tested and to all the items tested
All reportable information as specified by ISO 17025:2005 is available from AGAT Laboratories upon request

AGAT Laboratories

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MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
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Certificate of Analysis

AGAT WORK ORDER: 16Z131232

PROJECT: 1530908-2000

CLIENT NAME: GOLDER ASSOCIATES LTD

ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line

SAMPLED BY:

PCBs (water)

DATE RECEIVED: 2016-08-26

DATE REPORTED: 2016-11-02

				SAMPLE DESCRIPTION:	MW-9 dup
				SAMPLE TYPE:	Water
				DATE SAMPLED:	2016-08-02
Parameter	**Unit**	**G / S**	**RDL**	**7808503**	
PCBs	mg/L		0.00005	<0.00005	
Surrogate	**Unit**	**Acceptable Limits**			
Decachlorobiphenyl	%	60-130		109	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 16Z131232

PROJECT: 1530908-2000

CLIENT NAME: GOLDER ASSOCIATES LTD

ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line

SAMPLED BY:

Petroleum Hydrocarbon F1 - F4 in Water

DATE RECEIVED: 2016-08-26

DATE REPORTED: 2016-11-02

		SAMPLE DESCRIPTION:		MW-9 dup
		SAMPLE TYPE:		Water
		DATE SAMPLED:		2016-08-02
Parameter	Unit	G / S	RDL	7808503
C6 - C10 (F1)	mg/L		0.025	<0.025
C>10 - C16 (F2)	mg/L		0.1	<0.1
C>16 - C34 (F3)	mg/L		0.1	<0.1
C>34 - C50 (F4)	mg/L		0.1	<0.1
Gravimetric Heavy Hydrocarbons	mg/L		0.5	NA

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

7808503

The C6-C10 fraction is calculated using Toluene response factor.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and nC34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16 - C50 and are only determined if the chromatogram of the C34 - C50 Hydrocarbons indicated that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6-C50 results are corrected for BTEX contributions.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153/04, results are considered valid without determining the PAH contribution if not requested by the client.
NA = Not Applicable

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 16Z131232

PROJECT: 1530908-2000

CLIENT NAME: GOLDER ASSOCIATES LTD

ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line

SAMPLED BY:

CCME Metals - (Water) - (incl. Hg)

DATE RECEIVED: 2016-08-26

DATE REPORTED: 2016-11-02

		SAMPLE DESCRIPTION:		MW-9 dup
		SAMPLE TYPE:		Water
		DATE SAMPLED:		2016-08-02
Parameter	Unit	G / S	RDL	7808503
Arsenic	mg/L		0.001	<0.001
Cadmium	mg/L		0.0001	0.0003
Chromium	mg/L		0.001	0.003
Cobalt	mg/L		0.0005	0.0295
Copper	mg/L		0.005	0.014
Lead	mg/L		0.0001	0.0009
Mercury	mg/L		0.0001	<0.0001
Nickel	mg/L		0.001	0.137
Zinc	mg/L		0.005	0.057

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

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Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD

AGAT WORK ORDER: 16Z131232

PROJECT: 1530908-2000

ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line

SAMPLED BY:

Soil Analysis

RPT Date: Nov 02, 2016			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
CCME Metals Scan (Soil) (incl. Hg)															
Arsenic	7811293		3	3	NA	< 1	106%	70%	130%	103%	80%	120%	103%	70%	130%
Cadmium	7811293		<0.5	<0.5	NA	< 0.5	106%	70%	130%	109%	80%	120%	110%	70%	130%
Cobalt	7811293		4.5	4.3	4.5%	< 0.5	93%	70%	130%	101%	80%	120%	99%	70%	130%
Chromium	7811293		26	25	3.9%	< 1	86%	70%	130%	104%	80%	120%	90%	70%	130%
Copper	7811293		9	8	11.8%	< 1	98%	70%	130%	102%	80%	120%	99%	70%	130%
Lead	7811293		8	7	13.3%	< 1	106%	70%	130%	101%	80%	120%	99%	70%	130%
Mercury	7812256		<0.10	<0.10	NA	< 0.10	106%	70%	130%	94%	80%	120%	87%	70%	130%
Nickel	7811293		15	15	0.0%	< 1	98%	70%	130%	106%	80%	120%	103%	70%	130%
Zinc	7811293		31	30	3.3%	< 1	96%	70%	130%	104%	80%	120%	103%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By:

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http://www.agatlabs.com

Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD
AGAT WORK ORDER: 16Z131232
PROJECT: 1530908-2000
ATTENTION TO: Alyssa Troke
SAMPLING SITE:DEW Line
SAMPLED BY:

Trace Organics Analysis

RPT Date: Nov 02, 2016			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
PCBs (soil)															
PCBs	7809963		< 0.1	< 0.1	NA	< 0.1	111%	60%	140%	107%	60%	140%	100%	60%	140%
Petroleum Hydrocarbons F1 - F4 (C6 - C50) in Soil															
C6 - C10 (F1)	7805396		< 5	< 5	NA	< 5	71%	60%	130%	86%	60%	130%	102%	60%	130%
C>10 - C16 (F2)	7801675		< 10	< 10	NA	< 10	102%	70%	130%	80%	70%	130%	85%	70%	130%
C>16 - C34 (F3)	7801675		< 50	< 50	NA	< 50	103%	70%	130%	99%	70%	130%	89%	70%	130%
C>34 - C50 (F4)	7801675		< 50	< 50	NA	< 50	84%	70%	130%	96%	70%	130%	104%	70%	130%
PCBs (water)															
PCBs		TW	<0.05	<0.05	NA	<0.05	108%	60%	140%	113%	60%	140%	113%	60%	140%
Petroleum Hydrocarbon F1 - F4 in Water															
C6 - C10 (F1)	7807613		< 25	< 25	NA	< 25	111%	70%	130%	104%	70%	130%	76%	70%	130%
C>10 - C16 (F2)		TW	< 100	< 100	NA	< 100	100%	70%	130%	70%	70%	130%	70%	70%	130%
C>16 - C34 (F3)			< 100	< 100	NA	< 100	102%	70%	130%	84%	70%	130%	84%	70%	130%
C>34 - C50 (F4)			< 100	< 100	NA	< 100	100%	70%	130%	92%	70%	130%	88%	70%	130%

Comments: Tap water analysis has been performed as QC sample testing for duplicate and matrix spike due to insufficient sample volume.
When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

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Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD

AGAT WORK ORDER: 16Z131232

PROJECT: 1530908-2000

ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line

SAMPLED BY:

Water Analysis

RPT Date: Nov 02, 2016

PARAMETER	Batch	Sample Id	DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
			Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
CCME Metals - (Water) - (incl. Hg)															
Arsenic	7820788		< 0.001	< 0.001	NA	< 0.001	101%	90%	110%	105%	90%	110%	106%	70%	130%
Cadmium	7820788		< 0.0001	< 0.0001	NA	< 0.0001	100%	90%	110%	102%	90%	110%	110%	70%	130%
Chromium	7820788		< 0.001	< 0.001	NA	< 0.001	100%	90%	110%	100%	90%	110%	98%	70%	130%
Cobalt	7820788		< 0.0005	< 0.0005	NA	< 0.0005	97%	90%	110%	99%	90%	110%	95%	70%	130%
Copper	7820788		0.031	0.031	0.0%	< 0.005	100%	90%	110%	103%	90%	110%	83%	70%	130%
Lead	7820788		0.0001	0.0001	NA	< 0.0001	100%	90%	110%	102%	90%	110%	100%	70%	130%
Mercury	7805877		<0.0001	<0.0001	NA	< 0.0001	99%	90%	110%	103%	90%	110%	98%	80%	120%
Nickel	7820788		< 0.001	< 0.001	NA	< 0.001	101%	90%	110%	103%	90%	110%	97%	70%	130%
Zinc	7820788		0.005	0.005	NA	< 0.005	101%	90%	110%	103%	90%	110%	106%	70%	130%

Comments: .NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

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MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
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Method Summary

CLIENT NAME: GOLDER ASSOCIATES LTD

AGAT WORK ORDER: 16Z131232

PROJECT: 1530908-2000

ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Trace Organics Analysis			
PCBs	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD
Decachlorobiphenyl	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD
PCBs	ORG-91-5112	EPA SW-846 3510 & 8082	GC/ECD
Decachlorobiphenyl	ORG-91-5112	EPA SW-846 3510 & 8082	GC/ECD
C6 - C10 (F1)	VOL-91-5010	MOE PHC-E3421	(P&T)GC/FID
C>10 - C16 (F2)	VOL-91-5010	MOE PHC-E3421	GC/FID
C>16 - C34 (F3)	VOL-91-5010	MOE PHC-E3421	GC/FID
C>34 - C50 (F4)	VOL -91- 5010	MOE PHC-E3421	GC/FID
Gravimetric Heavy Hydrocarbons	VOL-91-5010	MOE PHC-E3421	BALANCE
C6 - C10 (F1)	VOL-91-5009	CCME Tier 1 Method	P & T GC/FID
C>10 - C16 (F2)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
C>16 - C34 (F3)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
C>34 - C50 (F4)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
Gravimetric Heavy Hydrocarbons	VOL - 5012	CCME Tier 1 Method	GRAVIMETRIC ANALYSIS
Moisture Content	VOL-91-5009	CCME Tier 1 Method	Balance
Water Analysis			
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Zinc	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS

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Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water intended for human consumption)

Report Information:

Company: Golder Associates
Contact: Alyssa Trake
Address: 1931 Robertson Rd
Ottawa
Phone: 613-592-9600 Fax:
Reports to be sent to:
1. Email: atrake@golder.com
2. Email: dplenderleith@golder.com

Project Information:

Project: 1536908-2000
Site Location:
Sampled By:
AGAT Quote #: 69566 PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☐ No ☐

Company:
Contact:
Address:
Email:

Regulatory Requirements:

☐ No Regulatory Requirement
(Please check all applicable boxes)

☐ Regulation 153/04
Table _____ *Indicate One*
☐ Ind/Com
☐ Res/Park
☐ Agriculture
Soil Texture *(Check One)*
☐ Coarse
☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm
Region _____ *Indicate One*

☐ Regulation 558
☒ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
_____ *Indicate One*

Is this submission for a **Record of Site Condition?** ☐ Yes ☑ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☑ No

Laboratory Use Only

Work Order #: 16713123 2
Cooler Quantity: 1
Arrival Temperatures: 6.7 | 6.9 | 6.5
6 | 5.9 | 5.8
Custody Seal Intact: ☐ Yes ☐ No ☐ N/A
Notes: on ice

Turnaround Time (TAT) Required:

Regular TAT ☒ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ 1 Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Metals and Inorganics	Metal Scan	Hydride Forming Metals	Client Custom Metals	(Check Applicable) ORPs: ☐ B-HWS ☐ Cl⁻ ☐ CN⁻ ☐ Cr^{6+} ☐ EC ☐ FOC ☐ NO_3/NO_2 ☐ Total N ☐ Hg ☐ pH ☐ SAR	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3/NO_2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	CCME Fractions 1 to 4	ABNs	PAHs	Chlorophenols	PCBs	Organochlorine Pesticides	TCLP Metals/Inorganics	Sewer Use	See Quote 69566							
MW-9 dup	Aug 2/16		4	GW																		X	X		- Missing 1 vial					
FZ-3a dup	Aug 21/16		2	S																		X	X							
MW-14a dup	Aug 20/16		↓	S																		X	X							
FZ-7a dup	Aug 19/16			S																		X	X							
MW-07a dup	Aug 19/16			S																		X								

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Alyssa Trake ~~Att~~ Alyssa Trake	Aug 26/16	10:30	CBerthelet DLLLLLL	26-Aug-16	12h05
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
			Simon	16/8/27	952

Page 1 of 1
N°: T017214

Document ID: DIV-78-1511.000

Pink Copy - Client | Yellow Copy - AGAT | White Copy - AGAT

Date Issued: Jan 8, 2015

Appendix C5

Certificate of Analysis –
Paracel Laboratories Ltd.,
Sept. 2, 2016; Order #1634163

PARACEL LABORATORIES LTD.
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Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Golder Associates Ltd. (Ottawa)

1931 Robertson Rd.
Ottawa, ON K2H 5B7
Attn: Alyssa Troke

Client PO:
Project: 1530908-2000
Custody: 26765

Report Date: 2-Sep-2016
Order Date: 16-Aug-2016

Revised Report

Order #: 1634163

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1634163-01	MW98-02
1634163-02	Fox 4 - Rinsate

Approved By:

Tim McCooeye
Senior Advisor

Any use of these results implies your agreement that our total liabilty in connection with this work, however arising, shall be limited to the amount paid by you for this work, and that our employees or agents shall not under any circumstances be liable to you in connection with this work.

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Mercury by CVAA	EPA 245.1 - Cold Vapour AA	17-Aug-16	17-Aug-16
Metals, ICP-MS	EPA 200.8 - ICP-MS	18-Aug-16	19-Aug-16
PCBs, total	EPA 608 - GC-ECD	18-Aug-16	18-Aug-16
PHC F1	CWS Tier 1 - P&T GC-FID	16-Aug-16	18-Aug-16
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	19-Aug-16	19-Aug-16

Certificate of Analysis

Client: Golder Associates Ltd. (Ottawa)

Client PO:

Report Date: 02-Sep-2016

Order Date: 16-Aug-2016

Project Description: 1530908-2000

	Client ID:	MW98-02	Fox 4 - Rinsate	-	-
	Sample Date:	04-Aug-16	05-Aug-16	-	-
	Sample ID:	1634163-01	1634163-02	-	-
	MDL/Units	Water	Water	-	-
Metals					
Mercury	0.0001 mg/L	<0.0001	<0.0001	-	-
Arsenic	0.001 mg/L	0.004	<0.001	-	-
Cadmium	0.0001 mg/L	<0.0001	<0.0001	-	-
Chromium	0.001 mg/L	<0.001	<0.001	-	-
Cobalt	0.0005 mg/L	0.0030	<0.0005	-	-
Copper	0.0005 mg/L	0.0006	<0.0005	-	-
Lead	0.0001 mg/L	0.0001	<0.0001	-	-
Nickel	0.001 mg/L	0.006	<0.001	-	-
Zinc	0.005 mg/L	0.090	<0.005	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	0.025 mg/L	0.395 [1]	<0.025 [1]	-	-
F2 PHCs (C10-C16)	0.100 mg/L	<0.100 [1]	<0.100 [1]	-	-
F3 PHCs (C16-C34)	0.100 mg/L	<0.100 [1]	<0.100 [1]	-	-
F4 PHCs (C34-C50)	0.100 mg/L	<0.100 [1]	<0.100 [1]	-	-
PCBs					
PCBs, total	0.00005 mg/L	<0.00005	<0.00005	-	-
Decachlorobiphenyl	Surrogate	54.8% [4]	72.4%	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	0.025	mg/L						
F2 PHCs (C10-C16)	ND	0.100	mg/L						
F3 PHCs (C16-C34)	ND	0.100	mg/L						
F4 PHCs (C34-C50)	ND	0.100	mg/L						
Metals									
Mercury	ND	0.0001	mg/L						
Arsenic	ND	0.001	mg/L						
Cadmium	ND	0.0001	mg/L						
Chromium	ND	0.001	mg/L						
Cobalt	ND	0.0005	mg/L						
Copper	ND	0.0005	mg/L						
Lead	ND	0.0001	mg/L						
Nickel	ND	0.001	mg/L						
Zinc	ND	0.005	mg/L						
PCBs									
PCBs, total	ND	0.00005	mg/L						
Surrogate: Decachlorobiphenyl	*.00020.*		*mg/L*		*80.6*	*60-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	0.025	mg/L	ND				30	
Metals									
Mercury	ND	0.0001	mg/L	ND				20	
Arsenic	ND	0.001	mg/L	0.0013			0.0	20	
Cadmium	ND	0.0001	mg/L	ND			0.0	20	
Chromium	ND	0.001	mg/L	ND			0.0	20	
Cobalt	ND	0.0005	mg/L	ND			0.0	20	
Copper	ND	0.0005	mg/L	ND				20	
Lead	ND	0.0001	mg/L	ND			0.0	20	
Nickel	ND	0.001	mg/L	ND				20	
Zinc	ND	0.005	mg/L	ND			0.0	20	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1.83	0.025	mg/L		91.3	68-117			
F2 PHCs (C10-C16)	1.67	0.100	mg/L		93.0	60-140			
F3 PHCs (C16-C34)	3.16	0.100	mg/L		85.0	60-140			
F4 PHCs (C34-C50)	2.12	0.100	mg/L		85.3	60-140			
Metals									
Mercury	0.00309	0.0001	mg/L	ND	103	70-130			
Arsenic	39.0		ug/L	1.3	75.3	80-120			QM-07
Cadmium	49.2		ug/L	0.01	98.4	80-120			
Chromium	49.9		ug/L	0.1	99.6	80-120			
Cobalt	49.0		ug/L	0.02	98.1	80-120			
Copper	48.0		ug/L	ND	96.0	80-120			
Lead	47.5		ug/L	0.08	94.8	80-120			
Nickel	49.2		ug/L	ND	98.5	80-120			
Zinc	52		ug/L	0.2	103	80-120			
PCBs									
PCBs, total	0.00110	0.00005	mg/L		110	60-140			
Surrogate: Decachlorobiphenyl	*0.00021*		*mg/L*		*87.2*	*60-140*			

Qualifier Notes:

Login Qualifiers :

Sample - One or more parameter received past hold time - CCME F1-F4 past hold time
Applies to samples: MW98-02, Fox 4 - Rinsate

Sample Qualifiers :

1 : Holding time had been exceeded upon receipt of the sample at the laboratory.

4 : The surrogate recovery for this sample is outside of established control limits due to a sample matrix effect.

QC Qualifiers :

QM-07 : The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

Sample Data Revisions

None

Work Order Revisions / Comments:

Revision 1, all results reported as mg/L.

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.

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www.paracellabs.com

Chain of Custody
(Lab Use Only)
№ 26765

Page 2 of 2

Client Name: Golder Associates
Contact Name: see page 1
Address:
Telephone:

Project Reference: 1530908-2000
Quote #: ~~15-304~~ Golder Dew Lines Monitoring
PO #:
Email Address: alyssa_troke@golder.com
dplenderleith@golder.com

TAT: [X] Regular [ ] 3 Day [ ] 2 Day [ ] 1 Day
Date Required:

Criteria: [ ] O. Reg. 153/04 (As Amended) Table __ [ ] RSC Filing [ ] O. Reg. 558/00 [ ] PWQO [X] CCME [ ] SUB (Storm) [ ] SUB (Sanitary) Municipality: _____ [ ] Other: _____

Matrix Type: (S) Soil/Sed. (GW) (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Paracel Order Number: 1634162-Soil
1634163-water

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Required Analyses: see Quote
1	MW98-02	GW		6	Aug 4	1700	X
2	Fox 4 - Rinsate	GW		6	Aug 5	—	X
3							
4							
5							
6							
7							
8							
9							
10							

Comments: Samples not preserved, not field filtered. SC.
Proceed regardless of hold time per Alyssa. SC.

Method of Delivery:

Relinquished By (Sign): Joanne Woodhouse
Relinquished By (Print): Joanne Woodhouse
Date/Time: Aug 16/2016 1030am

Received by Driver/Depot:
Date/Time: 08/16/16 11:30
Temperature: 8.8 °C

Received at Lab: SUNREPORN DOR MAT
Date/Time: AUG 16 2016 03:10
Temperature: 8.8 °C

Verified By: Rachel Subject
Date/Time: Aug 16/18 5:00
pH Verified [ ] By: RS

Appendix C6

Historical Soil Water Chemistry Data

Summary Information for DEW Line Monitoring Data Review Tables

FOX-2

The FOX-2 Auxiliary DEW Line site at Longstaff Bluff was constructed during the 1950s. The FOX-2 site was decommissioned in 1992 when an NWS short-range radar (SRR) site was established at the area of the FOX-2 site known as the Upper Site. Demolition of facilities not required for operation of the SRR was completed in 2011.

Site investigations in the Longstaff Bluff area identified five landfills which were attributed to DEW Line operations: the Airstrip Landfill, Airstrip Camp Landfill Lobe A, Airstrip West Landfill, West Landfill Lobe E, and the Upper Site Landfill. Remediation of the landfills began in 2009 and was completed in 2011. The Airstrip Landfill and Airstrip Landfill West were considered to pose a moderate environmental risk and were excavated completely and backfilled with clean granular fill. The Upper Site Landfill was considered to present a moderate environmental risk and a leachate containment system was constructed. The remaining landfills on the site — the Airstrip Camp Landfill Lobe A and West Landfill Lobe E— were categorized as low-risk landfills. Surface debris and contaminated soil was removed from these landfills as required, and the areas were regraded. Additionally, the Tier II Disposal Facility and Non-hazardous Waste Landfill, which were constructed during remediation, also require monitoring. Monitoring sampling is scheduled for the aforementioned landfills in years 2015, 2016, 2018, 2021, 2026 and 2036. 1) Chemical conditions are reviewed in this data summary, with only the Upper Site Landfill Lobe A and the Tier II Disposal Facility requiring thermal monitoring.

Soil sampling to establish general FOX-2 Background chemical conditions (not impacted by FOX-2 activities) for inorganic elements and PCBs was conducted in 1990 by the Environmental Science Group (ESG). Baseline conditions refer to existing soil chemistry at the landfill area prior to and during remediation. Baseline samples are collected in areas upgradient and downgradient of each landfill. Upgradient soil samples are taken in areas near the landfill but not influenced by migration of contaminants through the landfill. Downgradient soil samples are collected at surface and shallow depth areas from areas at the toe of each landfill and from areas of preferential drainage. These soil samples are analyzed for inorganic elements, Total PCBs and TPH to determine whether there has been migration of contaminants, historically or recent, from the landfill area. Although contaminants are primarily transported in water (surface and groundwater), they have a tendency to sorb to soil particles the water is migrating through. The soil retains information regarding the historical input of contaminants.

During the FOX-2 assessment and remediation program, hydrocarbons were typically analyzed in the laboratory as total petroleum hydrocarbons (TPH) using hexane extraction. The analysis of hydrocarbons performed for the long-term monitoring program is conducted according to the Canadian Council of Ministers of Environment (CCME 2008) Tier I Method –Rev. 5 Analysis of Petroleum Hydrocarbons (PHC) in Soil for F1 to F4 HC fractions. The TPH analysis resulted in a classification of either Type A or Type B. Type A refers to heavy end products, such as lubricating oils, and is visually observed by dark staining. When compared to the CWS PHC, Type A consists of the sum of the F3 and F4 constituents. Type B includes lighter end or more volatile hydrocarbon products such as MoGas, jet fuel and diesel, and is approximately equal to the sum of F1 to F3. In the following tables, results are presented for F1 to F3 individually, and the three fractions are summed to create a "modified TPH" value that can be compared to data collected from assessment and remediation phase of the project.

Analytical results of soil samples collected downgradient of landfills are compared to contaminant concentrations of samples collected upgradient of landfills. Downgradient samples are also compared to overall FOX-2 background contaminant levels. (1)

For the Dew Line Monitoring Data Review Tables, the background and baseline sample results were summarized by calculating the arithmetic mean, standard deviation, maximum concentration and minimum concentration along with the 95% confidence value of the mean. Concentrations which were below detection were included in the calculations as half of the detection limit. Duplicates (analytical and field duplicates) were averaged before being included in the background analyses.

Some Baseline soil results for copper, lead, zinc and PCBs from 2005 were analyzed by test kit and had higher detection limits. Non-detect values from those samples have been removed from the baseline average calculation, as they would artifically inflate the baseline average value. The non-detect values remain in the tables for information purposes. All detectable results were used in the baseline average calculation. The Upper Site Landfill was the only landfill impacted by this at FOX-2.

Monitoring Data is compared to Background and Baseline data as well as the DEW Line Cleanup Criteria in the tables by highlighting those values which exceed arithmetic mean of Background and Baseline elements, or the Tier I or Tier II Criteria.

Underlined values : Results exceed Background arithmetic mean
Bold Values : Results exceed Baseline arithmetic mean.
Italicized : Results exceed DLCU Tier I criteria.
Italicized and Highlighted : Results exceed DLCU Tier II criteria or Hydrocarbon Action Level.

Temporal trend analysis of upgradient and downgradient concentrations in monitoring locations is conducted to monitor change. Note that a minimum of seven data points are recommended to conclusively establish a trend. In addition, upgradient and downgradient monitoring results are compared to the Baseline arithmetic mean. The baseline arithmetic mean and the baseline arithmetic mean + 3x standard deviation are shown on the graphs. The standard deviation (x3) is useful as an indicator of natural variability seen in baseline samples.

Sample ID numbers vary with contractors but descriptions of the sample numbers are included in the Table as notes. Field duplicate samples were averaged in Baseline and Monitoring results but for Monitoring results, Interlab duplicates were entered as separate samples.

Water sample inorganic results are reported as Total metals and Samples are not preserved or filtered prior to analysis.

Landfill Monitoring Schedule at FOX-2 in progress including:
Year 1 *2012, performed by ESG/AECOM: Sample ID includes the year and the sample number* .
Year 2 2013, performed by Biogenie: Sample ID includes the year, site, MW location and indicates surface (A) or depth (B).
Year 3 2014, performed by Biogenie: Sample ID includes the site name (F2), MW location, A indicates surface, B for depth, and the year.
Year 4
Year 5

Year 7 yyyy
Analytical Methods yyyy: ***(Analytical Methods are listed only for future years - not necessary for past years)***

Year 10 yyyy
Analytical Methods yyyy:

Year 15 yyyy
Analytical Methods yyyy:

Year 20 yyyy
Analytical Methods yyyy:

References (FOX-2 DLCU LTM reports)

(1) Environmental Sciences Group, 2012. FOX-2 Longstaff Bluff, Nunavut, First-year Monitoring Program 2012. Prepared for the Department of National Defence, December 2012.
(2) AECOM Canada Ltd., 2013. FOX-2 Longstaff Bluff Baseline Landfill Monitoring. Prepared for the Department of National Defence, 20 February 2013.
(3) Biogénie, 2014. The Collection of Landfill Monitoring Data at the Former FOX-2 DEW Line Site, Final Report — 2013. Prepared for Defence Construction Canada, January 2014.
(4) Biogénie, 2015. The Collection of Landfill Monitoring Data at the Former FOX-2 DEW Line Site, Final Report — 2014. Prepared for Defence Construction Canada, June, 2015.

FOX-2 - Non-hazardous Waste Landfill - Summary of Monitoring Soil Analytical Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd* (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Cr* (mg/kg)	As (mg/kg)	Hg* (mg/kg)	Total PCB (mg/kg)	F1 C_6-C_{10} (mg/kg)	F2 C_{10}-C_{16} (mg/kg)	F3 C_{16}-C_{34} (mg/kg)	Modified TPH^ - Total C6-C34 (mg/kg)
Background Data - Arithmetic Mean*						55	46	17	1.0	10	84	59	23						
Baseline Data - Arithmetic Mean*						**48**	**52**	**19**	**1.0**	**10**	**85**	**69**	**23**	**0.10**	**0.10**				**10**
Baseline Data - Standard Deviation						20	13	6.8	0.0	3.8	15	9.7	8.3	0.0	0.021				28
Baseline Data mean + 3xStandard Deviation						107	92	39		21	130	98	48		0.16				94
**** If baseline or background arithmetic mean was below the detection limit, the mean has been modified to match the detection limit value.***																			
DEW Line Cleanup Tier I Criteria										*200*					*1*				
DEW Line Cleanup Tier II Criteria & Hydrocarbon Action Level						*100*	*100*	*50*	*5*	*500*	*500*	*250*	*30*	*2.0*	*5*				*2500*
Monitoring Data																			
Upgradient																			
	MW #5 surface																		
12-19452[1]/53[2]	MW-05	2012	1	1	0-10	**76**	**90**	**23**	<0.50	**8.3**	**130**	**96**	*32*	0.017	<0.020	<5.0	<10	53	**61**
F2-MW-5-S-A-2014	MW-05	2014	3	1	0-10	25	46	15	<0.5	6.0	**94**	**103**	19	<0.1	<0.02	<10	<10	<20	**20**
MW-05 (0-15)	MW-05	2015	4	1	0-15	**78.1**	**55.6**	**20.4**	<0.5	6.9	**106**	**83.3**	**23.4**	<0.1	<0.05	<7	<4	<8	10
MW-05b	MW-05	2016	5	1	0-15	24	40	14	<0.5	7	**103**	**86**	19	<0.1	<0.05	<7	<4	<8	10
	MW-05		10	2															#N/A
	MW-05		15	2															#N/A
	MW-05		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A
	MW #5 depth																		
12-19454[1]/55[2]	MW-05	2012	1	1	30-40	**63**	*110*	**32**	<0.50	**14**	**170**	**120**	*41*	<0.010	<0.020	<5.0	<10	<50	**25**
F2-MW-5-S-B-2014	MW-05	2014	3	1	40-50	31	44	13	<0.5	4.0	**93**	**103**	**26**	<0.1	<0.02	<10	<10	<20	**20**
MW-05 (30-40)	MW-05	2015	4	1	30-40	**69.6**	**86.4**	**25.6**	<0.5	**14.8**	**137**	**83.1**	**28.8**	<0.1	<0.05	<7	<4	<8	10
MW-05a	MW-05	2016	5	1	30-40	26	42	14	<0.5	4	81	**88**	12	<0.1	<0.05	<7	<4	<8	10
	MW-05		10	2															#N/A
	MW-05		15	2															#N/A
	MW-05		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A

TPH Sum will appear when F1, F2 and F3 fractions are entered.

FOX-2 - Non-hazardous Waste Landfill - Summary of Monitoring Soil Analytical Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd* (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Cr* (mg/kg)	As (mg/kg)	Hg* (mg/kg)	Total PCB (mg/kg)	F1 C_6-C_{10} (mg/kg)	F2 C_{10}-C_{16} (mg/kg)	F3 C_{16}-C_{34} (mg/kg)	Modified TPH^ - Total C6-C34 (mg/kg)
Downgradient																			
	MW #6 surface																		
12-19456[1]/57[2]	MW-06	2012	1	1	0-10	35	45	16	<0.50	**18**	**110**	**81**	20	0.048	<0.020	<5.0	<10	200	**200**
F2-MW-6-S-A-2014	MW-06	2014	3	1	0-10	**59**	**84**	18	<0.5	6.0	**110**	**165**	19	<0.1	<0.02	<10	<10	60	**70**
MW06 (0-15) (Dup Avg)	MW-06	2015	4	1	0-15	38	43	16	<0.5	**13**	**98**	**72**	**24**	<0.1	<0.1	<6	<4	73	**78**
MW-06a	MW-06	2016	5	1	0-15	**60**	51	16	<0.5	8	78	68	16	<0.1	<0.05	<7	<4	<8	10
	MW-06		10	2															#N/A
	MW-06		15	2															#N/A
	MW-06		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A
	MW #6 depth																		
12-19458[1]/59[2]	MW-06	2012	1	1	30-40	**61**	**68**	**24**	<0.50	**11**	**140**	**110**	**27**	0.018	<0.020	<5.0	<10	56	**56**
F2-MW-6-S-B-2014	MW-06	2014	3	1	40-50	**90**	**99**	**23**	<0.5	8.0	**119**	**146**	*36*	<0.1	<0.02	<10	<10	<20	**20**
MW-06 (40-50)	MW-06	2015	4	1	40-50	**56.3**	**54.2**	18.5	<0.5	**10.7**	**91.9**	67.3	*40.7*	<0.1	<0.05	<7	<4	<8	10
Not sampled - refusal	MW-06	2016	5	1															#N/A
	MW-06		10	2															#N/A
	MW-06		15	2															#N/A
	MW-06		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A
	MW #7 surface																		
12-19460[1]/61[2]	MW-07	2012	1	1	0-10	**77**	**82**	**22**	<0.50	**11**	**130**	**130**	**27**	0.011	<0.050	<5.0	<10	<50	**25**
F2-MW-7-S-A-2014	MW-07	2014	3	1	0-10	**82**	*107*	**21**	<0.5	**11**	**109**	**168**	**27**	<0.1	<0.02	<10	<10	<20	**20**
MW-07 (0-15)	MW-07	2015	4	1	0-15	**55.2**	50.6	16.5	<0.5	**14.6**	**90.7**	**73.8**	*34.3*	<0.1	<0.05	<7	<4	<8	10
MW-07b	MW-07	2016	5	1	0-15	20	39	13	<0.5	8	**86**	**80**	19	<0.1	<0.05	<7	<4	<8	10
	MW-07		10	2															#N/A
	MW-07		15	2															#N/A
	MW-07		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A

FOX-2 - Non-hazardous Waste Landfill - Summary of Monitoring Soil Analytical Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd* (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Cr* (mg/kg)	As (mg/kg)	Hg* (mg/kg)	Total PCB (mg/kg)	F1 C_6-C_{10} (mg/kg)	F2 C_{10}-C_{16} (mg/kg)	F3 C_{16}-C_{34} (mg/kg)	Modified TPH^ - Total C6-C34 (mg/kg)
	MW #7 depth																		
12-19462[1]/63[2]	MW-07	2012	1	1	30-40	**52**	**63**	**23**	<0.50	**15**	**130**	**95**	*31*	0.011	<0.020	<5.0	<10	<50	**25**
F2-MW-7-S-B-2014	MW-07	2014	3	1	40-50	**56**	**59**	13	<0.5	9	75	**103**	16	<0.1	<0.02	<10	<10	<20	**20**
MW-07 (40-50)	MW-07	2015	4	1	40-50	31.6	43.9	15.8	<0.5	**33.6**	**95**	**75.8**	**28.6**	<0.1	<0.05	<7	<4	<8	10
MW-07a (Dup Avg)	MW-07	2016	5	1	40-50	29	37	13	<0.5	4	84	**72**	**29**	<0.1	<0.05	<6	<7	<29	**21**
	MW-07		10	2															#N/A
	MW-07		15	2															#N/A
	MW-07		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A
	MW #8 surface																		
12-19464[1]/65[2]	MW-08	2012	1	1	0-10	*150*	*180*	*90*	<0.50	**17**	**210**	**88**	*40*	0.022	<0.020	<5.0	<10	<50	**25**
F2-MW-8-S-A-2014	MW-08	2014	3	1	0-10	**77**	*123*	**44**	<0.5	**12**	**163**	**140**	**27**	<0.1	<0.02	<10	<10	<20	**20**
MW08 (0-15) (Dup Avg)	MW-08	2015	4	1	0-15	**94**	*169*	*62.0*	0.6	**14**	**209**	**73**	*56*	<0.1	<0.1	<6	<4	<8	9
MW-08a	MW-08	2016	5	1	0-15	**56**	**96**	**30**	<0.5	**10**	**117**	65	**24**	<0.1	<0.05	<7	<4	<8	10
	MW-08		10	2															#N/A
	MW-08		15	2															#N/A
	MW-08		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A
	MW #8 depth																		
12-19466[1]/67[2]	MW-08	2012	1	1	30-40	**79**	*100*	**34**	<0.50	**12**	**170**	**75**	*41*	<0.010	<0.020	<5.0	<10	<50	**25**
F2-MW-8-S-B-2014	MW-08	2014	3	1	40-50	**55**	*101*	**27**	<0.5	9	**126**	**142**	*58*	<0.1	<0.02	<10	<10	<20	**20**
MW-08 (40-50)	MW-08	2015	4	1	40-50	**87.6**	*114*	**39.7**	0.5	**16.3**	**145**	63.4	*52*	<0.1	<0.05	<7	<4	<8	10
Not sampled - refusal	MW-08	2016	5	1															#N/A
	MW-08		10	2															#N/A
	MW-08		15	2															#N/A
	MW-08		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A

Legend

XX	sample exceeds background
XX	**sample exceeds baseline**
XX	*sample exceeds DLCU Tier I criteria*
XX	*sample exceeds DLCU Tier II criteria*

Note: Modified TPH Total (C_6-C_{34}) has been calculated by adding results for F1, F2 and F3.

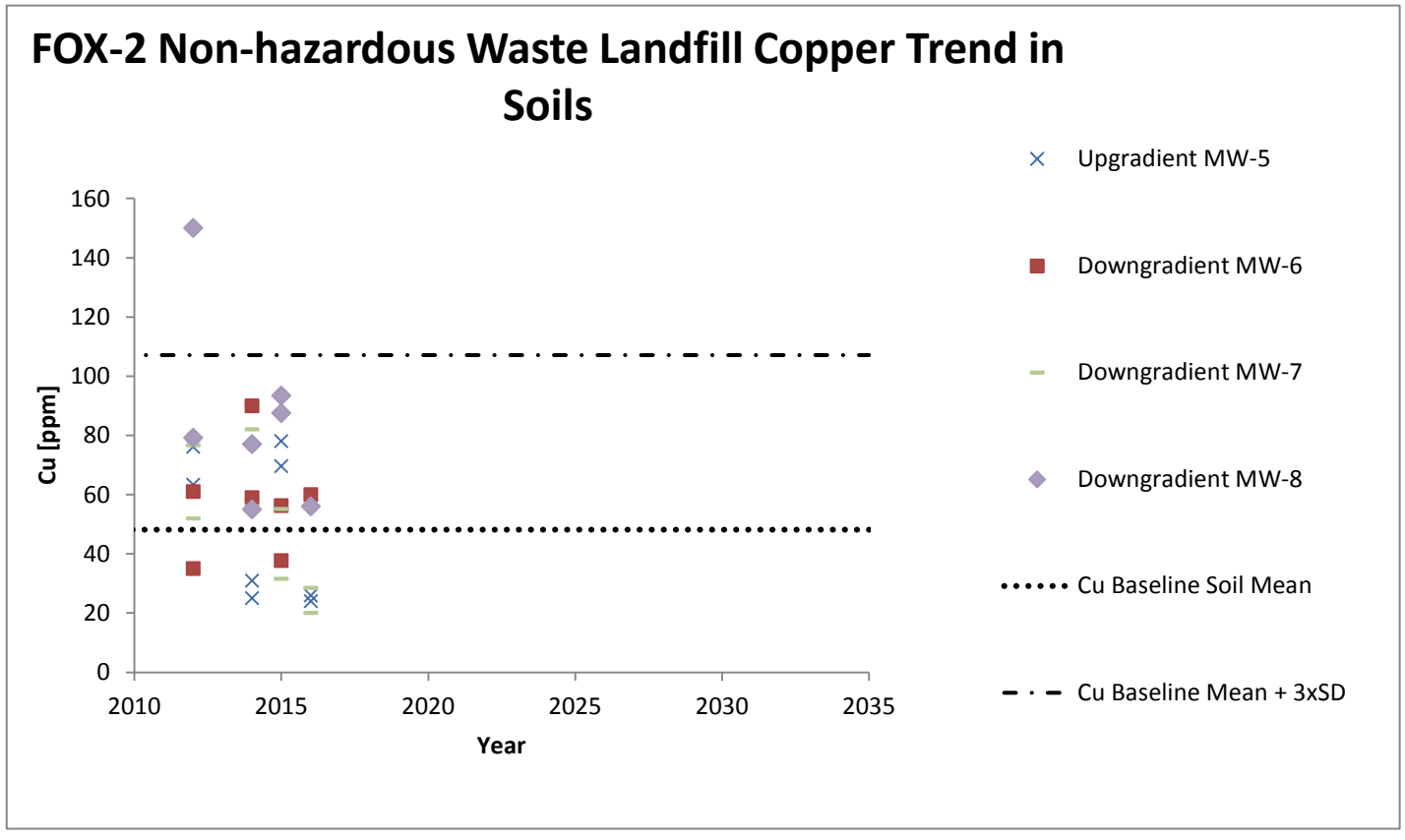
[1] - soil sample analyzed for inorganics and PCBs

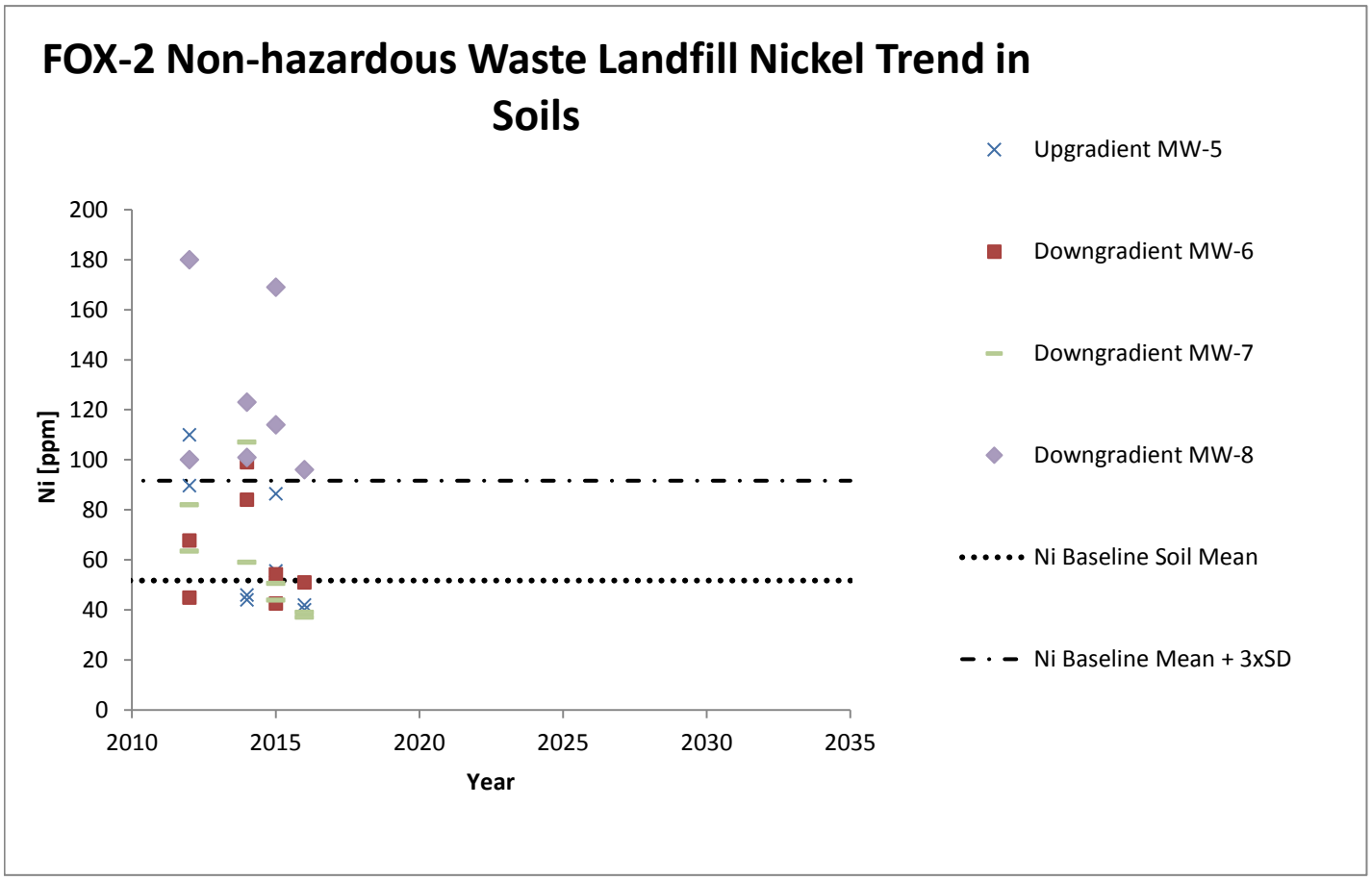
[2] - soil sample analyzed for F1-F3 fraction PHCs

FOX-2 Non-hazardous Waste Landfill Trends in Soil Inorganics, PCBs and PHCs (modified TPH)

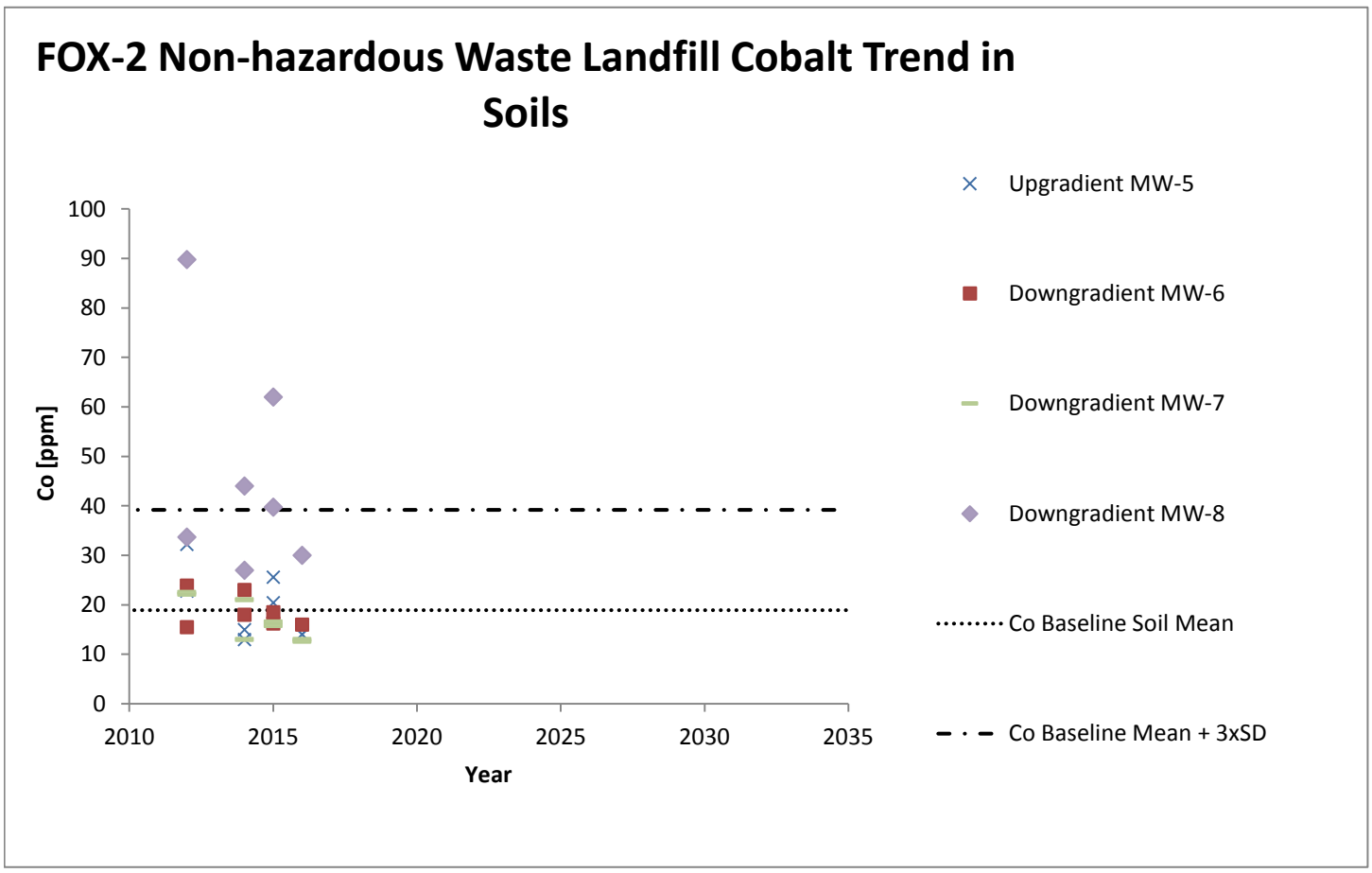
Where results are below detection, half of the detection limit has been used in the charts for the sample points.

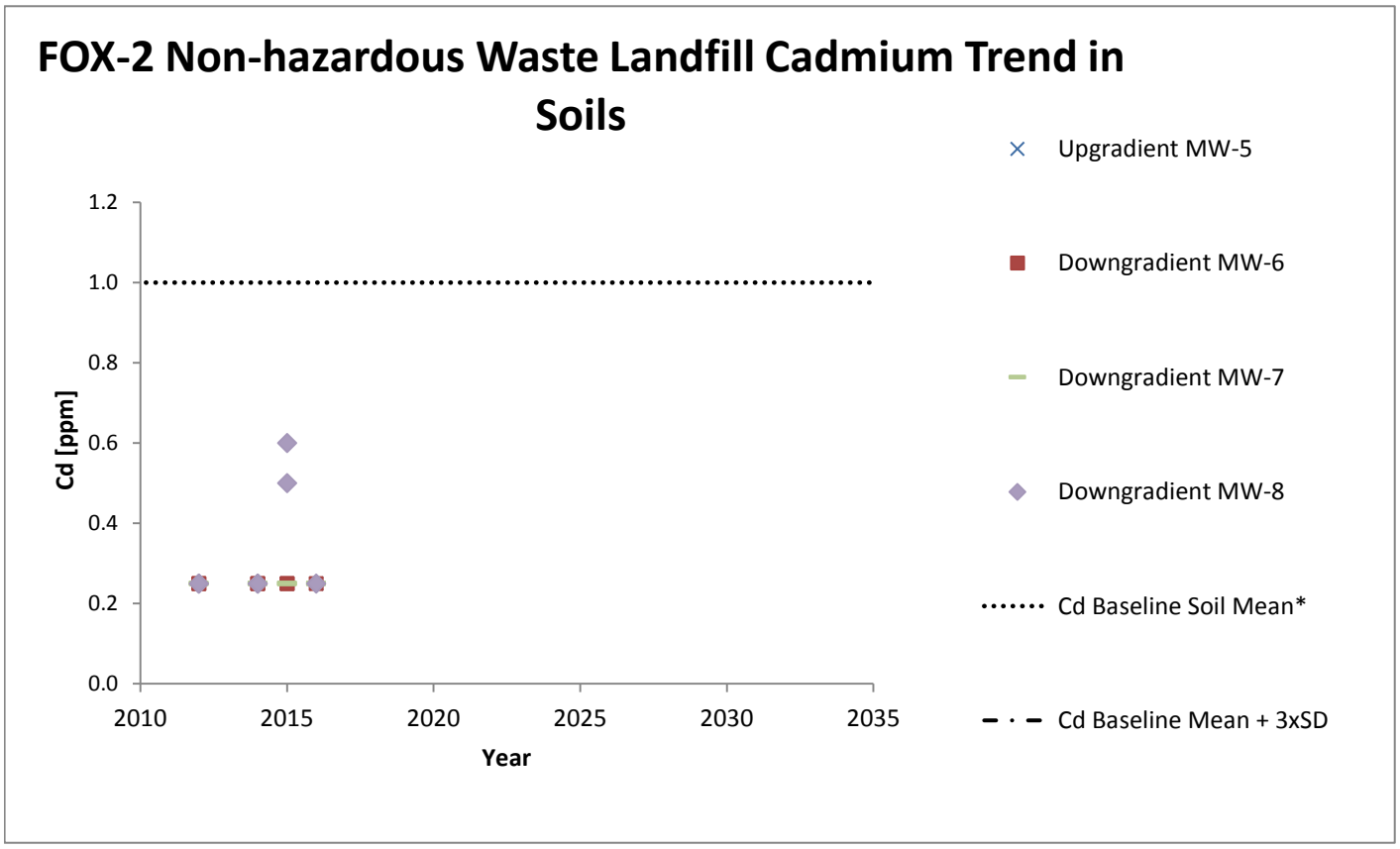
Trendlines are intended for visual interpretation of temporal trends. When all monitoring results are below detection, trendlines are a reflection of changes in detection limit. Users should refer to data tables.





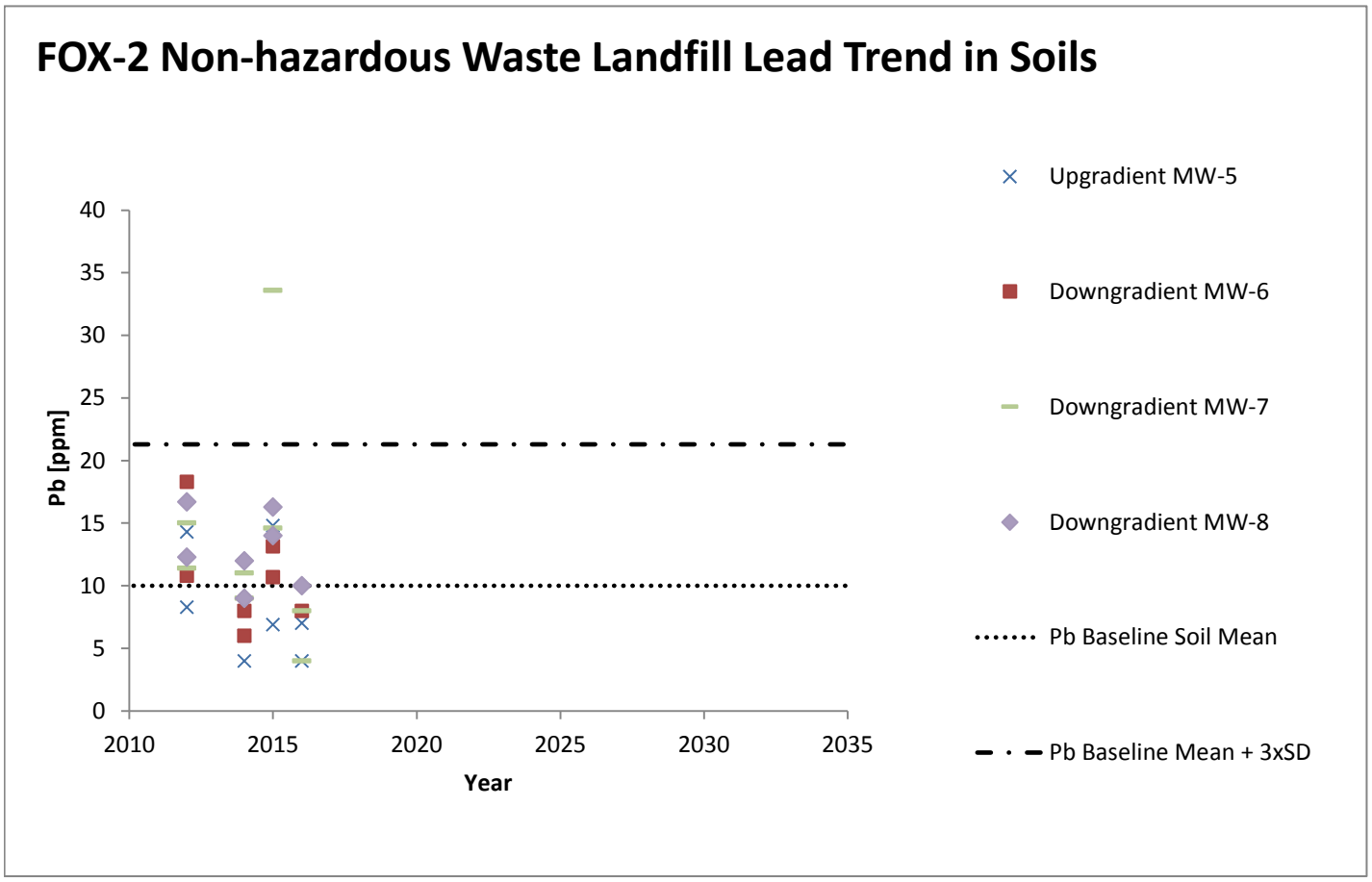
FOX-2 Non-hazardous Waste Landfill Trends in Soil Inorganics, PCBs and PHCs (modified TPH)

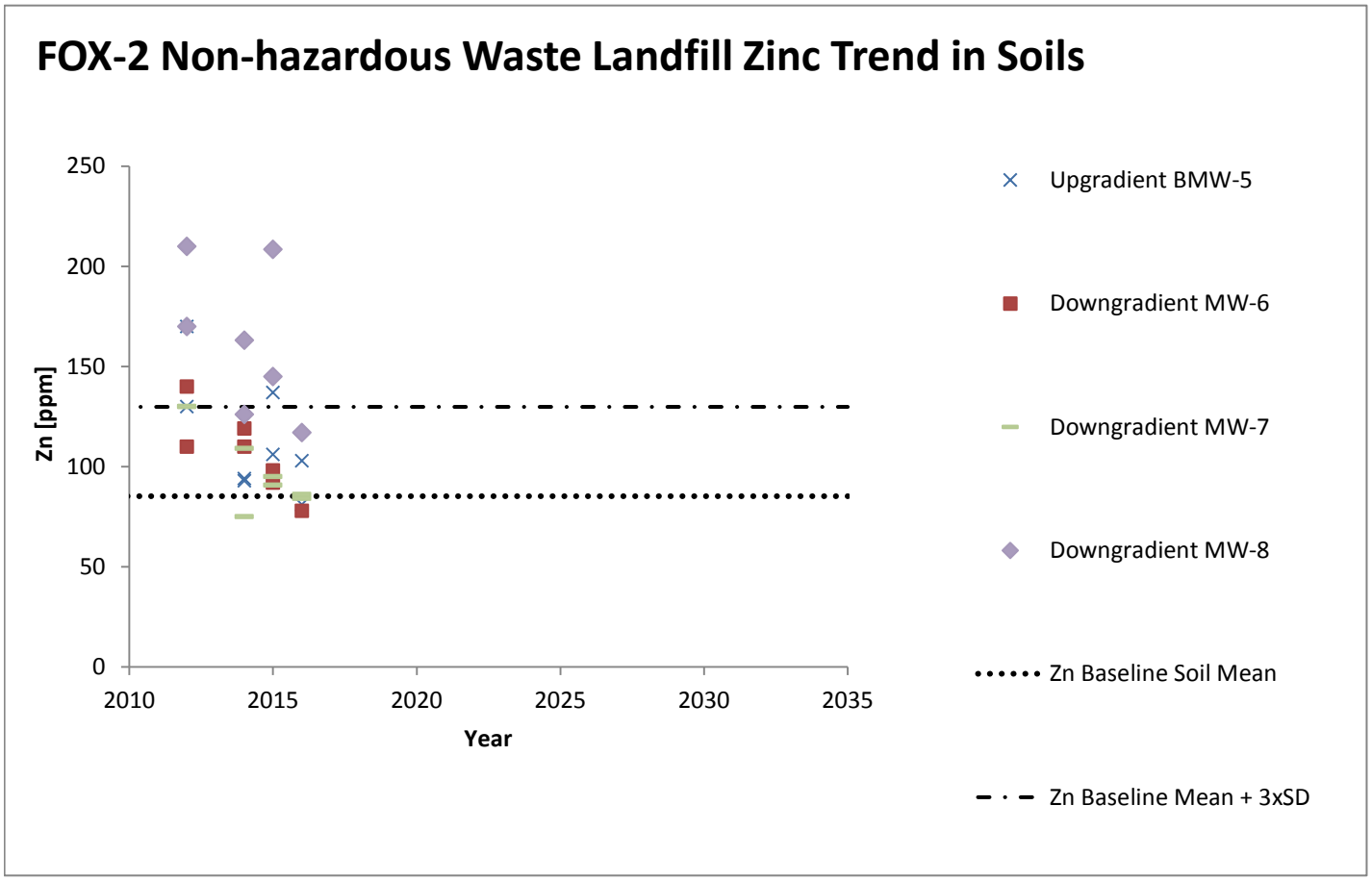




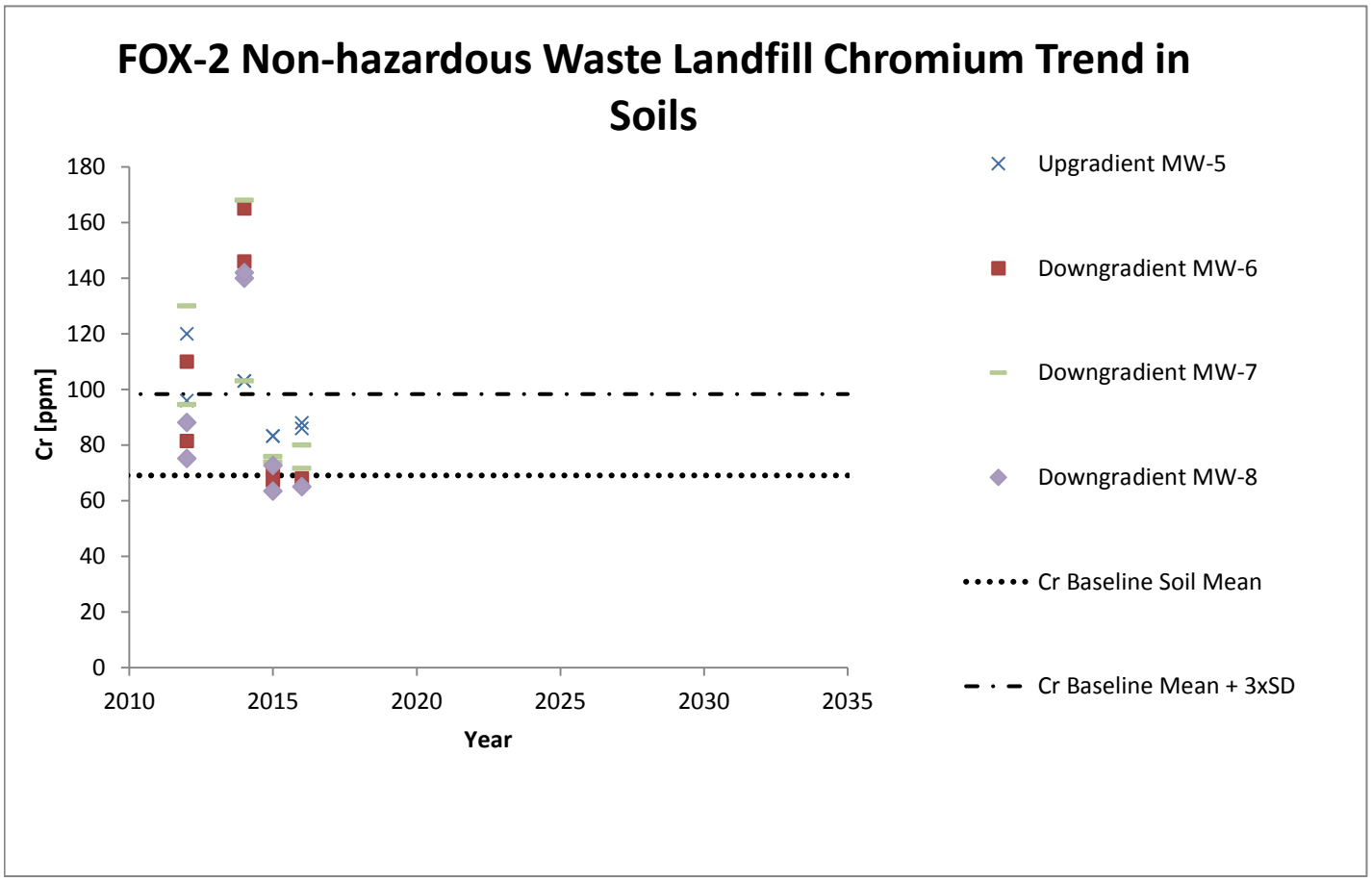
*Cd Baseline Mean is equal to the baseline detection limit.

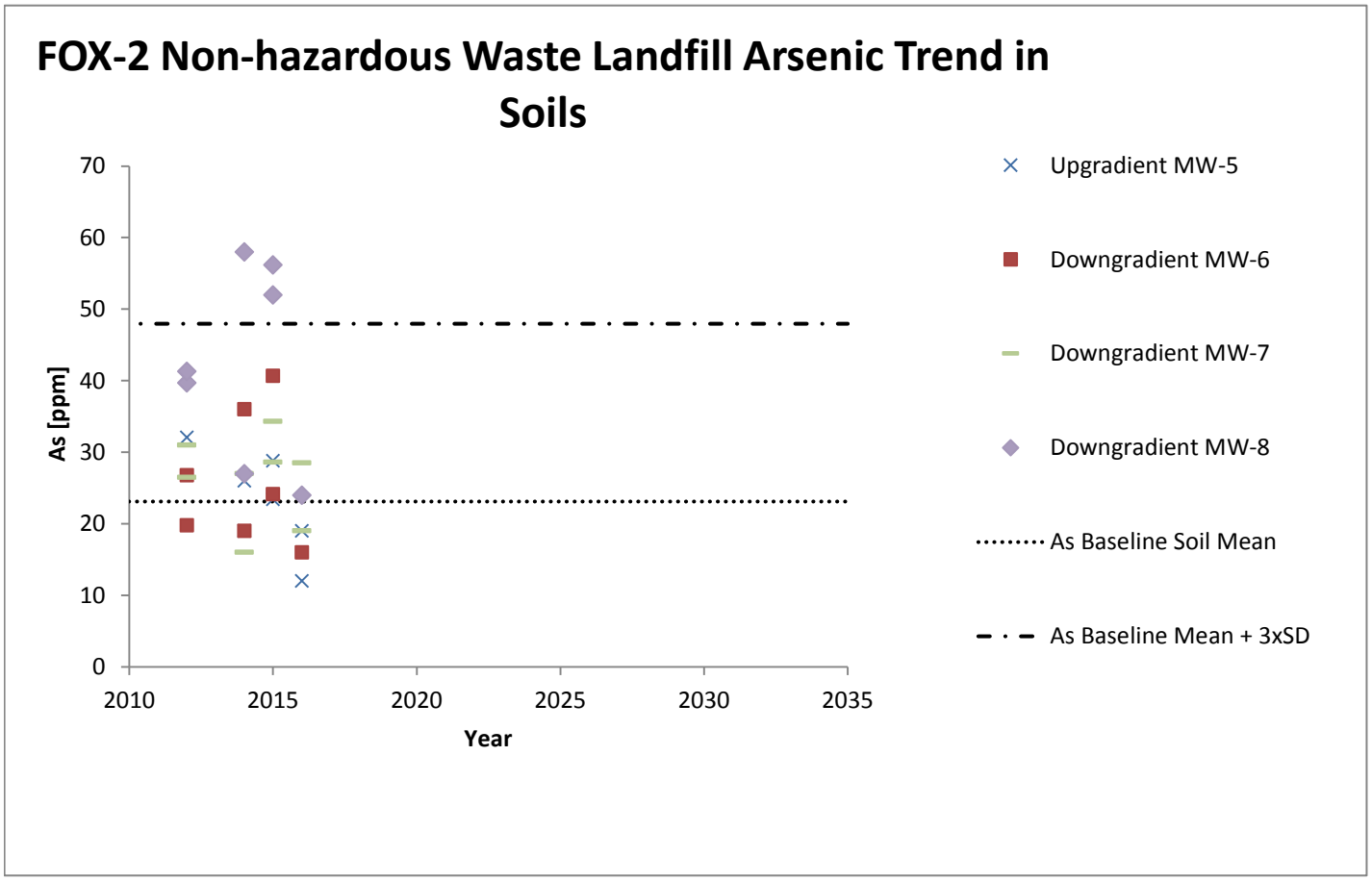
FOX-2 Non-hazardous Waste Landfill Trends in Soil Inorganics, PCBs and PHCs (modified TPH)



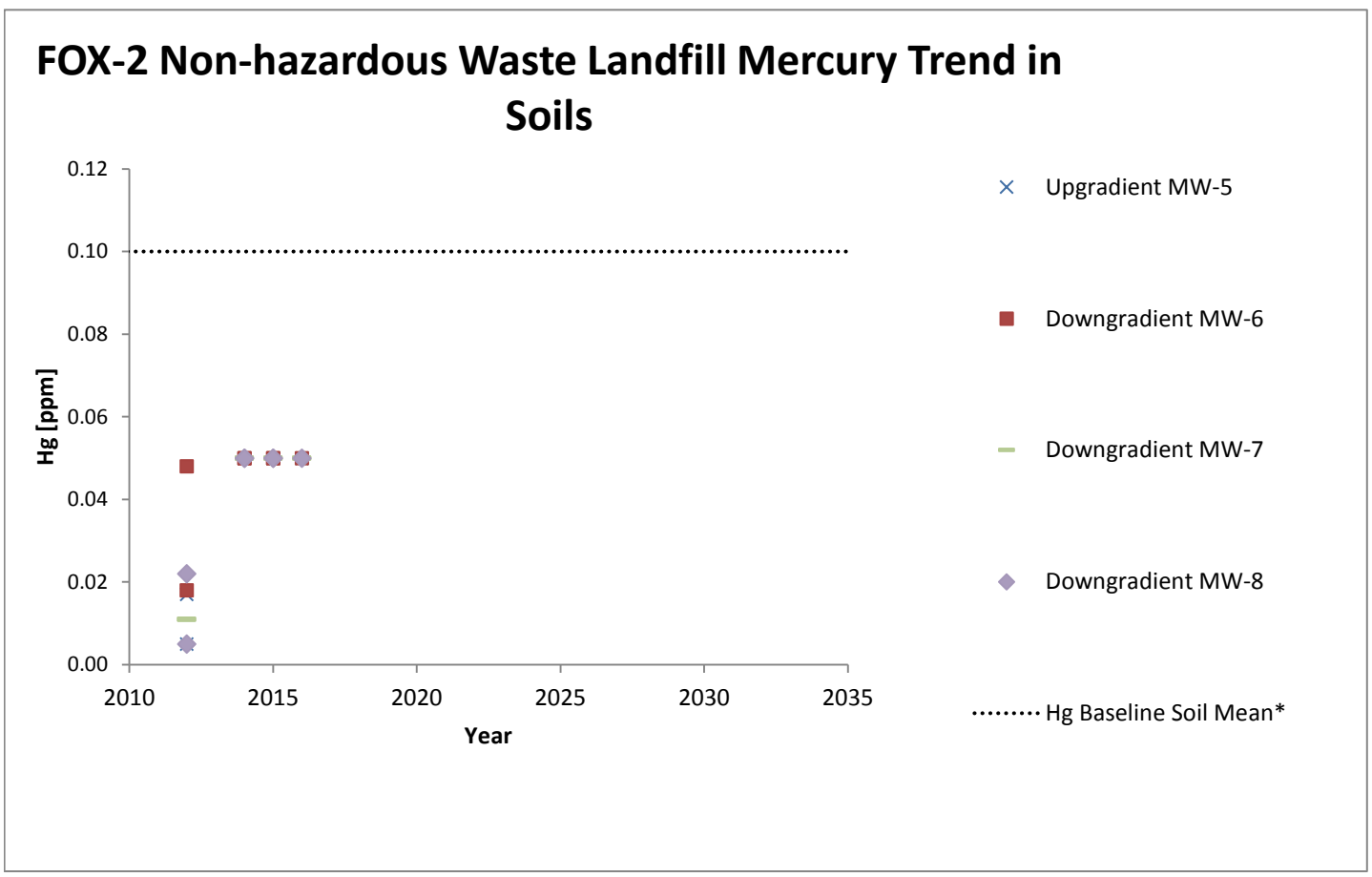


FOX-2 Non-hazardous Waste Landfill Trends in Soil Inorganics, PCBs and PHCs (modified TPH)

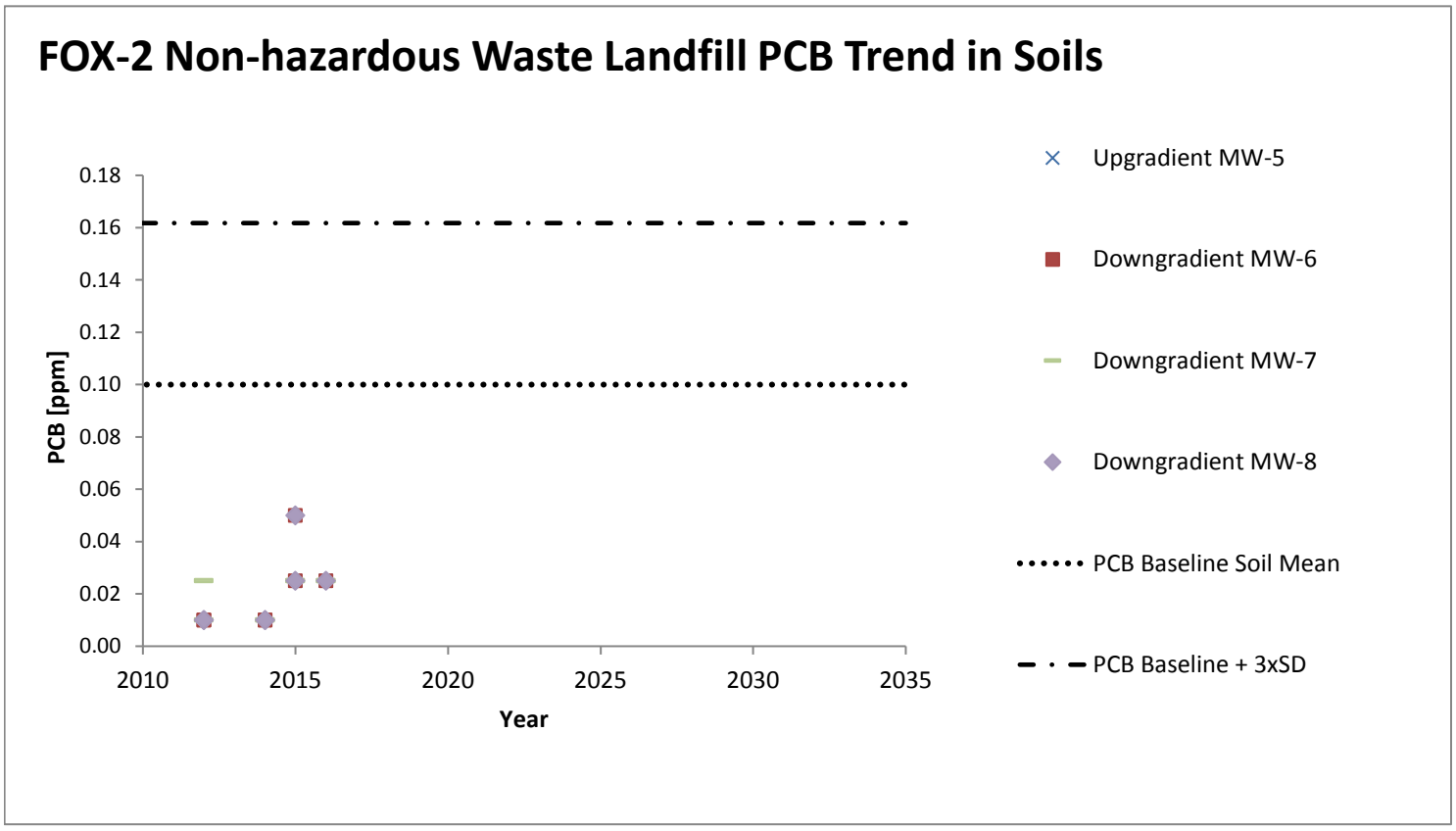




FOX-2 Non-hazardous Waste Landfill Trends in Soil Inorganics, PCBs and PHCs (modified TPH)

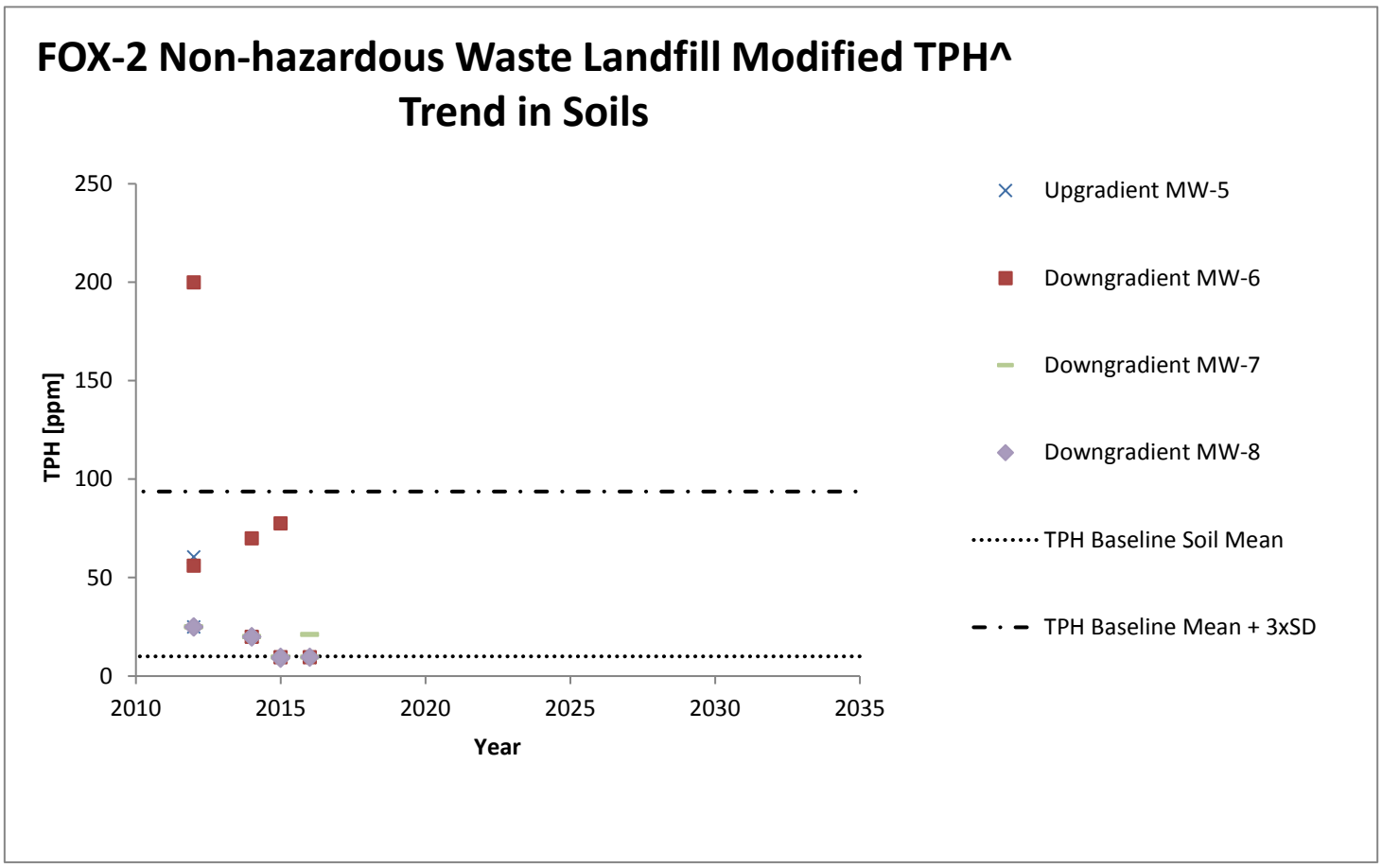


*Hg Baseline Mean is equal to the baseline detection limit.



PCB Baseline Mean is equal to the baseline detection limit

FOX-2 Non-hazardous Waste Landfill Trends in Soil Inorganics, PCBs and PHCs (modified TPH)



TPH Baseline Mean is equal to the baseline detection limit
^ Modified TPH is Sum of F1, F2 and F3 fractions (C_6 - C_{34})

FOX-2 - Non-hazardous Waste Landfill - Summary of Monitoring Groundwater Analytical Data

Sample ID	Location	Date	Monitoring Year	Monitoring Phase	Cu (mg/L)	Ni (mg/L)	Co (mg/L)	Cd (mg/L)	Pb (mg/L)	Zn (mg/L)	Cr (mg/L)	As (mg/L)	Hg (mg/L)	Total PCB (mg/L)	F1 C_6-C_{10} (mg/L)	F2 C_{10}-C_{16} (mg/L)	F3 C_{16}-C_{34} (mg/L)	Modified TPH^ - Total C6-C34 (mg/L)
Baseline Data																		
Upgradient:																		
not sampled, well dry	MW-05	2010																
Downgradient:																		
10-20109	MW-06	2010			0.029	0.18	0.016	<0.0010	<0.010	0.023	0.030	0.0076	<0.00040	<0.000020	<0.050	<0.50	<1.0	<1.0
10-20119	MW-08	2010			0.038	0.39	0.045	<0.0010	0.013	0.058	0.12	0.014	<0.00040	<0.000020	<0.050	<0.50	<1.0	<1.0
11-09305	MW-06	2011			0.022	0.13	0.016	<0.0010	<0.0010	0.020	0.095	<0.0030	<0.00040	<0.0030	<0.050	<0.50	<1.0	<1.0
11-09310	MW-08	2011			0.044	0.66	0.072	<0.0010	<0.0010	0.10	0.14	0.0050	<0.00040	<0.0030	<0.050	<0.50	<1.0	<1.0
		N value			4	4	4	4	4	4	4	4	4	4				4
		Arithmetic Mean			0.033	0.34	0.04	0.0005	0.0048	0.05	0.096	0.007	0.0002	0.0008				0.25
		Arithmetic Mean Corrected for Detection Limits			**0.033**	**0.340**	**0.037**	**0.001**	**0.001**	**0.050**	**0.096**	**0.007**	**0.0004**	**0.003**				**1.0**
		Standard Deviation			0.010	0.24	0.027	0.0	0.0059	0.037	0.047	0.0054	0.0	0.00086				0.0
		Arithmetic Mean + 3xStandard Deviation			0.063	1.05	0.12	0.001	0.019	0.16	0.24	0.023	0.0	0.006				1.0
		Detection Limit			<0.0050	<0.010	<0.0050	<0.0010	<0.0010	<0.0050	<0.0050	<0.0030	<0.00040	<0.0030				<1.0
Monitoring Data														**Modified TPH TOTAL will appear when F1, F2, F3 fraction results are entered.**				
Upgradient - MW- 05																		
Not sampled, well frozen	MW-05	2012	1	1														#N/A
Not sampled - insufficient volume	MW-05	2014	3	1														#N/A
Not sampled - insufficient volume	MW-05	2015	4	1														#N/A
Not sampled - well frozen	MW-05	2016	5	1														#N/A
	MW-05		10	2														#N/A
	MW-05		15	2														#N/A
	MW-05		25	2														#N/A
																		#N/A
																		#N/A
																		#N/A
																		#N/A

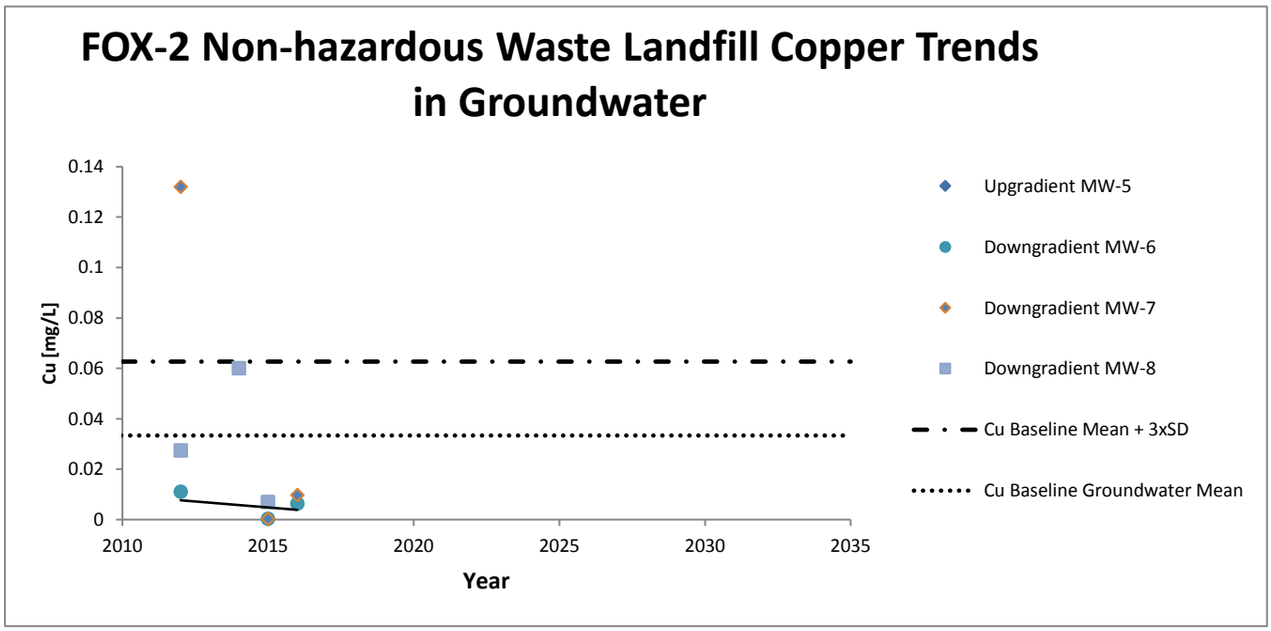
FOX-2 - Non-hazardous Waste Landfill - Summary of Monitoring Groundwater Analytical Data

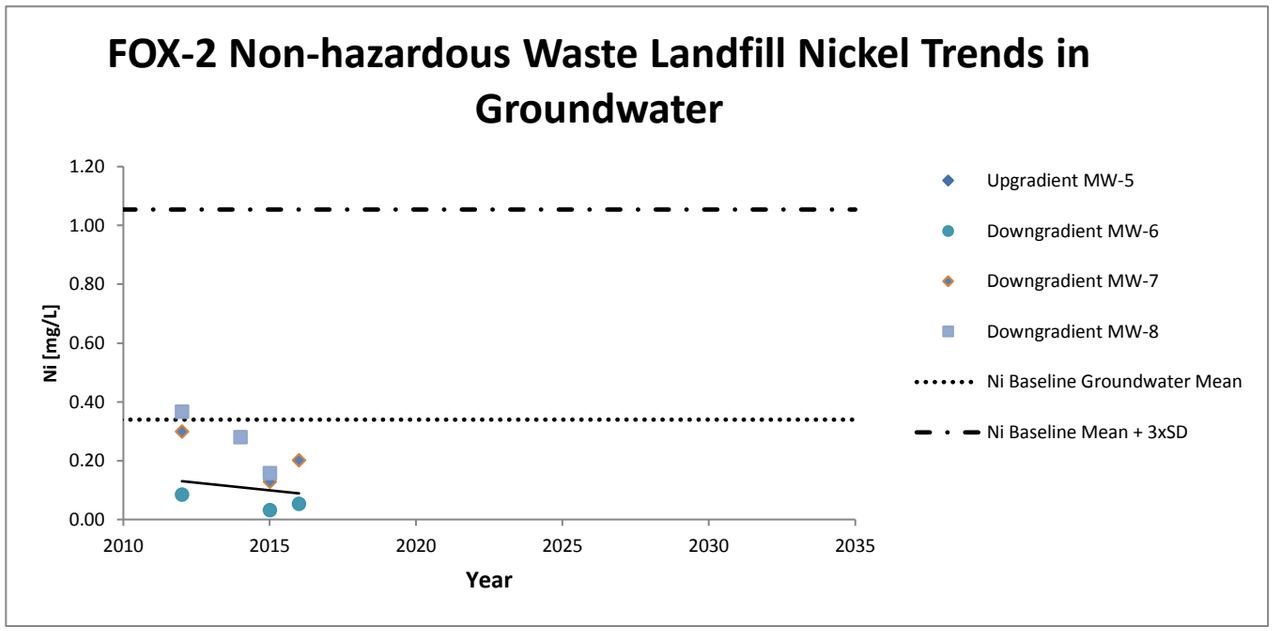
Sample ID	Location	Date	Monitoring Year	Monitoring Phase	Cu (mg/L)	Ni (mg/L)	Co (mg/L)	Cd (mg/L)	Pb (mg/L)	Zn (mg/L)	Cr (mg/L)	As (mg/L)	Hg (mg/L)	Total PCB (mg/L)	F1 C_6-C_{10} (mg/L)	F2 C_{10}-C_{16} (mg/L)	F3 C_{16}-C_{34} (mg/L)	Modified TPH^ - Total C6-C34 (mg/L)
Downgradient - MW-06																		
12-15136/37	MW-06	2012	1	1	0.011	0.084	0.0072	0.00058	**0.0013**	0.012	0.0051	0.0025	<0.00010	<0.000020	<0.025	<0.10	<0.25	<0.25
Not sampled - insufficient volume	MW-06	2014	3	1														#N/A
MW-06	MW-06	2015	4	1	<0.0005	0.032	0.0034	<0.0001	<0.0001	0.007	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.1	<0.1	0.1
MW-06	MW-06	2016	5	1	0.0064	0.053	0.0045	<0.0001	<0.0001	0.008	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	0.1
	MW-06		10	2														#N/A
	MW-06		15	2														#N/A
	MW-06		25	2														#N/A
																		#N/A
																		#N/A
																		#N/A
																		#N/A
Downgradient - MW-07																		
12-15138	MW-07	2012	1	1	0.13	0.30	**0.052**	<0.00090	**0.044**	**0.16**	0.049	**0.059**	<0.00010	<0.000020	<0.025	<0.10	2.4	**2.4**
Not sampled - insufficient volume	MW-07	2014	3	1														#N/A
MW-07	MW-07	2015	4	1	<0.0005	0.129	0.0241	0.0002	<0.0001	0.019	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.1	<0.1	0.1
MW-07	MW-07	2016	5	1	0.0097	0.201	0.0308	0.0003	<0.0001	**0.059**	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	0.1
	MW-07		10	2														#N/A
	MW-07		15	2														#N/A
	MW-07		25	2														#N/A
																		#N/A
																		#N/A
																		#N/A
																		#N/A
Downgradient - MW-08																		
12-15139	MW-08	2012	1	1	0.027	**0.37**	**0.046**	0.00046	**0.0079**	**0.072**	0.0087	0.0068	<0.00010	<0.000020	<0.025	<0.10	<0.25	<0.25
F2-MW-8-2014	MW-08	2014	3	1	0.06	0.28	**0.05**	<0.008	**0.01**	**0.12**	<0.05	**0.04**	<0.0001	<0.0001	<0.025	<0.10	<0.2	0.2
MW-08	MW-08	2015	4	1	0.007	0.158	0.0196	0.0002	<0.0001	**0.063**	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.1	<0.1	0.1
Not sampled - well frozen	MW-08	2016	5	1														#N/A
	MW-08		10	2														#N/A
	MW-08		15	2														#N/A
	MW-08		25	2														#N/A
																		#N/A
																		#N/A
																		#N/A
																		#N/A

Note: Modified TPH Total (C_6-C_{34}) has been calculated by adding results for F1, F2 and F3.

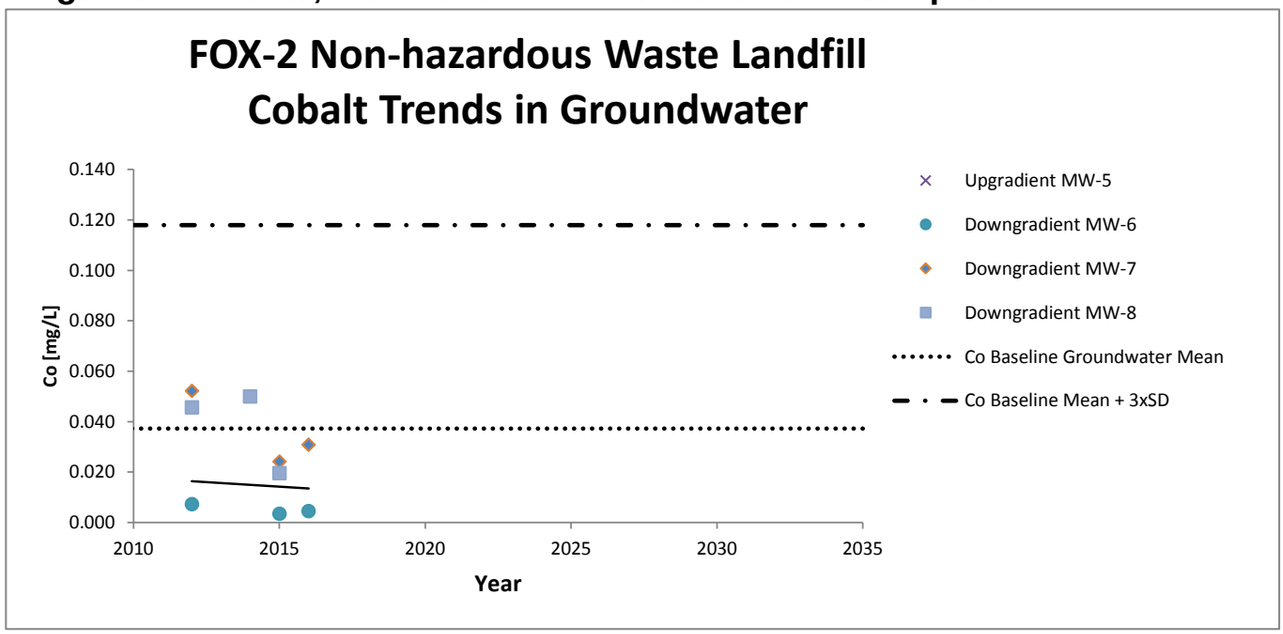
FOX-2 Non-hazardous Waste Landfill Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples

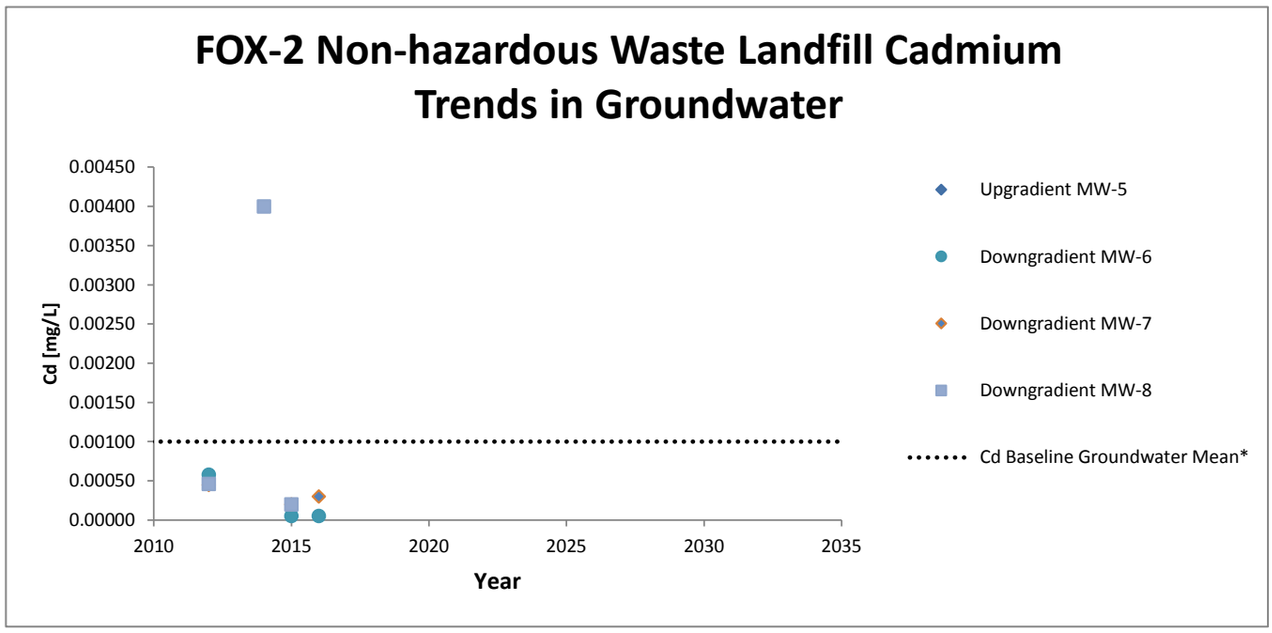
Where results are below detection, half of the detection limit has been used in the charts for the sample points. Trendlines are intended for visual interpretation of temporal trends. When all monitoring results are below detection, trendlines are a reflection of changes in detection limit. Users should refer to data tables.





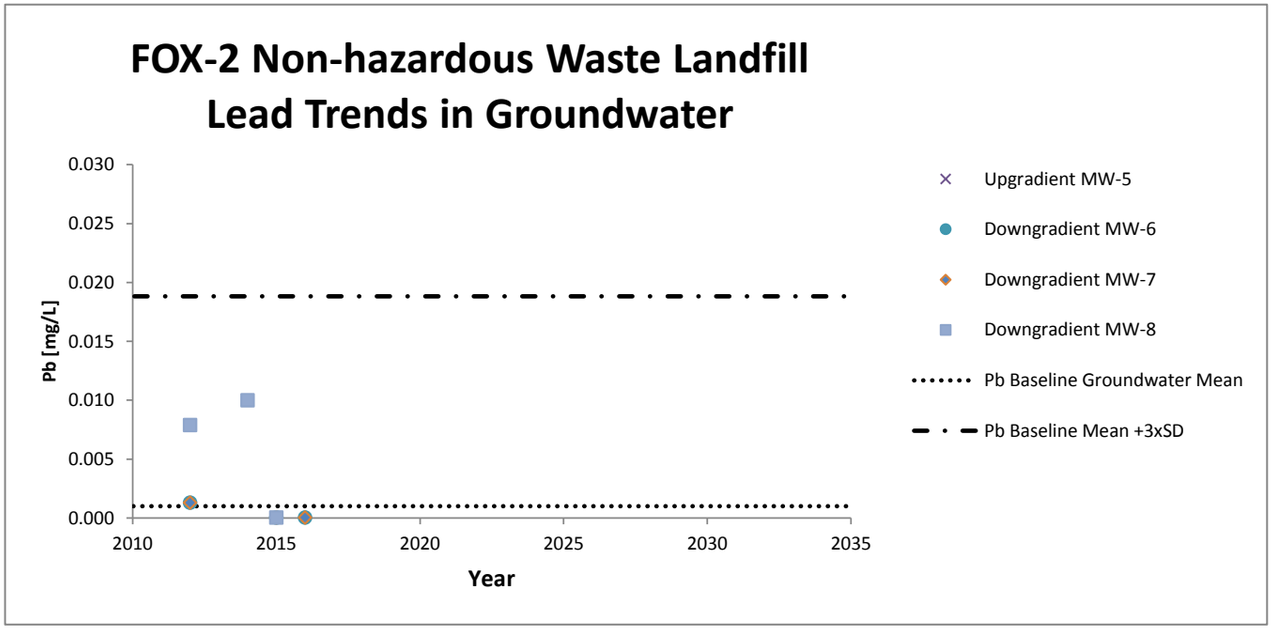
FOX-2 Non-hazardous Waste Landfill Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples

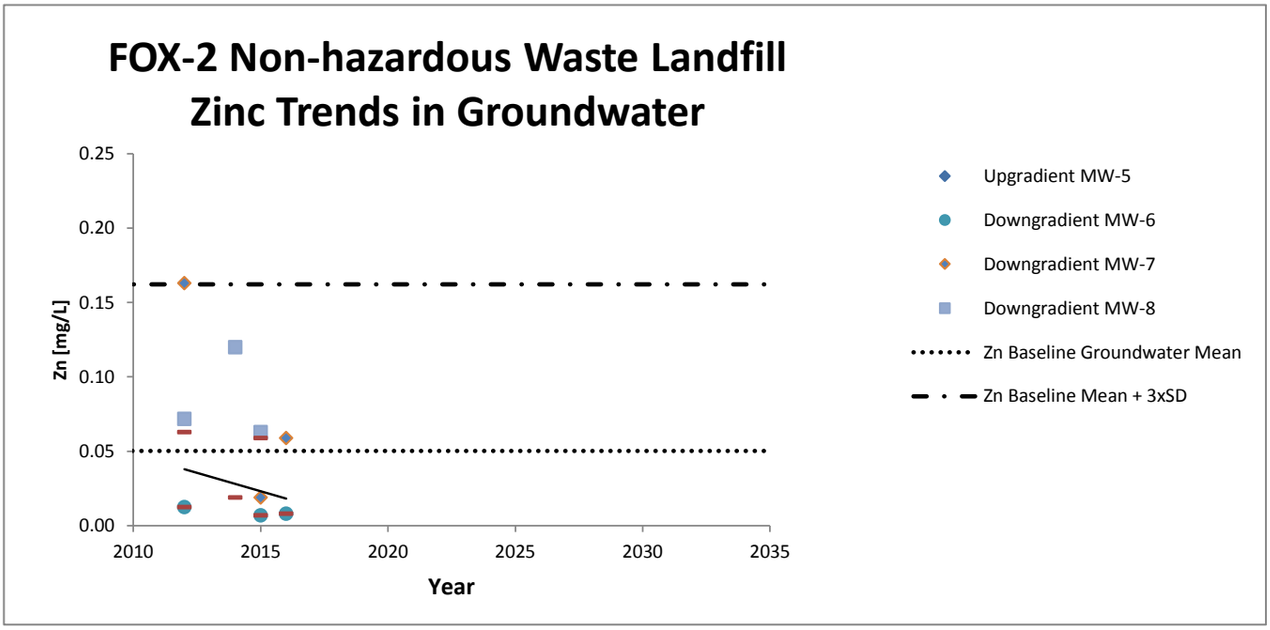




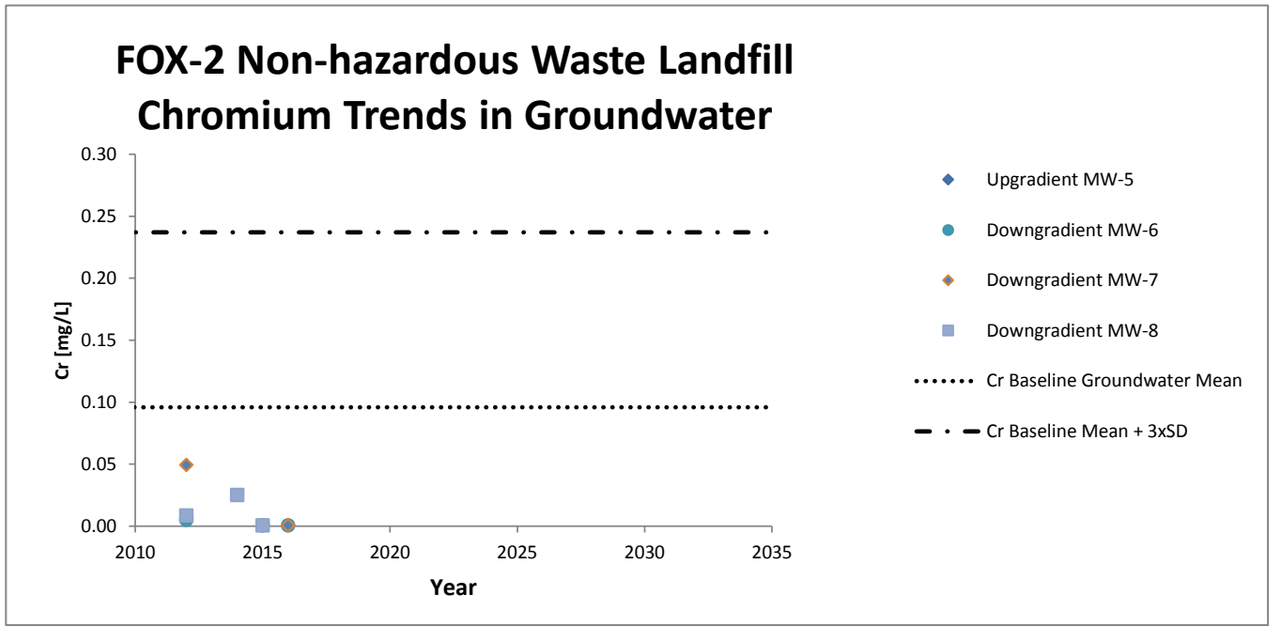
*Cd Baseline Mean is equal to the baseline detection limit.

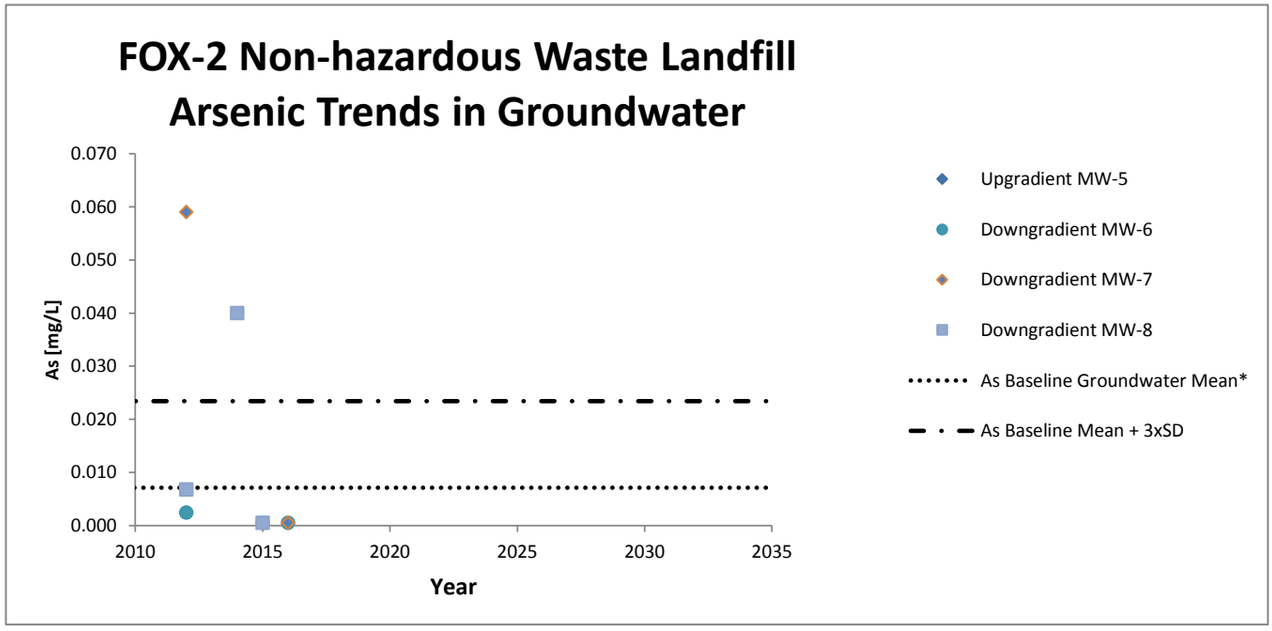
FOX-2 Non-hazardous Waste Landfill Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples



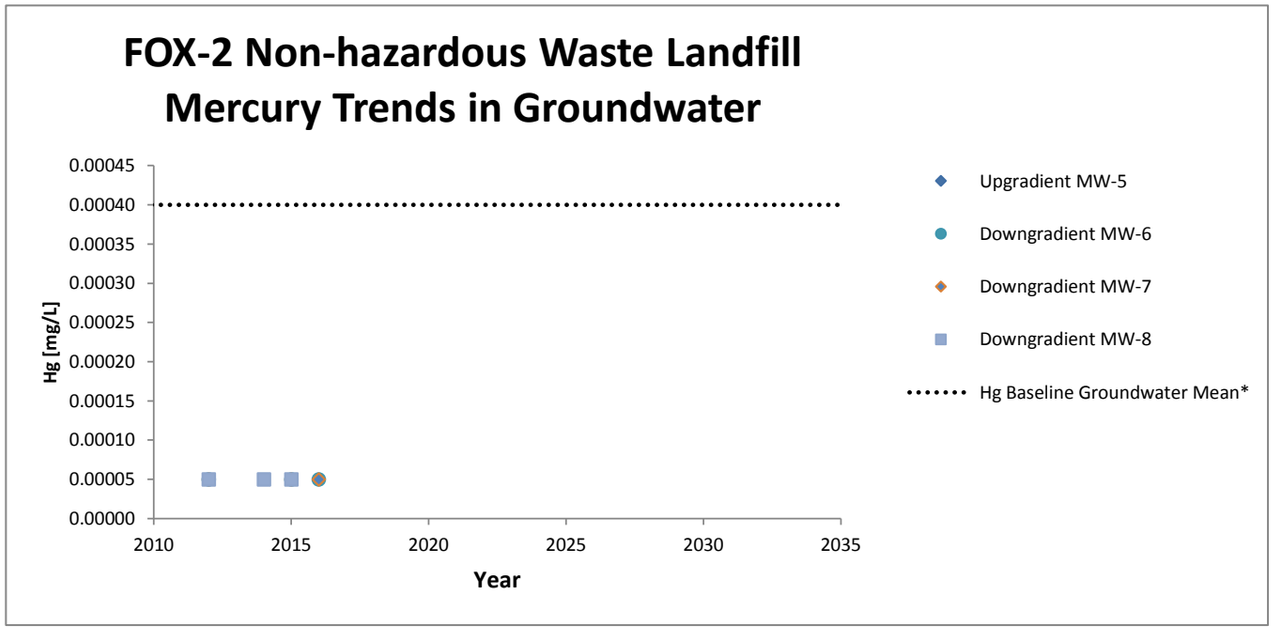


FOX-2 Non-hazardous Waste Landfill Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples

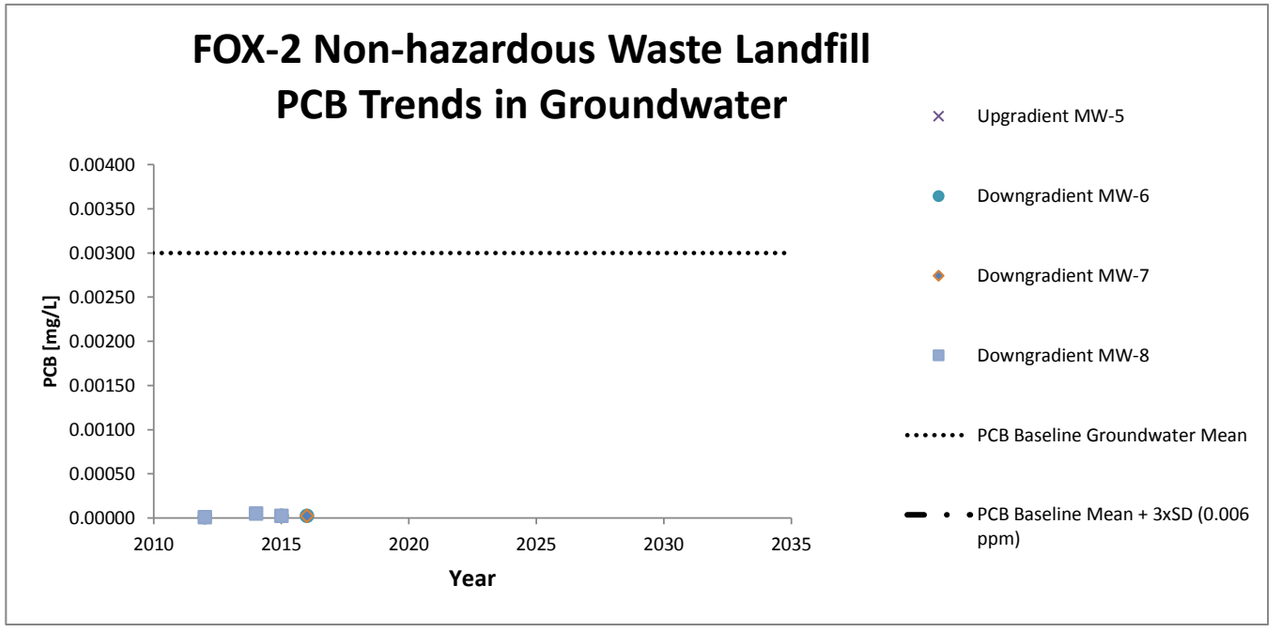




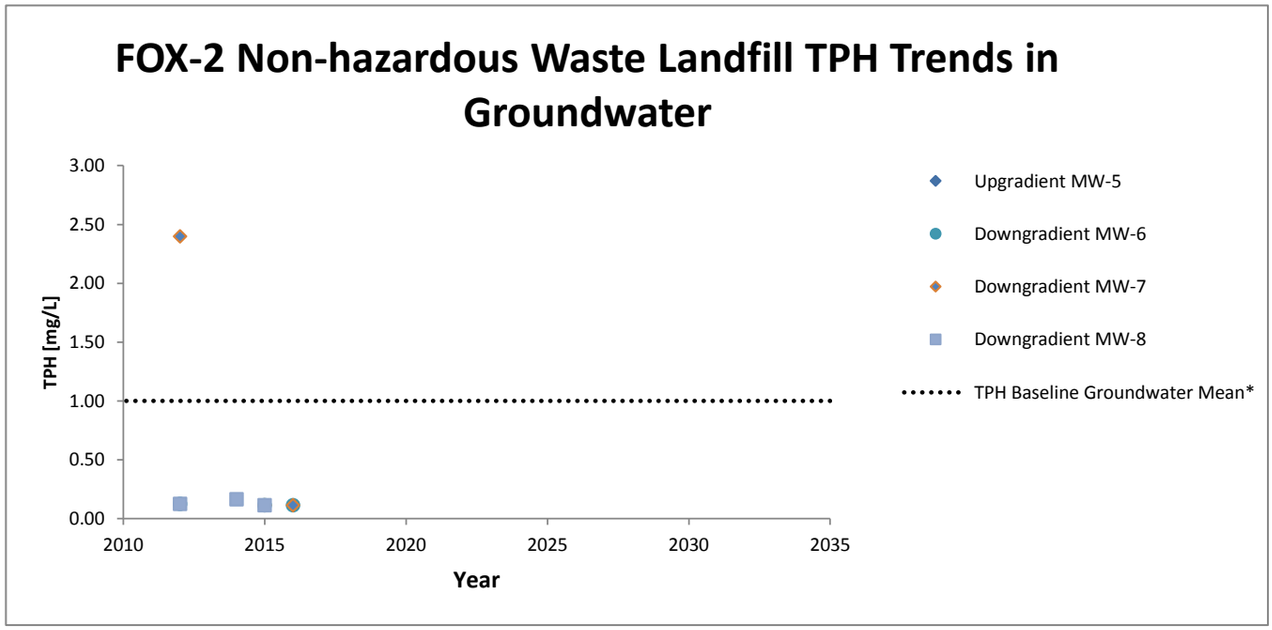
FOX-2 Non-hazardous Waste Landfill Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples



*Hg Baseline Mean is equal to the baseline detection limit.
*Hg Baseline SD = 0



FOX-2 Non-hazardous Waste Landfill Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples



*TPH Baseline Mean is equal to the baseline detection limit.
*TPH Baseline Mean SD = 0

FOX-2 - Tier II Disposal Facility - Summary of Monitoring Soil Analytical Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd* (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Cr (mg/kg)	As (mg/kg)	Hg* (mg/kg)	Total PCB (mg/kg)	F1 C_6-C_{10} (mg/kg)	F2 C_{10}-C_{16} (mg/kg)	F3 C_{16}-C_{34} (mg/kg)	Modified TPH^ - Total C6-C34 (mg/kg)
Background Data - Arithmetic Mean*						55	46	17	1.0	10	84	59	23						
Baseline Data - Arithmetic Mean*						**52**	**35**	**12**	**1.0**	**10**	**65**	**44**	**38**	**0.10**	**0.10**				**20**
Baseline Data - Standard Deviation						26	7.1	2.2	0.0	5.4	10	5.9	13	0.0	0.021				17
Baseline Data mean + 3xStandard Deviation						131	57	19		26	94	62	78		0.16				73
**** If baseline or background arithmetic mean was below the detection limit, the mean has been modified to match the detection limit value.***																			
DEW Line Cleanup Tier I Criteria										*200*					*1*				
DEW Line Cleanup Tier II Criteria & Hydrocarbon Action Level						*100*	*100*	*50*	*5*	*500*	*500*	*250*	*30*	*2.0*	*5*				*2500*
Monitoring Data																			**TPH Sum will appear when F1, F2 and F3 fractions are entered.**
Upgradient																			
	MW #9 surface																		
12-19416[1]/17[2]	MW-09	2012	1	1	0-10	**54**	**55**	**16**	<0.50	**14**	**110**	**71**	*58*	<0.010	<0.020	<5.0	<10	66	**74**
2013-F2-MW-09-A	MW-09	2013	2	1	0-10	34	30	10	<0.10	8.0	57	34	29	<0.050	<0.010	<10	<10	22	**32**
F2-MW-9-S-A-2014	MW-09	2014	3	1	0-10	46	**46**	12	<0.5	9.0	**72**	**58**	*40*	<0.1	<0.02	<10	<10	70	**80**
MW-09 (0-15)	MW-09	2015	4	1	0-15	25.5	21.3	7.3	<0.5	6.8	42.6	28.2	26.5	<0.1	<0.05	<7	<4	<8	10
MW-09a	MW-09	2016	5	1	0-15	34	31	10	<0.5	**11**	50	34	*64*	<0.1	<0.05	<7	<4	<8	10
	MW-09		7	2															#N/A
	MW-09		10	2															#N/A
	MW-09		15	2															#N/A
	MW-09		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A
	MW #9 depth																		
12-19418[1]/19[2]	MW-09	2012	1	1	30-40	51	**51**	**14**	<0.50	**19**	**110**	**72**	*60*	0.034	<0.020	<5.0	<10	100	**108**
2013-F2-MW-09-B	MW-09	2013	2	1	40-50	36	33	11	<0.10	8.0	62	37	*31*	<0.050	<0.010	<10	<10	21	**31**
F2-MW-9-S-B-2014	MW-09	2014	3	1	40-50	46	**62**	11	<0.5	9.0	**72**	**102**	*36*	<0.1	<0.02	<10	<10	<20	20
MW-09 (30-40)	MW-09	2015	4	1	30-40	28.1	23.3	7.8	<0.5	7.9	46.8	31.6	27.9	<0.1	<0.05	<7	<4	25	**31**
Not sampled - refusal	MW-09	2016	5	1															#N/A
	MW-09		7	2															#N/A
	MW-09		10	2															#N/A
	MW-09		15	2															#N/A
	MW-09		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A

FOX-2 - Tier II Disposal Facility - Summary of Monitoring Soil Analytical Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd* (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Cr (mg/kg)	As (mg/kg)	Hg* (mg/kg)	Total PCB (mg/kg)	F1 C_6-C_{10} (mg/kg)	F2 C_{10}-C_{16} (mg/kg)	F3 C_{16}-C_{34} (mg/kg)	Modified TPH^ - Total C6-C34 (mg/kg)
Downgradient																			
	MW #10 surface																		
12-19420[1]/21[2]	MW-10	2012	1	1	0-10	39	**37**	11	<0.50	7.3	**87**	**89**	14	<0.010	<0.050	<5.0	<10	140	**148**
2013-F2-MW-10-A	MW-10	2013	2	1	0-15	*120*	**48**	11	<0.10	**22**	**87**	**56**	*66*	0.060	<0.010	<10	<10	160	**170**
F2-MW-10-S-A-2014	MW-10	2014	3	1	0-15	**71**	**62**	11	<0.5	**11**	**81**	**96**	*56*	<0.1	<0.02	<10	<10	<20	20
MW-10 (0-15)	MW-10	2015	4	1	0-15	*104*	**41**	11.2	0.5	**22.6**	**75.1**	**50.2**	*83.7*	<0.1	<0.05	<7	<4	82	**88**
MW-10a	MW-10	2016	5	1	0-15	*132*	**59**	**15**	<0.5	**29**	**82**	**66**	*68*	<0.1	<0.05	<7	<4	94	**100**
	MW-10		7	2															#N/A
	MW-10		10	2															#N/A
	MW-10		15	2															#N/A
	MW-10		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A
	MW #10 depth																		
12-19422[1]/23[2]	MW-10	2012	1	1	30-40	*150*	**61**	**14**	<0.50	**30**	**110**	**73**	*96*	0.035	<0.020	<5.0	<10	57	**65**
2013-F2-MW-10-B	MW-10	2013	2	1	40-50	*100*	**44**	12	<0.10	**20**	**82**	**52**	*63*	<0.050	<0.010	<10	<10	28	**38**
Not sampled - bedrock reached at 0.2m	MW-10	2014	3	1															#N/A
MW-10 (40-50)	MW-10	2015	4	1	40-50	**74.8**	35.2	11.5	0.5	**17.3**	60.1	40.8	*86.9*	<0.1	<0.05	<7	<4	<8	10
Not sampled - refusal	MW-10	2016	5	1															#N/A
	MW-10		7	2															#N/A
	MW-10		10	2															#N/A
	MW-10		15	2															#N/A
	MW-10		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A

FOX-2 - Tier II Disposal Facility - Summary of Monitoring Soil Analytical Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd* (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Cr (mg/kg)	As (mg/kg)	Hg* (mg/kg)	Total PCB (mg/kg)	F1 C_6-C_{10} (mg/kg)	F2 C_{10}-C_{16} (mg/kg)	F3 C_{16}-C_{34} (mg/kg)	Modified TPH^ - Total C6-C34 (mg/kg)
	MW #11 surface																		
12-19424[1]/25[2]	MW-11	2012	1	1	0-10	**75**	**52**	**13**	<0.50	**14**	**90**	**51**	*50*	<0.010	<0.020	<5.0	<10	<50	**33**
2013-F2-MW-11-A	MW-11	2013	2	1	0-15	**53**	**40**	11	<0.10	**10**	**72**	40	*43*	<0.050	<0.010	<10	<10	11	**21**
F2-MW-11-S-A-2014	MW-11	2014	3	1	0-15	**65**	**48**	12	<0.5	**11**	**79**	**61**	*51*	<0.1	<0.02	<10	<10	40	**50**
MW-11 (0-15)	MW-11	2015	4	1	0-15	**53.8**	33	8.3	<0.5	**10.9**	57.9	36.9	*39.4*	<0.1	<0.05	<7	<4	<8	10
MW-11b	MW-11	2016	5	1	0-15	**64**	**46**	**13**	<0.5	**11**	62	43	*37*	<0.1	<0.05	<7	<4	<8	10
	MW-11		7	2															#N/A
	MW-11		10	2															#N/A
	MW-11		15	2															#N/A
	MW-11		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A
	MW #11 depth																		
12-19426[1]/27[2]	MW-11	2012	1	1	30-40	**84**	**52**	**12**	<0.50	**15**	**91**	**57**	*56*	0.012	<0.020	<5.0	<10	<50	**33**
2013-F2-MW-11-B	MW-11	2013	2	1	40-50	**56**	**46**	**13**	<0.10	**12**	**77**	43	*46*	<0.050	<0.010	<10	<10	10	20
F2-MW-11-S-B-2014	MW-11	2014	3	1	40-50	**73**	**48**	11	<0.5	**12**	**75**	**57**	*47*	<0.1	<0.02	<10	<10	30	**40**
MW-11 (40-50) (Dup Avg)	MW-11	2015	4	1	40-50	**57**	**38**	9.6	<0.5	**11**	**67**	43	*51*	<0.1	<0.1	<6	<4	32	**37**
MW-11a	MW-11	2016	5	1	30-40	**64**	**40**	11	<0.5	**12**	53	39	*33*	<0.1	<0.05	<7	<4	<8	10
	MW-11		7	2															#N/A
	MW-11		10	2															#N/A
	MW-11		15	2															#N/A
	MW-11		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A

FOX-2 - Tier II Disposal Facility - Summary of Monitoring Soil Analytical Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd* (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Cr (mg/kg)	As (mg/kg)	Hg* (mg/kg)	Total PCB (mg/kg)	F1 C_6-C_{10} (mg/kg)	F2 C_{10}-C_{16} (mg/kg)	F3 C_{16}-C_{34} (mg/kg)	Modified TPH^ - Total C6-C34 (mg/kg)
	MW #12 surface																		
12-19428[1]/29[2]	MW-12	2012	1	1	0-10	52	**56**	**15**	<0.50	**16**	**92**	**61**	*61*	0.021	<0.020	<5.0	<10	<50	**33**
2013-F2-MW-12-A	MW-12	2013	2	1	0-15	50	**39**	**13**	<0.10	**10**	**67**	39	*48*	<0.050	<0.010	<10	<10	14	**24**
F2-MW-12-S-A-2014	MW-12	2014	3	1	0-15	**72**	**60**	**17**	<0.5	**12**	**90**	**58**	*70*	<0.1	<0.02	<10	<10	<20	20
MW-12 (0-15)	MW-12	2015	4	1	0-15	41	33.8	10.8	<0.5	**12.1**	64.4	39.8	*34.4*	<0.1	<0.05	<7	<4	<8	10
MW-12b	MW-12	2016	5	1	0-15	**54**	**36**	10	<0.5	**11**	48	39	*32*	<0.1	<0.05	<7	<4	61	**67**
	MW-12		7	2															#N/A
	MW-12		10	2															#N/A
	MW-12		15	2															#N/A
	MW-12		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A
	MW #12 depth																		
12-19430[1]/31[2]	MW-12	2012	1	1	30-40	37	34	11	<0.50	**10**	**83**	**83**	14	<0.010	<0.020	<5.0	<10	<50	**33**
2013-F2-MW-12-B	MW-12	2013	2	1	40-50	45	**36**	12	<0.10	**10**	63	35	*51*	<0.050	<0.010	<10	<10	<10	15
F2-MW-12-S-B-2014	MW-12	2014	3	1	40-50	**72**	**78**	**20**	<0.5	**14**	**104**	**97**	*65*	<0.1	<0.02	<10	<10	<20	20
MW-12 (40-50)	MW-12	2015	4	1	40-50	38.5	31.2	10.3	<0.5	7.8	57.5	36	*36.8*	<0.1	<0.05	<7	<4	<8	10
MW-12a	MW-12	2016	5	1	30-40	**54**	**39**	11	<0.5	**11**	55	41	*34*	<0.1	<0.05	<7	<4	<8	10
	MW-12		7	2															#N/A
	MW-12		10	2															#N/A
	MW-12		15	2															#N/A
	MW-12		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A

Note: Modified TPH Total (C_6-C_{34}) has been calculated by adding results for F1, F2 and F3.

[1] - soil sample analyzed for inorganics and PCBs

[2] - soil sample analyzed for F1-F3 fraction PHCs

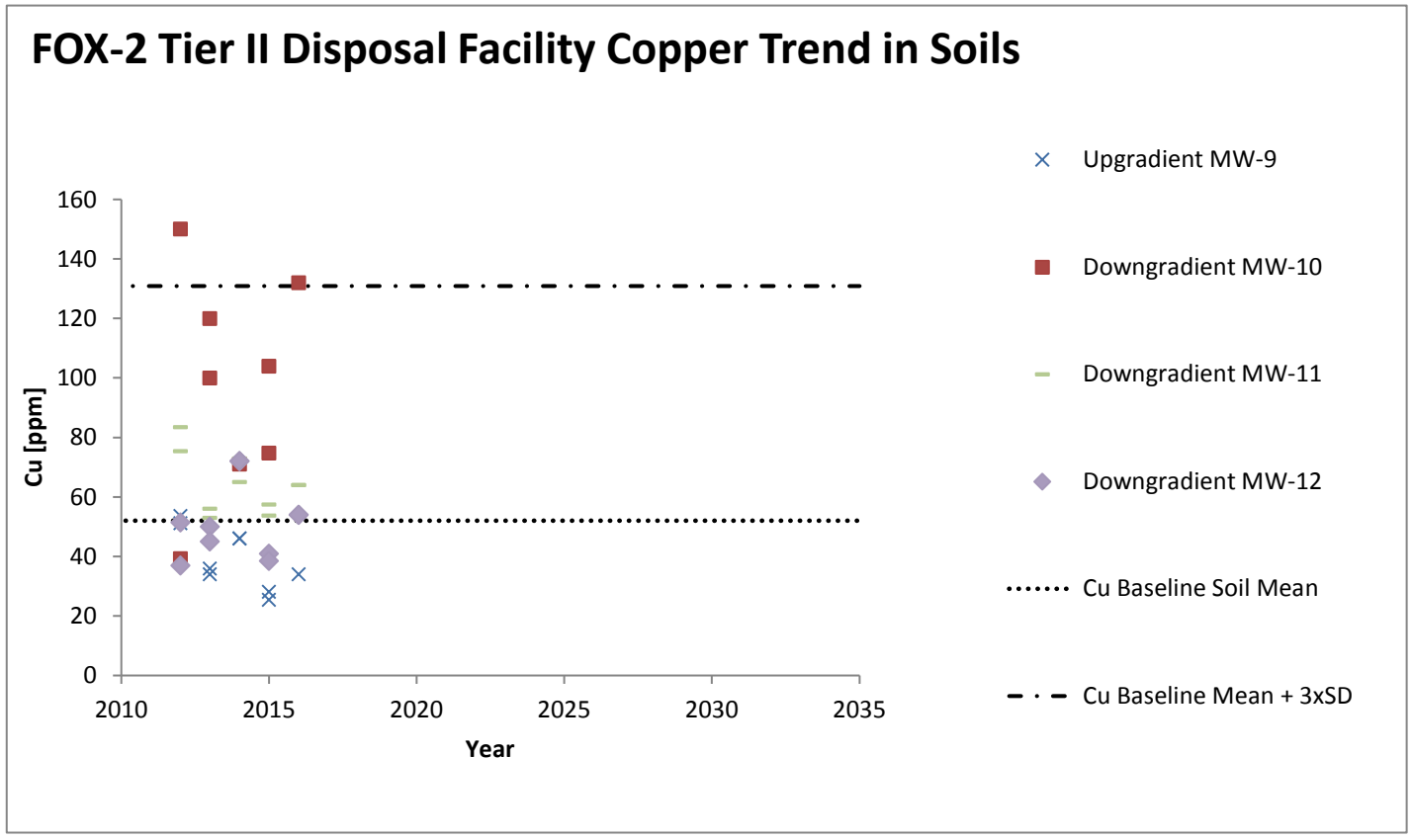
Legend

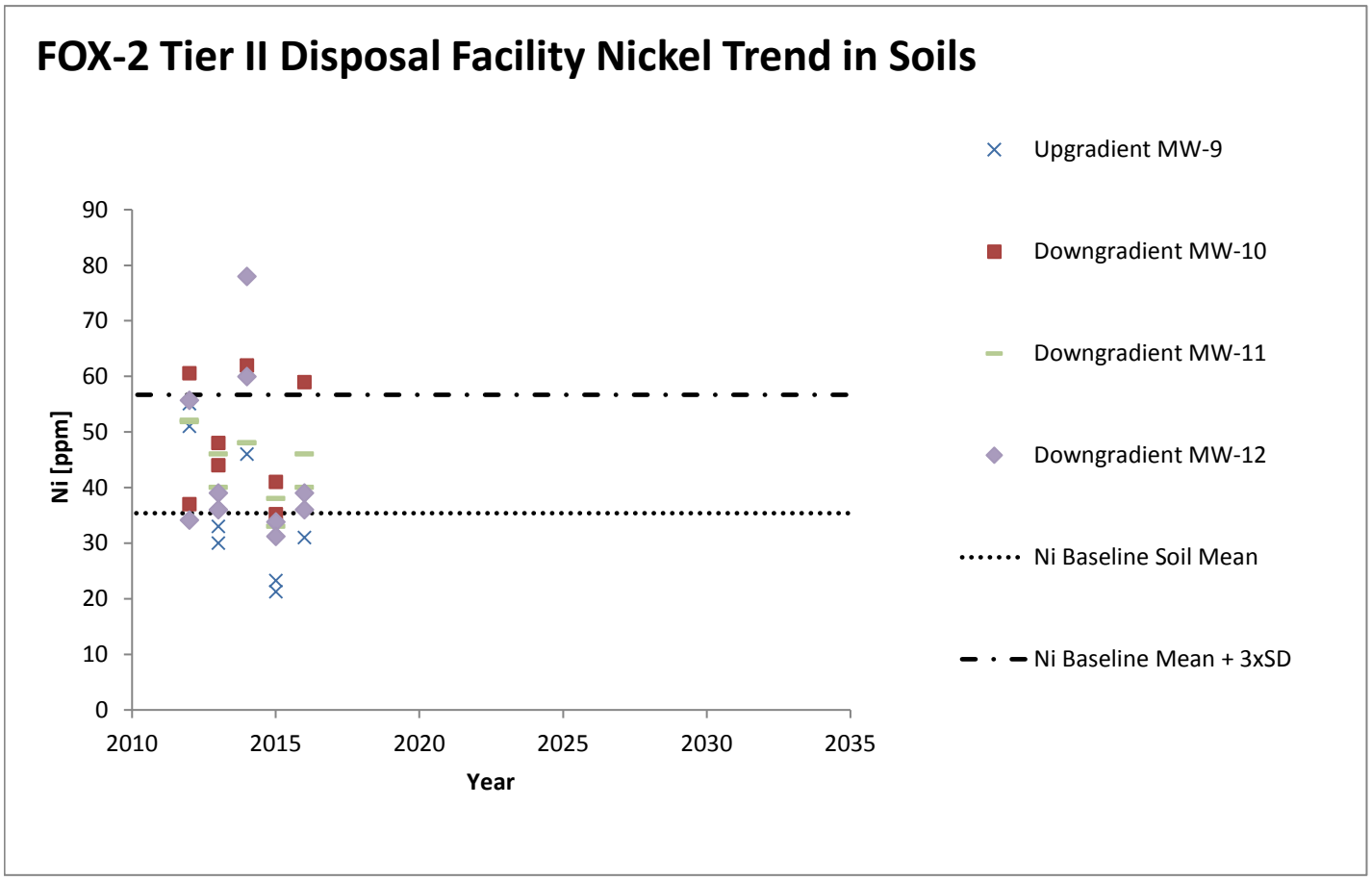
XX	sample exceeds background
XX	**sample exceeds baseline**
XX	*sample exceeds DLCU Tier I criteria*
XX	*sample exceeds DLCU Tier II criteria*

FOX-2 Tier II Disposal Facility Trends in Soil Inorganics, PCBs and PHCs (modified TPH)

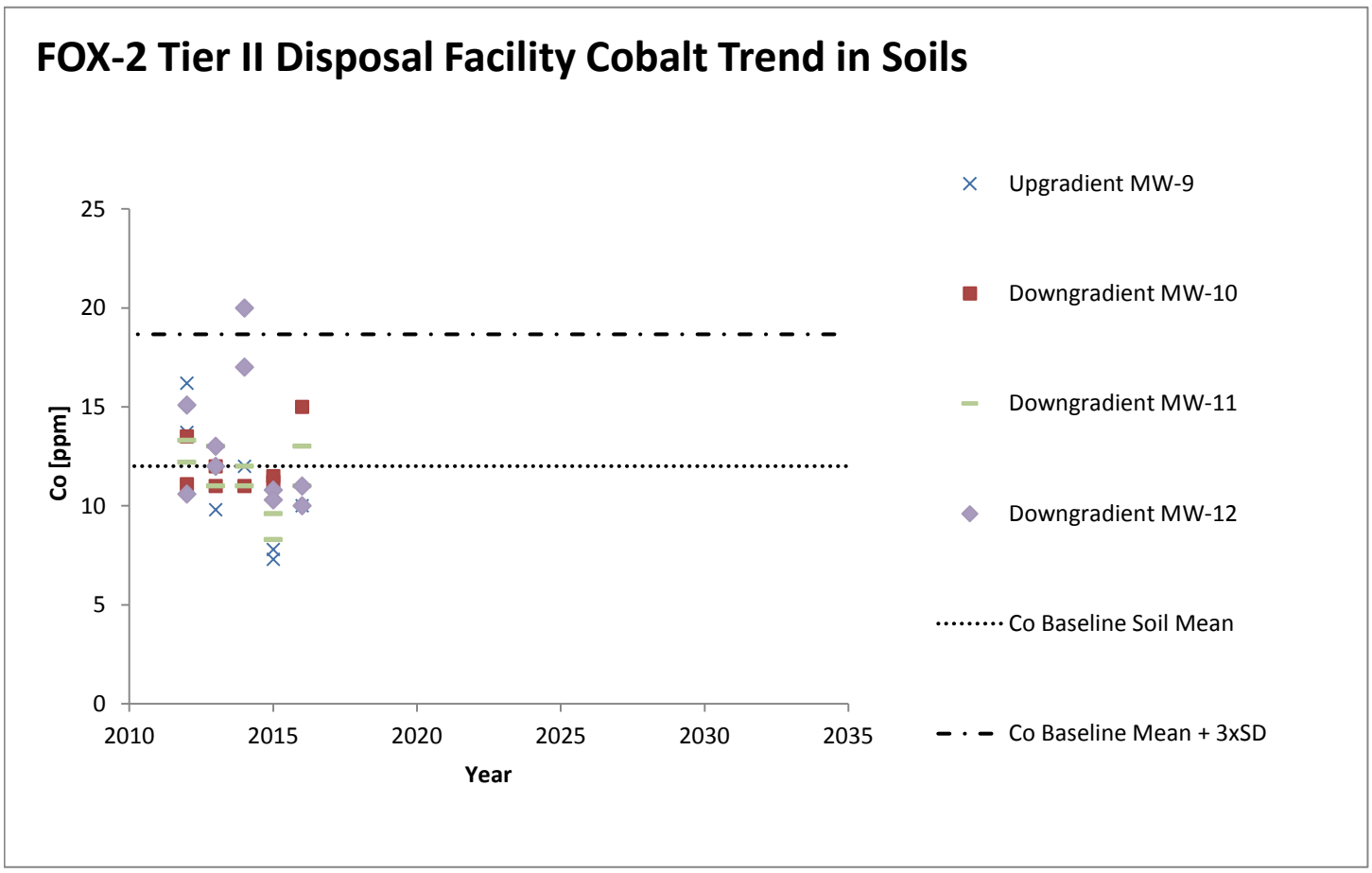
Where results are below detection, half of the detection limit has been used in the charts for the sample points.

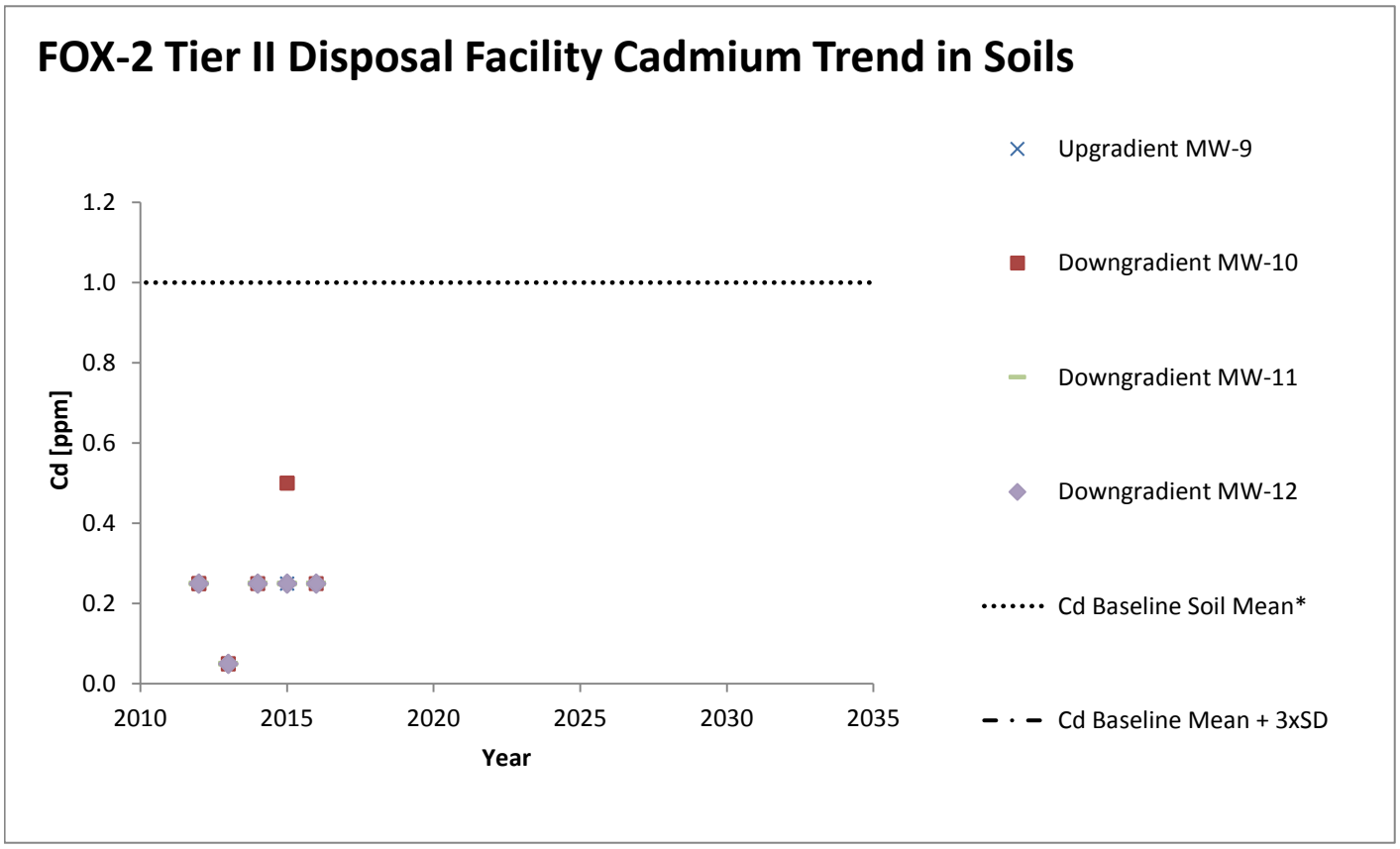
Trendlines are intended for visual interpretation of temporal trends. When all monitoring results are below detection, trendlines are a reflection of changes in detection limit. Users should refer to data tables.





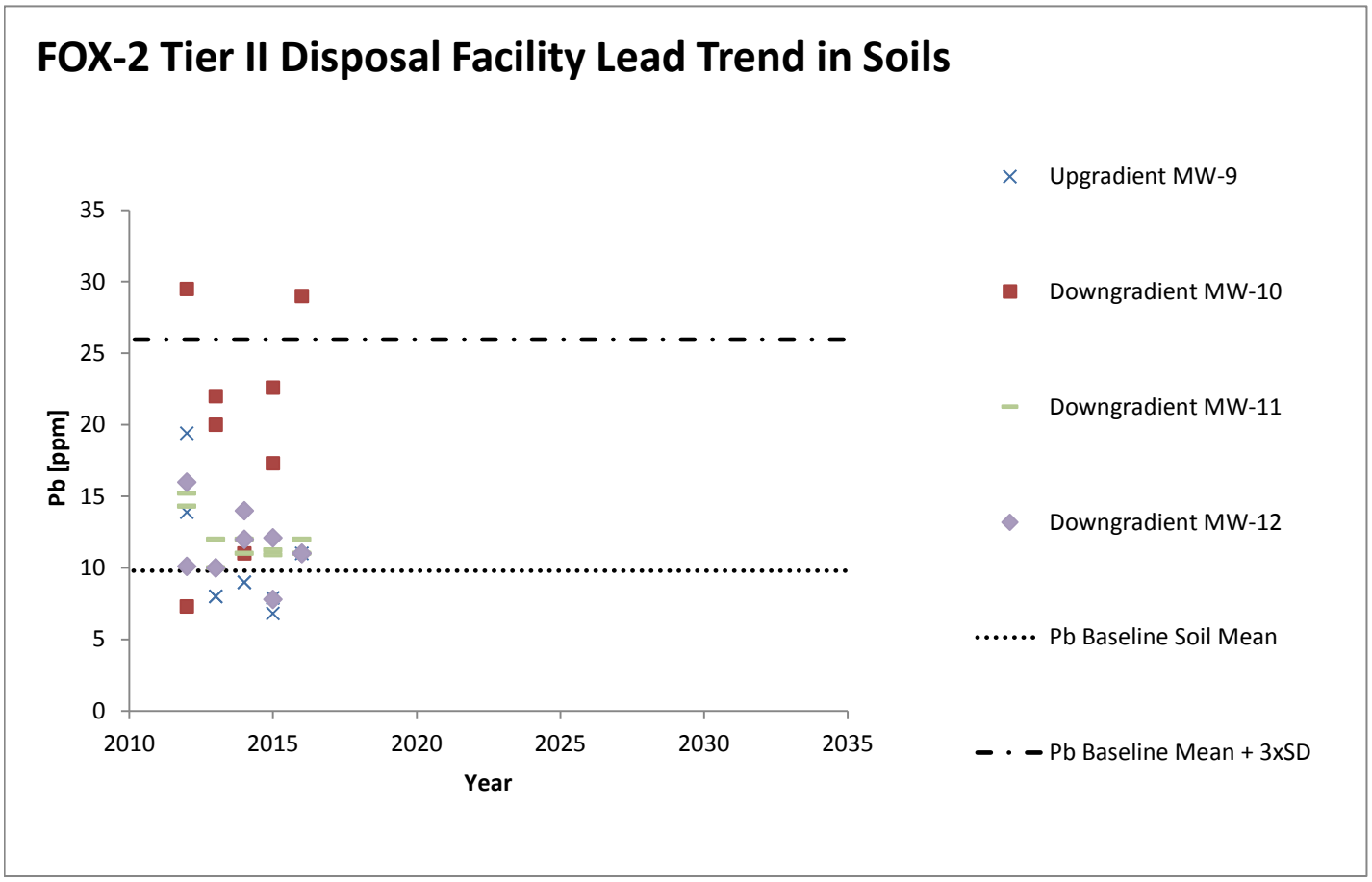
FOX-2 Tier II Disposal Facility Trends in Soil Inorganics, PCBs and PHCs (modified TPH)

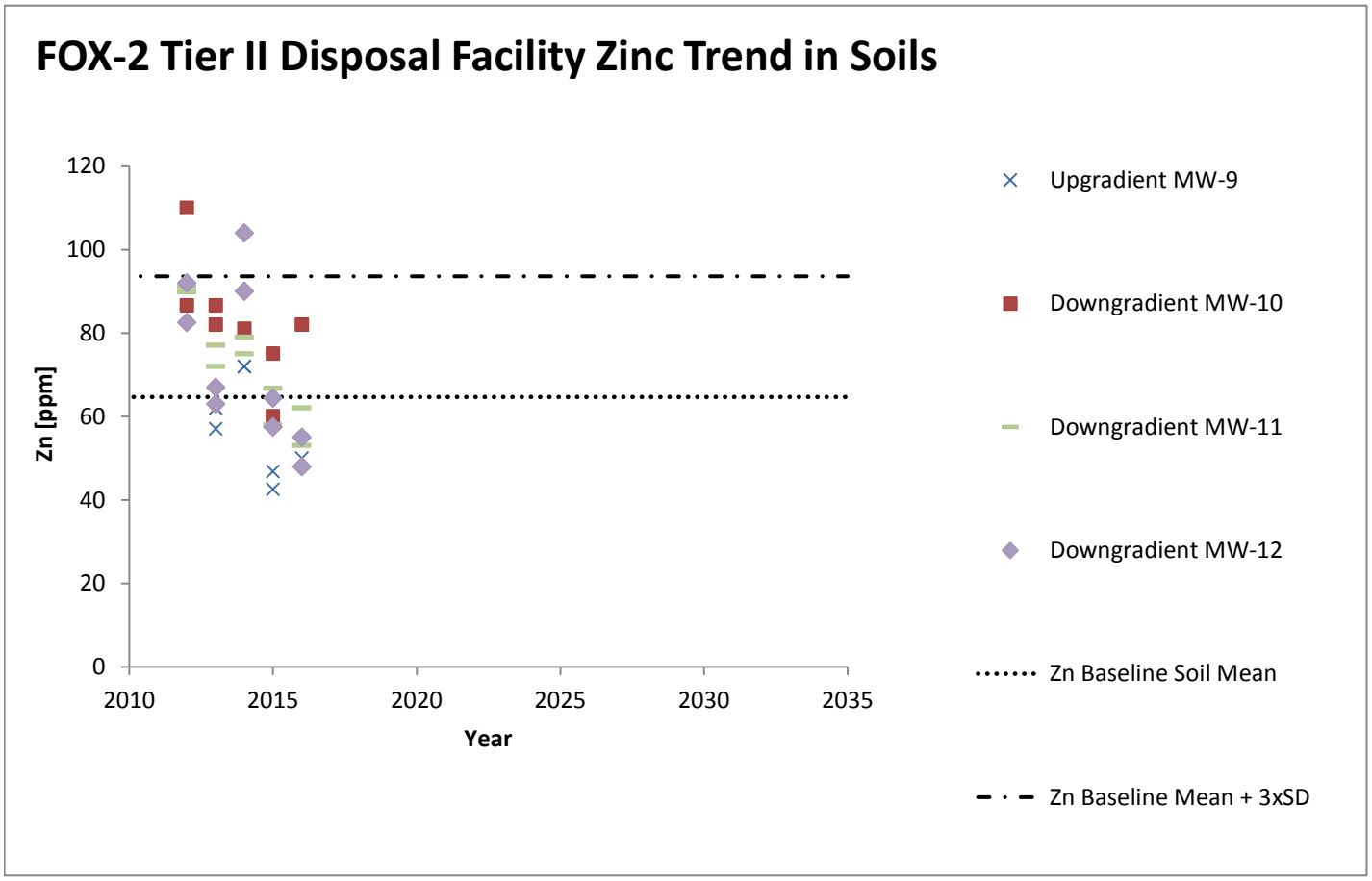




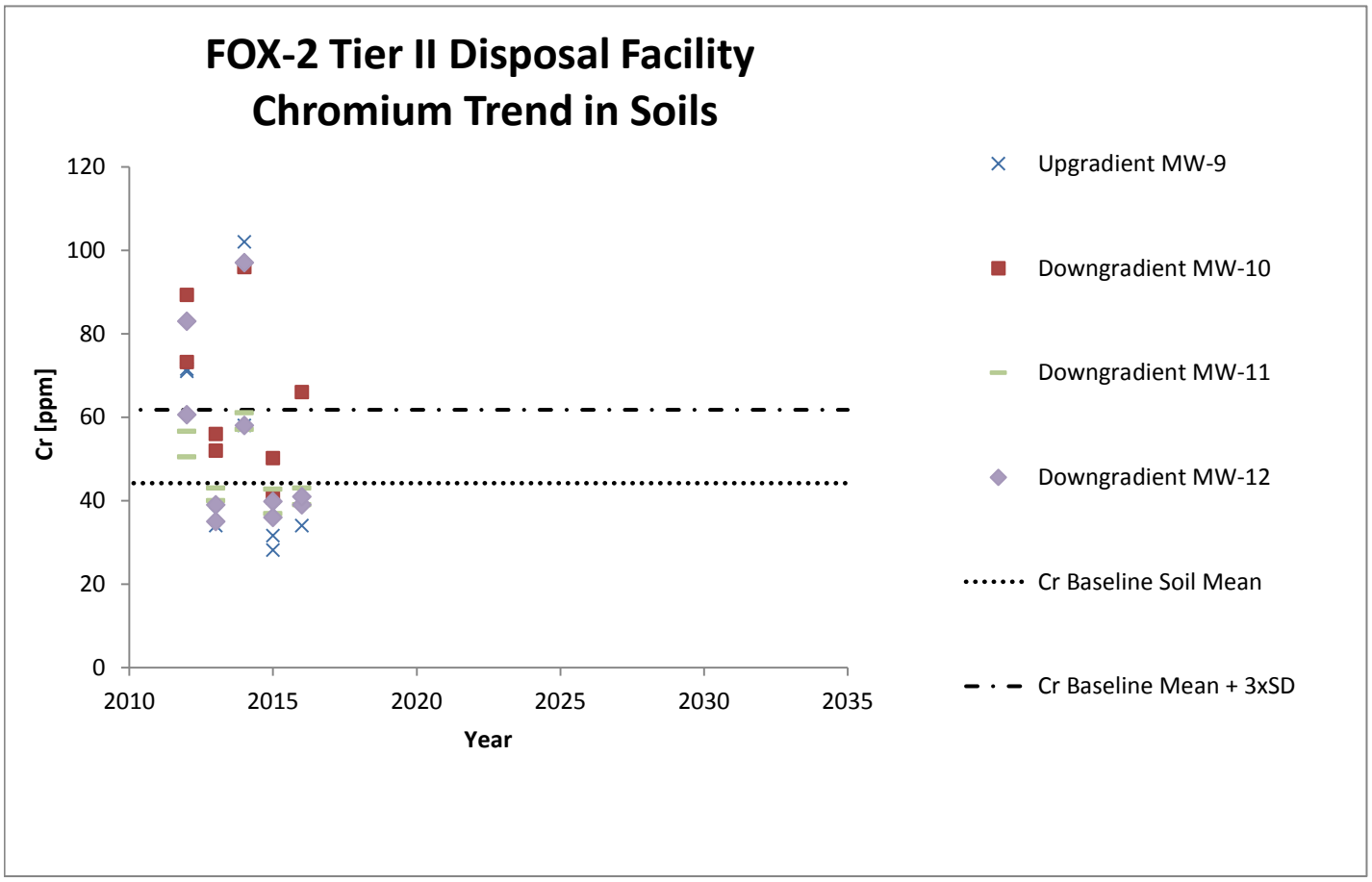
*Cd Baseline Mean is equal to the baseline detection limit.
Cd Baseline SD = 0

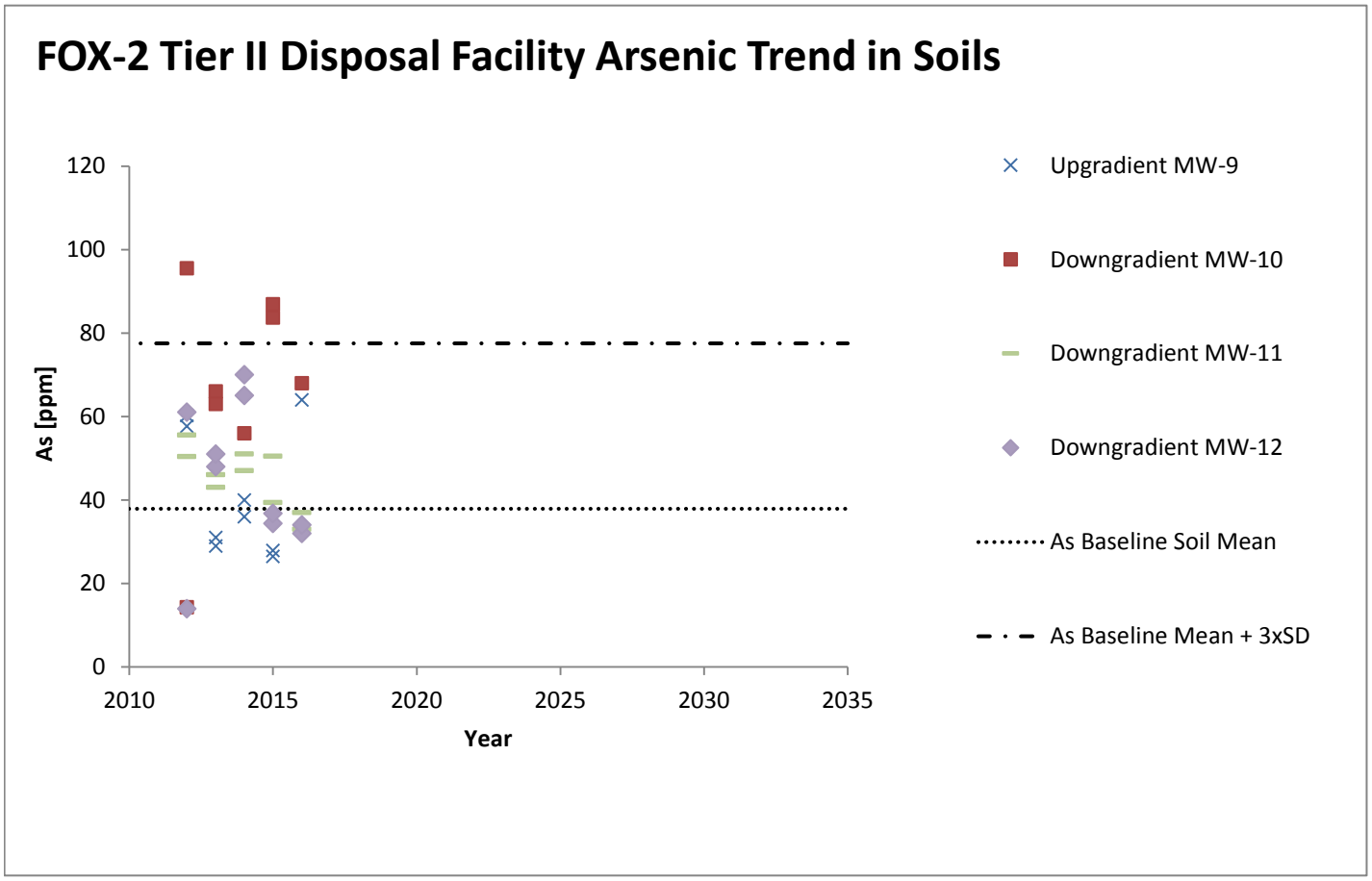
FOX-2 Tier II Disposal Facility Trends in Soil Inorganics, PCBs and PHCs (modified TPH)



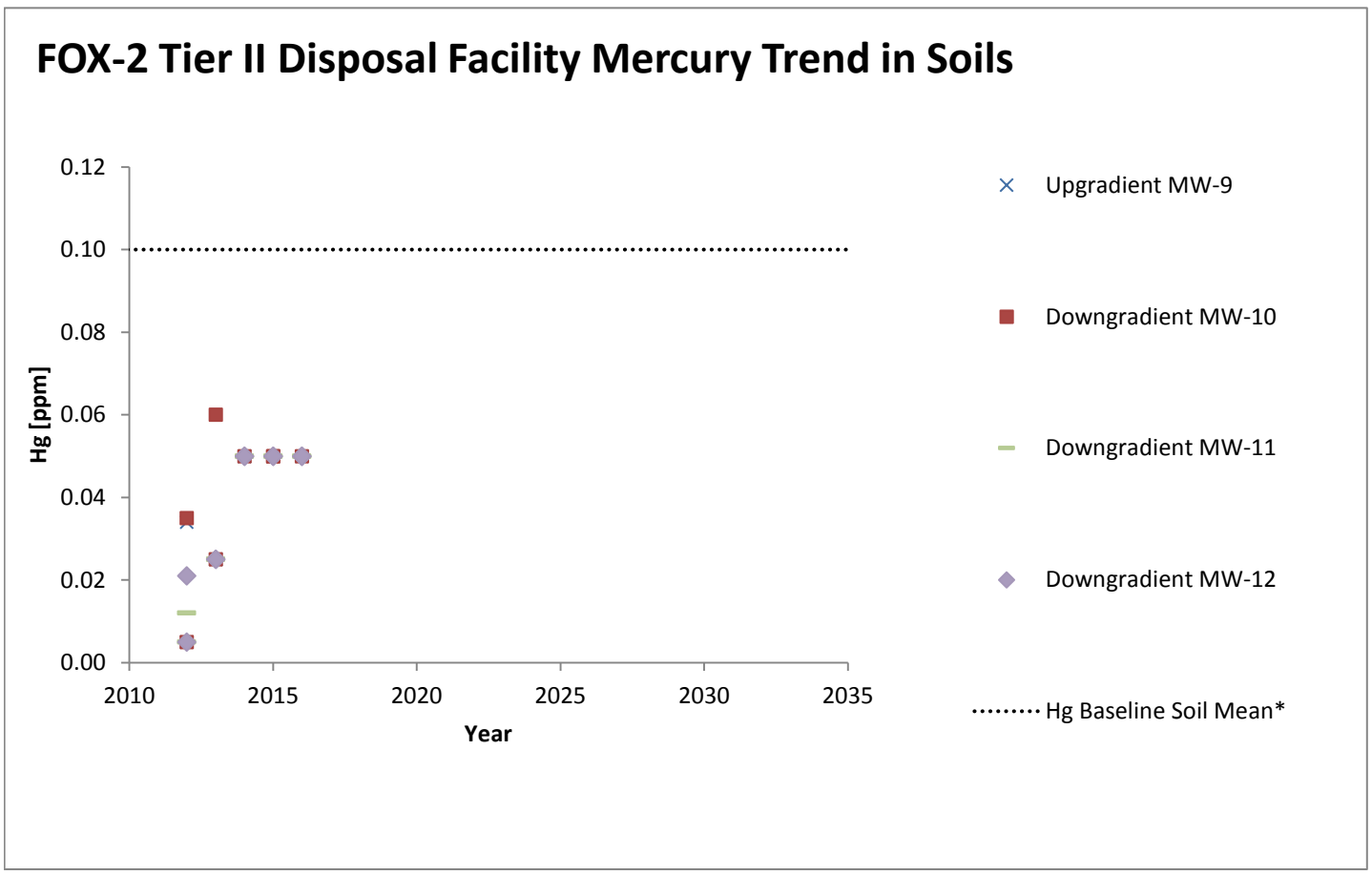


FOX-2 Tier II Disposal Facility Trends in Soil Inorganics, PCBs and PHCs (modified TPH)

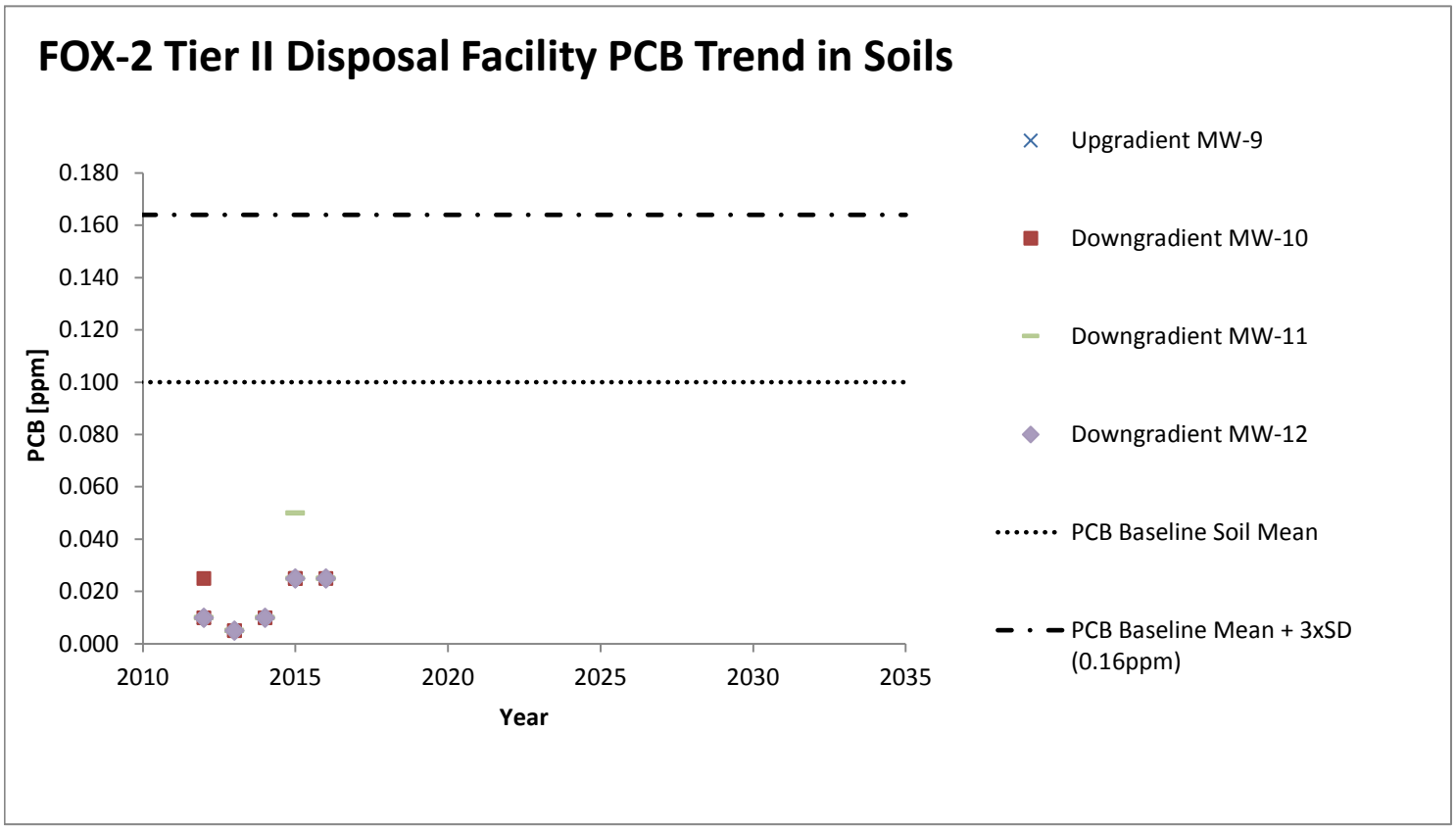




FOX-2 Tier II Disposal Facility Trends in Soil Inorganics, PCBs and PHCs (modified TPH)

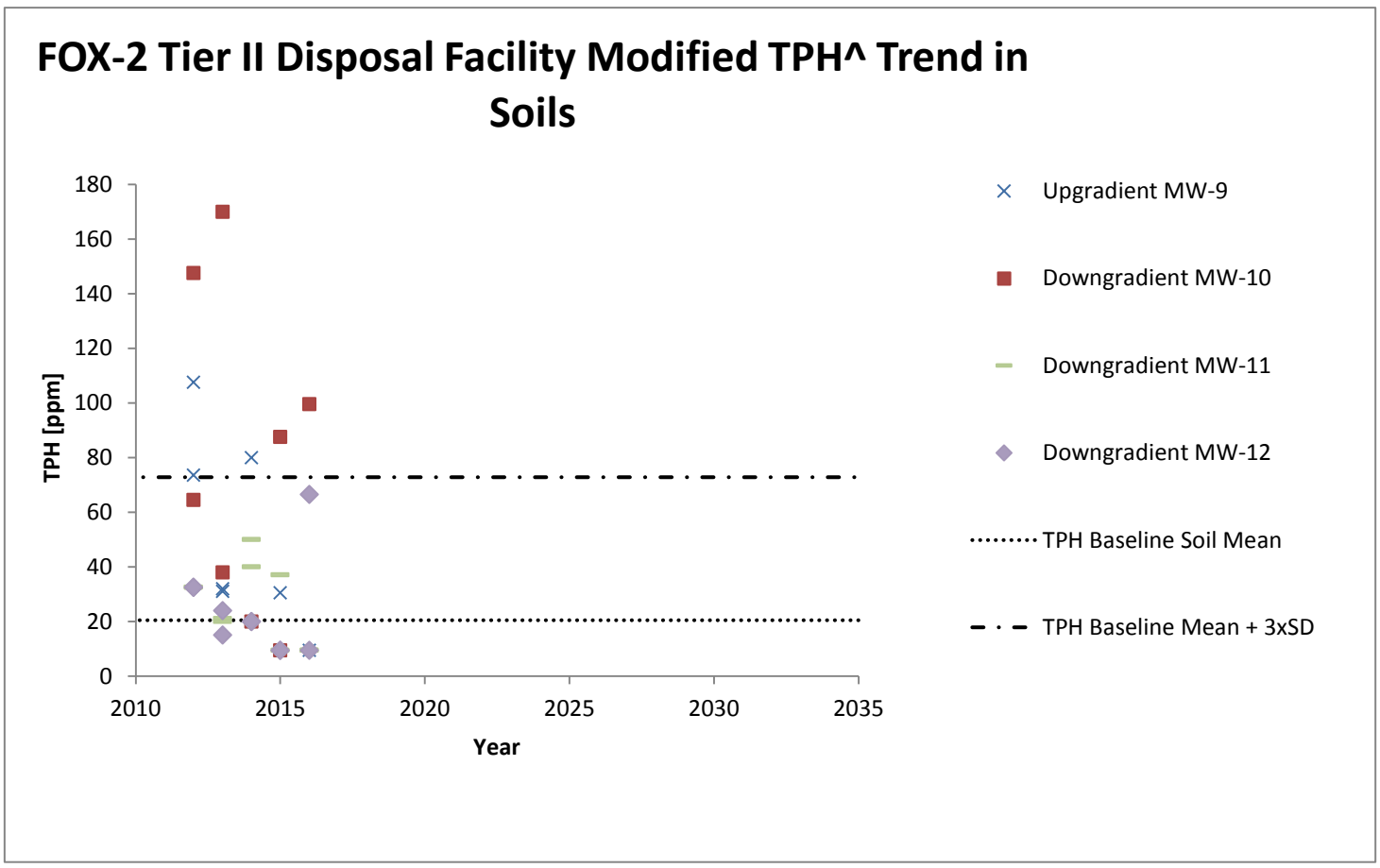


*Hg Baseline Mean is equal to the baseline detection limit.
Hg Baseline SD = 0



PCB Baseline Mean equals the baseline detection limit.

FOX-2 Tier II Disposal Facility Trends in Soil Inorganics, PCBs and PHCs (modified TPH)



^ Modified TPH is Sum of F1, F2 and F3 fractions (C_6 - C_{34})

FOX-2 - Tier II Disposal Facility - Summary of Monitoring Groundwater Analytical Data

Sample ID	Location	Date	Monitoring Year	Monitoring Phase	Cu (mg/L)	Ni (mg/L)	Co (mg/L)	Cd (mg/L)	Pb (mg/L)	Zn (mg/L)	Cr (mg/L)	As (mg/L)	Hg (mg/L)	Total PCB (mg/L)	F1 C_6-C_{10} (mg/L)	F2 C_{10}-C_{16} (mg/L)	F3 C_{16}-C_{34} (mg/L)	Modified TPH^ - Total C6-C34 (mg/L)
Baseline Data																		
Upgradient:																		
09-38043	MW-09	2009			0.11	0.26	0.052	<0.0010	<0.010	0.12	0.057	0.013	<0.00040	<0.000020	<0.050	0.70	<1.0	1.2
10-20126	MW-09	2010			0.23	0.22	0.055	0.0018	0.032	0.22	0.11	0.055	<0.00040	<0.000020	0.14	<0.50	<1.0	0.89
11-09278	MW-09	2011			0.019	0.048	0.014	<0.0010	<0.010	0.029	0.021	<0.0030	<0.00040	<0.0030	<0.050	<0.50	<1.0	0.78
Downgradient:																		
10-20132	MW-10	2010			0.086	0.32	0.080	<0.0010	0.023	0.15	0.061	0.034	<0.00040	<0.000020	<0.050	<0.50	<1.0	0.78
10-20142	MW-12	2010			0.076	0.47	0.094	<0.0010	0.022	0.26	0.078	0.037	<0.00040	<0.000020	<0.050	<0.50	<1.0	0.78
11-09284	MW-12	2011			0.42	0.30	0.072	0.0020	0.11	0.37	0.23	0.14	<0.00040	<0.0030	<0.050	<0.50	<1.0	0.78
		N value			6	6	6	6	6	6	6	6	6	6				6
	Arithmetic Mean				0.16	0.27	0.06	0.0010	0.033	0.19	0.093	0.046	0.0002	0.0005				0.87
	Arithmetic Mean Corrected for Detection Limit				**0.16**	**0.27**	**0.06**	**0.0010**	**0.033**	**0.19**	**0.09**	**0.046**	**0.0004**	**0.003**				**1.0**
	Standard Deviation				0.15	0.14	0.028	0.00073	0.039	0.12	0.073	0.048	0.0	0.00077				0.18
	Arithmetic Mean + 3xStandard Deviation				0.60	0.68	0.145	0.0032	0.15	0.55	0.31	0.19	0.00040	0.0053				1.5
	Detection Limit				<0.0050	<0.010	<0.0050	<0.0010	<0.0010	<0.0050	<0.0050	<0.0030	<0.00040	<0.0030				<1.0
Monitoring Data																		
Upgradient - MW- 09																		
12-15133	MW-09	2012	1	1	0.037	0.10	0.024	0.00028	0.0060	0.047	0.015	0.0073	<0.00010	<0.000020	<0.025	<0.10	<0.25	0.19
2013-F2-MW-09/09-D	MW-09	2013	2	1	0.025	0.21	0.046	0.00053	0.0021	0.072	0.015	0.028	<0.000010	<0.000010	<0.025	<0.10	<0.10	0.11
F2-MW-9-2014*	MW-09	2014	3	1	0.04	0.10	0.02	<0.008	<0.01	0.06	<0.05	<0.02	<0.0001	<0.0001				#N/A
MW9	MW-09	2015	4	1	0.0093	<0.005	<0.0025	<0.0005	0.0018	<0.025	<0.005	<0.005	<0.0001		<0.025	<0.1	<0.1	0.1
MW-09 (Dup Avg)	MW-09	2016	5	1	0.011	0.1195	0.0269	0.0003	0.0005	0.05	0.002	<0.001	<0.0001	<0.00005	<0.025	<0.1	<0.1	0.1
	MW-09		7	2														#N/A
	MW-09		10	2														#N/A
	MW-09		15	2														#N/A
	MW-09		25	2														#N/A
																		#N/A

Modified TPH TOTAL will appear when F1, F2, F3 fraction results are entered.

FOX-2 - Tier II Disposal Facility - Summary of Monitoring Groundwater Analytical Data

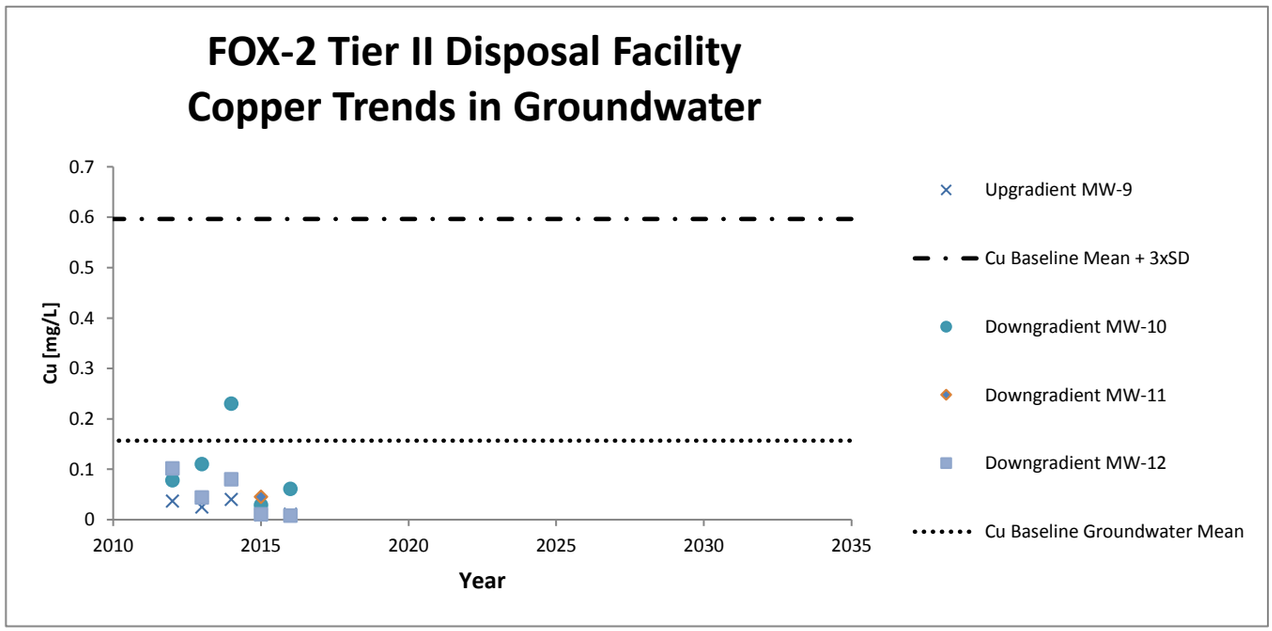
Sample ID	Location	Date	Monitoring Year	Monitoring Phase	Cu (mg/L)	Ni (mg/L)	Co (mg/L)	Cd (mg/L)	Pb (mg/L)	Zn (mg/L)	Cr (mg/L)	As (mg/L)	Hg (mg/L)	Total PCB (mg/L)	F1 C_6-C_{10} (mg/L)	F2 C_{10}-C_{16} (mg/L)	F3 C_{16}-C_{34} (mg/L)	Modified TPH^ - Total C6-C34 (mg/L)
Downgradient - MW-10																		
12-15134	MW-10	2012	1	1	0.078	0.24	**0.063**	<0.00090	0.020	0.13	0.025	0.018	<0.00010	<0.000020	<0.025	<0.10	<0.25	0.19
2013-F2-MW-10	MW-10	2013	2	1	0.11	**0.45**	**0.10**	**0.0012**	0.019	0.19	0.056	0.023	<0.000010	<0.000010	<0.025	<0.10	<0.10	0.11
F2-MW-10-2104*	MW-10	2014	3	1	0.23	**0.34**	**0.07**	<0.008	**0.08**	**0.23**	**0.18**	**0.11**	<0.0001	<0.0001				#N/A
MW10	MW-10	2015	4	1	0.0292	0.115	0.0277	<0.0005	0.0021	0.049	<0.005	<0.005	<0.0001	<0.00005	<0.025	<0.1	<0.1	0.1
MW-10	MW-10	2016	5	1	0.0613	0.256	**0.0673**	0.0007	0.0003	0.119	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	0.1
	MW-10		7	2														#N/A
	MW-10		10	2														#N/A
	MW-10		15	2														#N/A
	MW-10		25	2														#N/A
																		#N/A
																		#N/A
																		#N/A
Downgradient - MW-11																		
not sampled - insufficient water	MW-11	2012	1	1														#N/A
not sampled - insufficient water	MW-11	2013	2	1														#N/A
Not sampled, well frozen	MW-11	2014	3	1														#N/A
MW11	MW-11	2015	4	1	0.0456	**0.301**	**0.0729**	0.0006	0.0051	0.129	0.014	<0.005	<0.0001	<0.00005	<0.025	<0.1	<0.1	0.1
Not sampled - frozen	MW-11	2016	5	1														#N/A
	MW-11		7	2														#N/A
	MW-11		10	2														#N/A
	MW-11		15	2														#N/A
	MW-11		25	2														#N/A
																		#N/A
																		#N/A
Downgradient - MW-12																		
12-15135	MW-12	2012	1	1	0.10	0.17	0.052	<0.00090	**0.043**	0.13	0.041	**0.057**	<0.00010	<0.000020	<0.025	<0.10	<0.25	0.19
2013-F2-MW-12	MW-12	2013	2	1	0.044	0.15	0.032	0.00029	0.012	0.078	0.053	0.023	<0.000010	<0.000010	<0.025	<0.10	<0.10	0.1
F2-MW-12-2014*	MW-12	2014	3	1	0.08	0.12	0.02	<0.008	0.02	0.10	0.05	0.04	<0.0001	<0.0001				#N/A
MW12	MW-12	2015	4	1	0.0109	0.049	0.0102	<0.0005	0.0022	0.17	<0.005	<0.005	<0.0001	<0.00005	<0.025	<0.1	<0.1	0.1
MW-12	MW-12	2016	5	1	0.0082	0.097	0.0244	0.0003	<0.0001	0.037	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	0.1
	MW-12		7	2														#N/A
	MW-12		10	2														#N/A
	MW-12		15	2														#N/A
	MW-12		25	2														#N/A
																		#N/A
																		#N/A

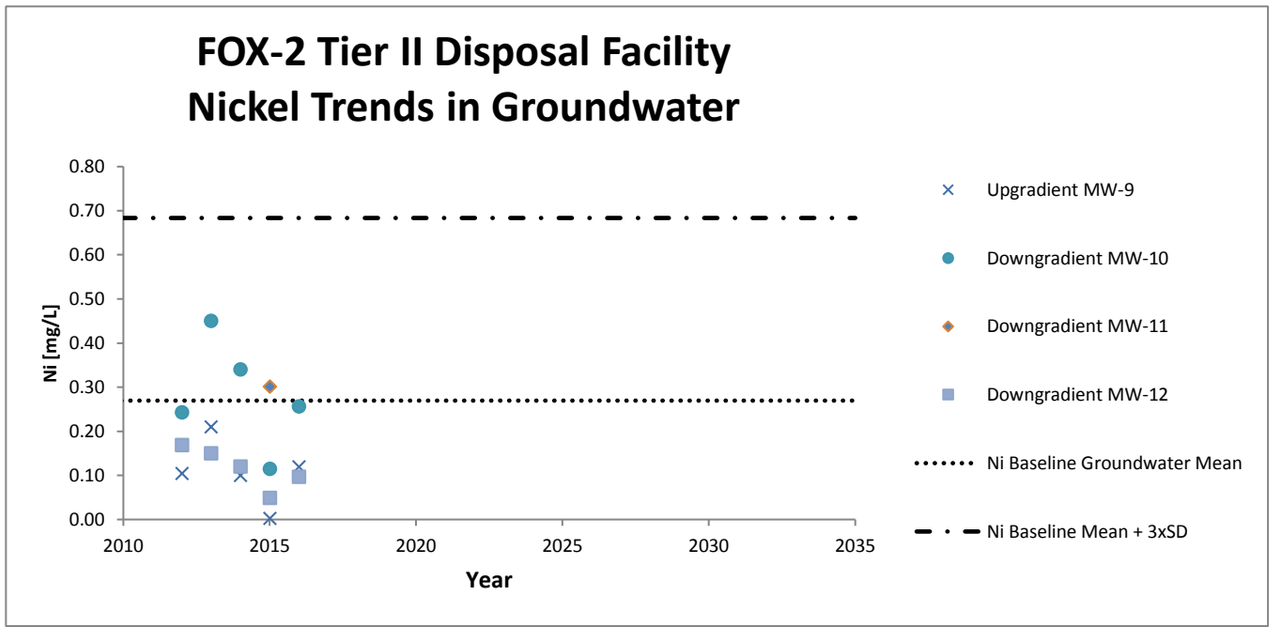
Note: Modified TPH Total (C_6-C_{34}) has been calculated by adding results for F1, F2 and F3.

* insufficient volume to perform all analyses

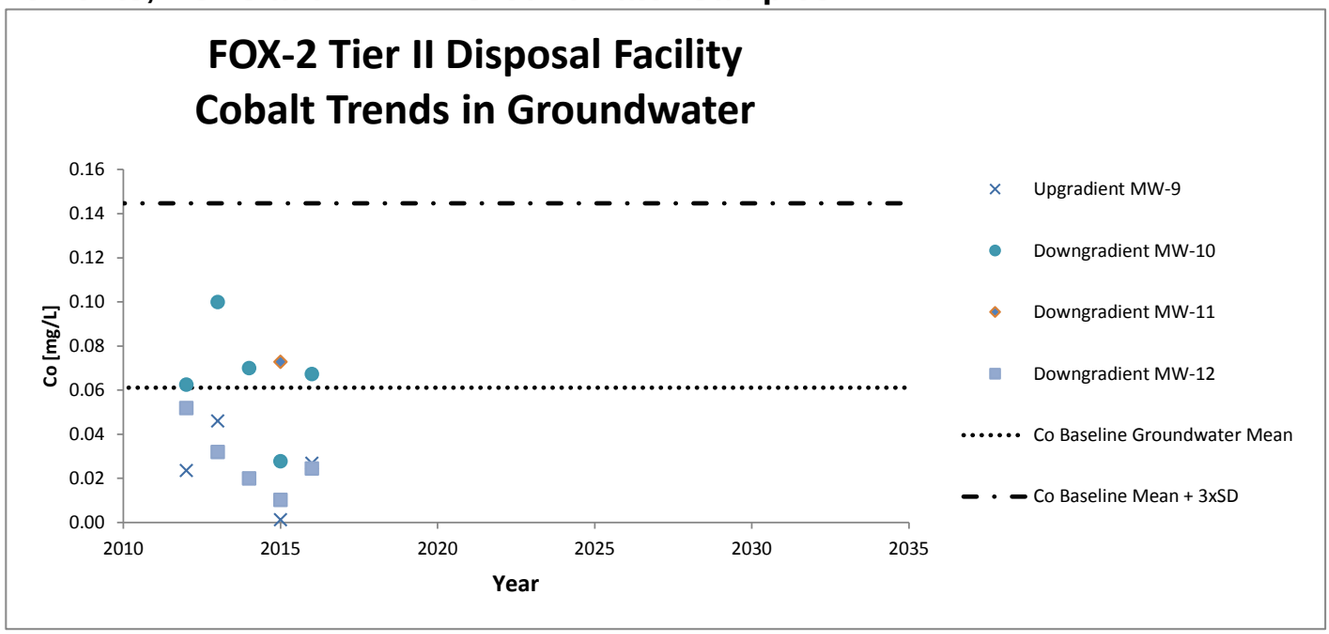
FOX-2 Tier II Disposal Facility Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples

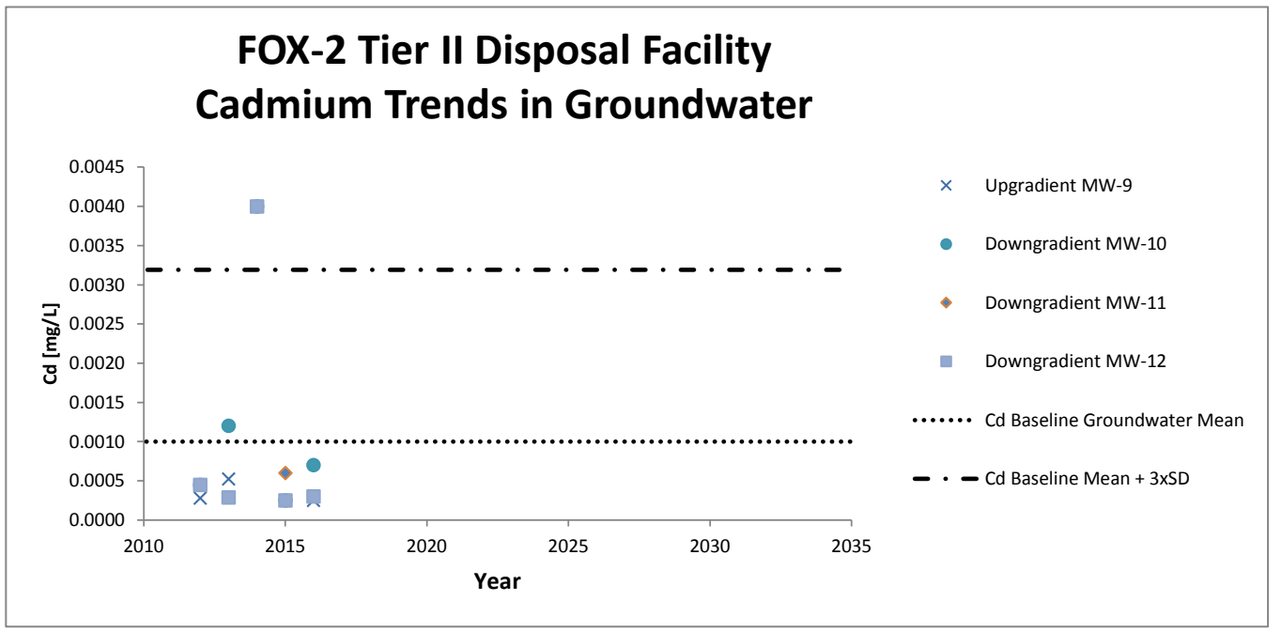
Where results are below detection, half of the detection limit has been used in the charts for the sample points. Trendlines are intended for visual interpretation of temporal trends. When all monitoring results are below detection, trendlines are a reflection of changes in detection limit. Users should refer to data tables.





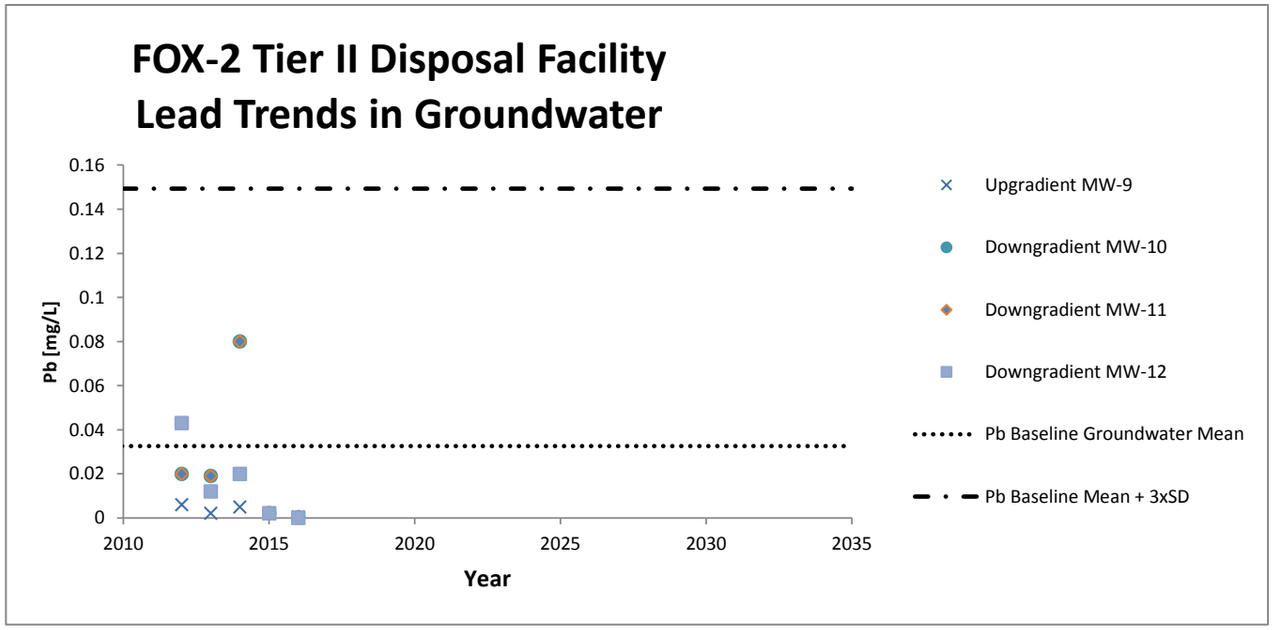
FOX-2 Tier II Disposal Facility Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples

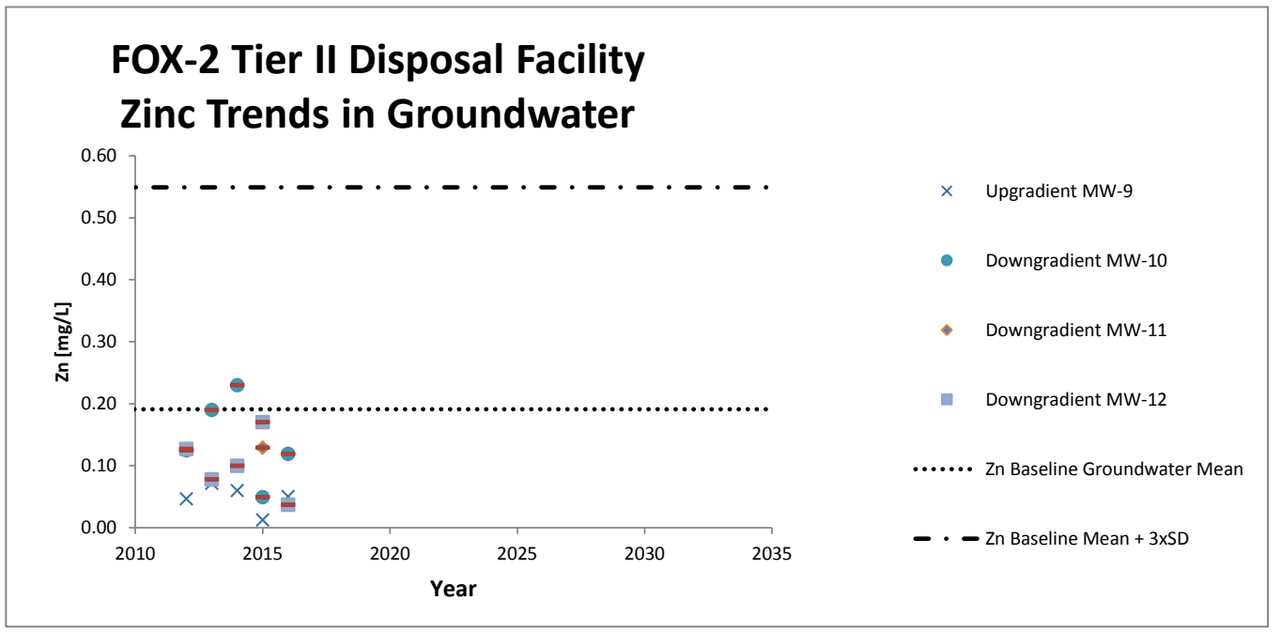




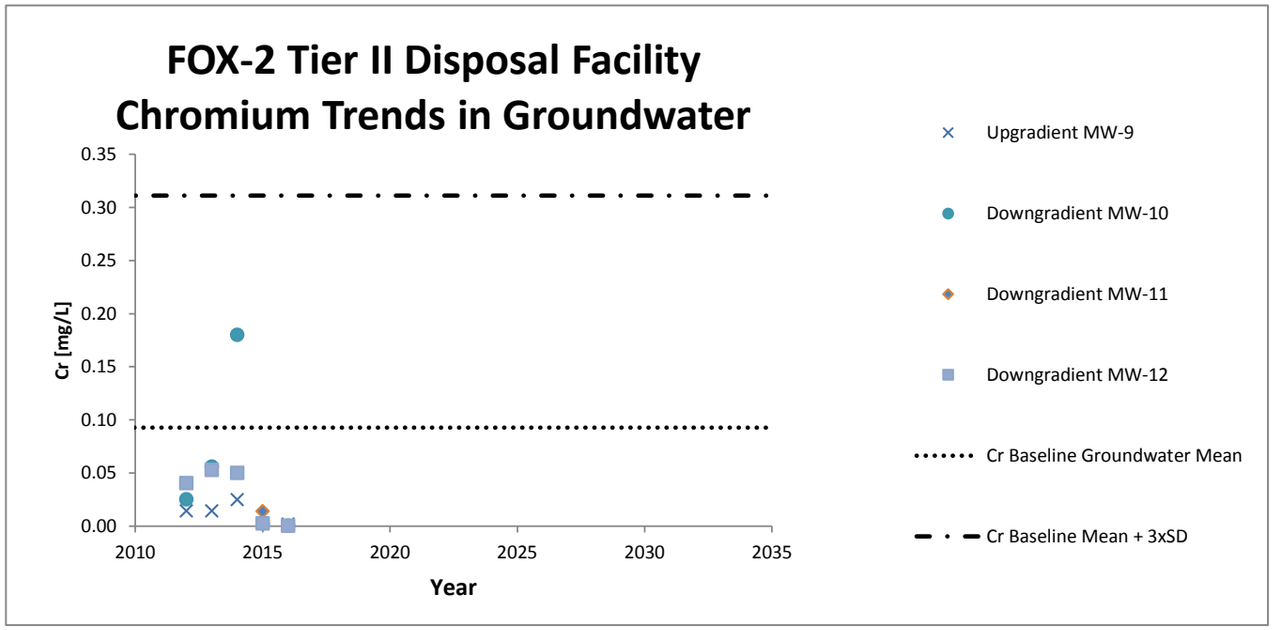
Cd Baseline mean equals the baseline detection limit
Cd detection limits in 2014 were higher than previous years, resulting in elevated values in the chart.

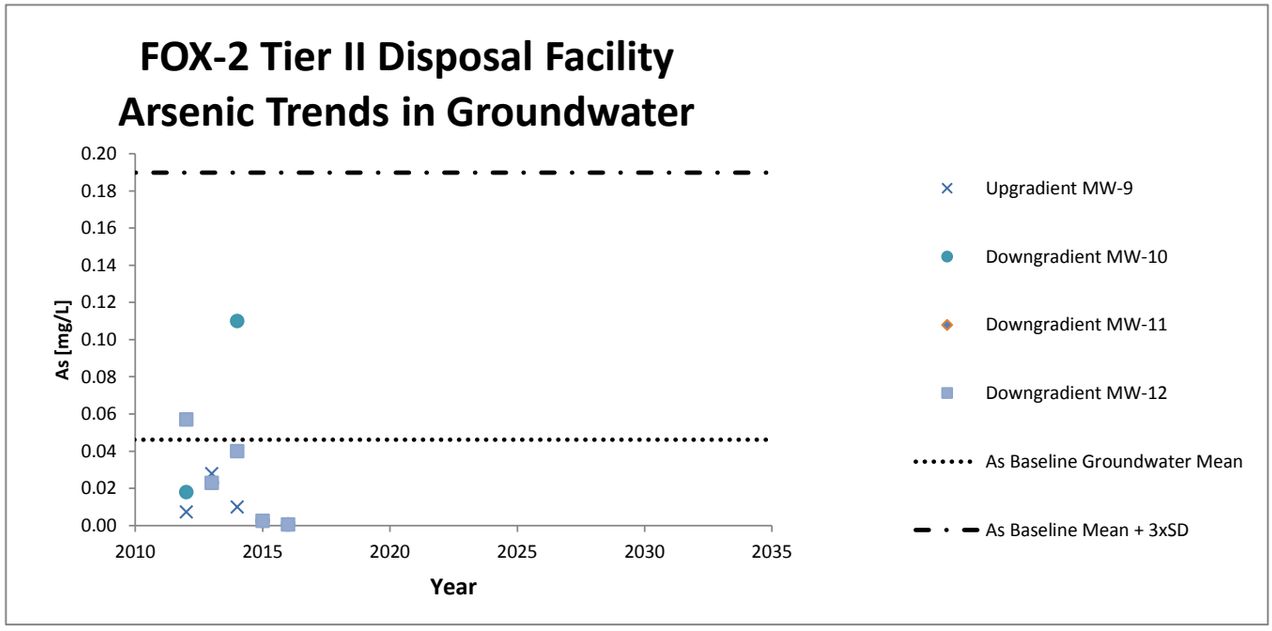
FOX-2 Tier II Disposal Facility Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples



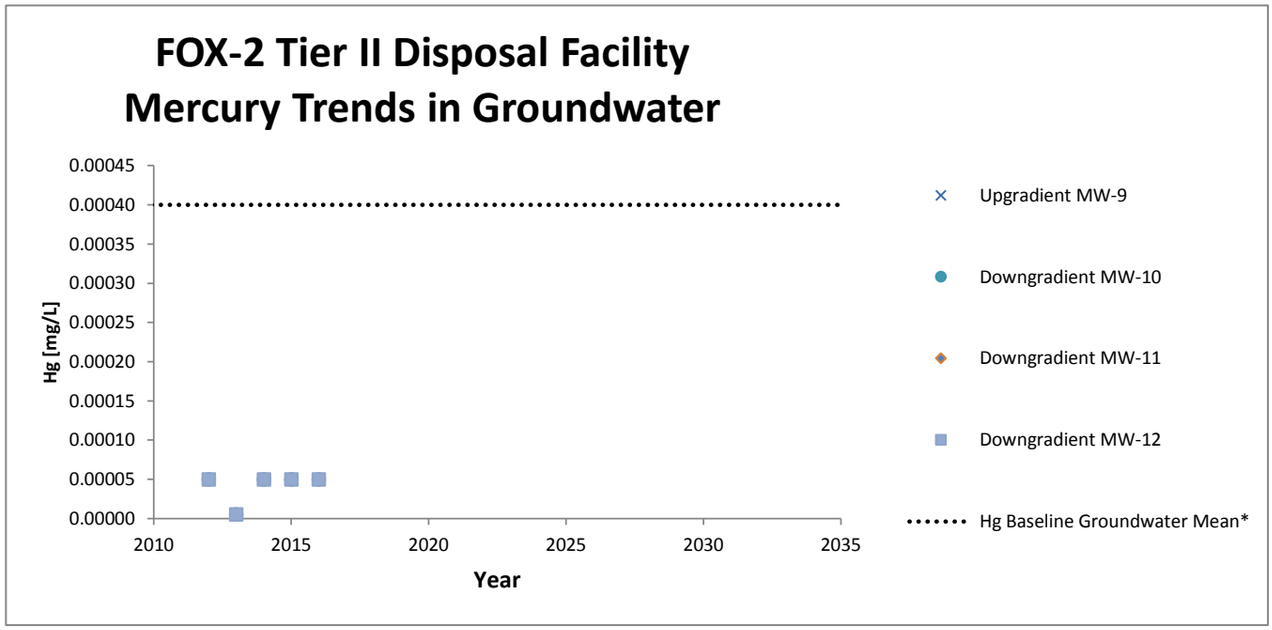


FOX-2 Tier II Disposal Facility Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples

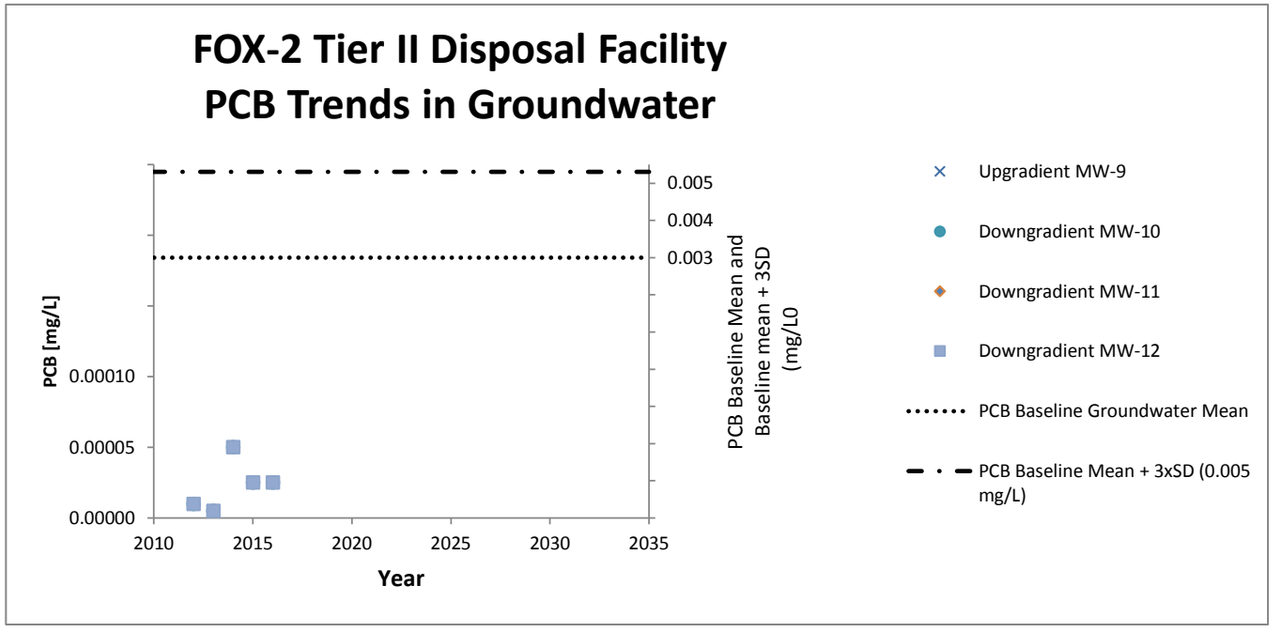




FOX-2 Tier II Disposal Facility Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples

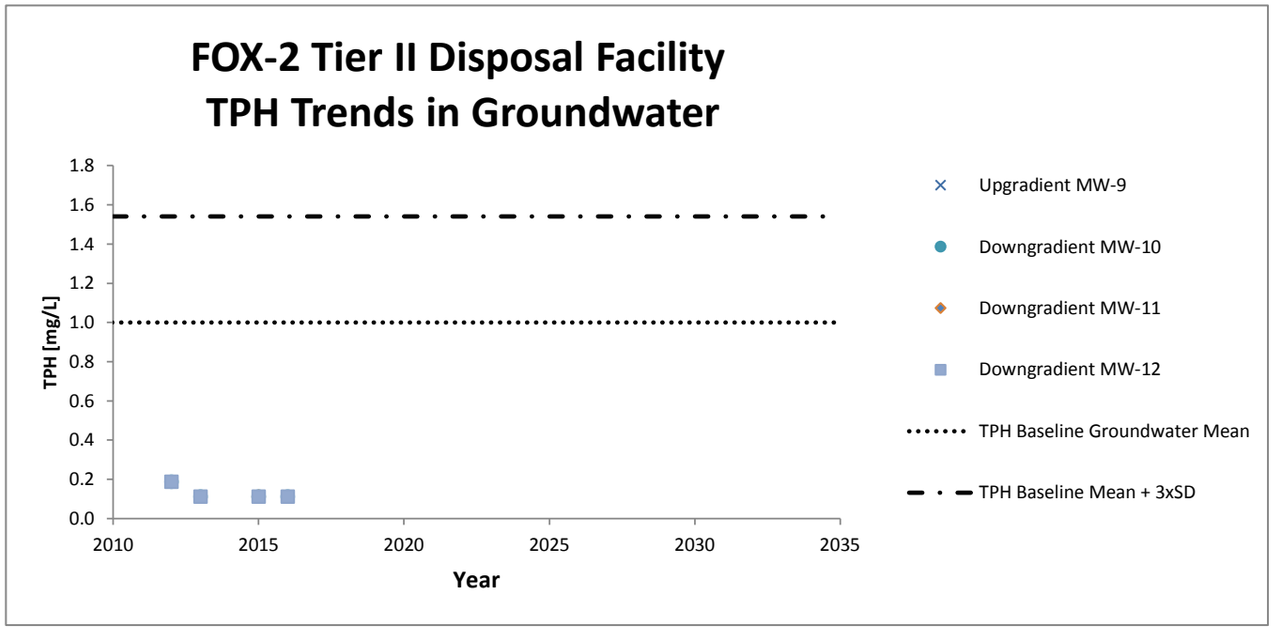


*Hg Baseline Mean is equal to the baseline detection limit.
*Hg Baseline SD = 0



PCB Baseline mean equals the baseline detection limit

FOX-2 Tier II Disposal Facility Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples



TPH Baseline mean equals the baseline detection limit

FOX-2 - Upper Site Landfill Lobe A - Summary of Monitoring Soil Analytical Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd* (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Cr* (mg/kg)	As (mg/kg)	Hg* (mg/kg)	Total PCB (mg/kg)	F1 C_6-C_{10} (mg/kg)	F2 C_{10}-C_{16} (mg/kg)	F3 C_{16}-C_{34} (mg/kg)	Modified TPH^ - Total C6-C34 (mg/kg)
Background Data - Arithmetic Mean*						55	46	17	1.0	10	84	59	23						
Baseline Data - Arithmetic Mean*						**55**	**40**	**14**	**1.0**	**10**	**83**	**46**	**34**	**0.05**	**0.10**				**124**
Baseline Data - Standard Deviation						22	9.0	2.9	0.0	63	26	6.0	10	0.0	1.7				177
Baseline Data Mean + 3xStandard Deviation						121	67	22		198	161	64	65		5.1				654
**** If baseline or background arithmetic mean was below the detection limit, the mean has been modified to match the detection limit value.***																			
DEW Line Cleanup Tier I Criteria										*200*					*1*				
DEW Line Cleanup Tier II Criteria & Hydrocarbon Action Level						*100*	*100*	*50*	*5*	*500*	*500*	*250*	*30*	*2.0*	*5*				*2500*
Monitoring Data																			**TPH Sum will appear when F1, F2 and F3 fractions are entered.**
Upgradient																			
	MW-13 surface																		
12-19400[1]/01[2]	MW-13	2012	1	1	0-10	**58**	**71**	**16**	<0.50	**31**	**160**	**190**	26	<0.010	<0.050	<5.0	<10	170	**178**
2013-F2-13-A/13-A-D	MW-13	2013	2	1	0-10	41	**41**	12	0.20	**21**	**88**	**49**	*32*	<0.050	0.028	<10	<10	24	34
F2-MW-13-S-A-2014	MW-13	2014	3	1	0-10	42	38	12	<0.5	8.0	69	**52**	*35*	<0.1	<0.02	<10	<10	<20	20
MW-13 (0-15)	MW-13	2015	4	1	0-10	30.2	27.1	10.1	<0.5	9.8	53	34.8	26.9	<0.1	<0.05	<7	<4	<8	10
MW-13a	MW-13	2016	5	1	0-15	54	**44**	**14**	<0.5	**12**	66	45	*41*	<0.1	<0.05	<7	<4	18	23.5
	MW-13		7	2															#N/A
	MW-13		10	2															#N/A
	MW-13		15	2															#N/A
	MW-13		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A
	MW-13 depth																		
12-19402[1]/03[2]	MW-13	2012	1	1	30-40	47	38	13	<0.50	**11**	77	45	*64*	0.013	<0.020	<5.0	<10	<50	33
2013-F2-13-B	MW-13	2013	2	1	40-50	36	33	12	<0.10	9.0	64	39	*30*	<0.050	<0.010	<10	<10	<10	15
F2-MW-13-S-B-2014	MW-13	2014	3	1	40-50	43	**50**	12	<0.5	8.0	76	**82**	*36*	<0.1	<0.02	<10	<10	<20	20
MW-13 (40-50)	MW-13	2015	4	1	40-50	37.6	32.4	11.6	<0.5	**10**	60.9	39.4	*30.6*	<0.1	<0.05	<7	<4	14	20
Not sampled - refusal	MW-13	2016	5	1															#N/A
	MW-13		7	2															#N/A
	MW-13		10	2															#N/A
	MW-13		15	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A

FOX-2 - Upper Site Landfill Lobe A - Summary of Monitoring Soil Analytical Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd* (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Cr* (mg/kg)	As (mg/kg)	Hg* (mg/kg)	Total PCB (mg/kg)	F1 C_6-C_{10} (mg/kg)	F2 C_{10}-C_{16} (mg/kg)	F3 C_{16}-C_{34} (mg/kg)	Modified TPH^ - Total C6-C34 (mg/kg)
Downgradient																			
	MW-14 surface																		
12-19404[1]/05[2]	MW-14	2012	1	1	0-10	47	**41**	13	<0.50	10	76	45	*38*	<0.010	<0.020	<5.0	<10	75	83
2013-F2-14-A	MW-14	2013	2	1	0-10	44	39	12	0.10	9.0	70	39	*39*	<0.050	<0.010	<10	<10	12	22
F2-MW-14-S-A-2014	MW-14	2014	3	1	0-10	44	**52**	12	<0.5	8.0	71	**78**	*35*	<0.1	<0.02	<10	<10	120	**130**
MW-14 (0-15)	MW-14	2015	4	1	0-15	33.7	30.2	10.8	<0.5	8.7	55.4	32.9	*30.3*	<0.1	<0.05	<7	<4	45	51
MW-14a (Dup Avg)	MW-14	2016	5	1	0-15	43	36	12	<0.5	8	57	37	*32*	<0.1	<0.05	<6	<7	<29	21
	MW-14		7	2															#N/A
	MW-14		10	2															#N/A
	MW-14		15	2															#N/A
	MW-14		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A
	MW-14 depth																		
12-19406[1]/07[2]	MW-14	2012	1	1	30-40	**63**	**52**	**17**	<0.50	**11**	**93**	**52**	*50*	<0.010	<0.020	<5.0	<10	<50	33
2013-F2-14-B	MW-14	2013	2	1	40-50	43	38	12	0.10	9.0	68	38	*33*	<0.050	<0.010	<10	<10	17	27
F2-MW-14-S-B-2014	MW-14	2014	3	1	40-50	55	**55**	13	<0.5	8.0	79	**73**	*41*	<0.1	<0.02	<10	<10	30	40
MW-14 (40-50)	MW-14	2015	4	1	40-50	40.1	34.1	11.6	<0.5	8.8	61.9	35.5	*34.4*	<0.1	<0.05	<7	<4	38	44
Not sampled - refusal	MW-14	2016	5	1															#N/A
	MW-14		7	2															#N/A
	MW-14		10	2															#N/A
	MW-14		15	2															#N/A
	MW-14		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
	MW-15 surface																		
12-19408[1]/09[2]	MW-15	2012	1	1	0-10	**63**	**52**	14	<0.50	**13**	**100**	**71**	*41*	0.030	<0.020	<5.0	<10	280	**288**
2013-F2-15-A	MW-15	2013	2	1	0-10	51	**43**	**14**	<0.10	**10**	77	42	*38*	<0.050	<0.010	<10	<10	24	34
F2-MW-15-S-A-2014	MW-15	2014	3	1	0-10	**62**	**47**	**15**	<0.5	9.0	**91**	46	*35*	<0.1	<0.02	<10	<10	100	110
MW-15 (0-15)	MW-15	2015	4	1	0-15	48.4	34.4	11.7	<0.5	**11**	64.4	38	*36.8*	<0.1	<0.05	<7	<4	<8	10
MW-15a	MW-15	2016	5	1	0-15	**86**	**42**	12	<0.5	**11**	59	43	*34*	<0.1	<0.05	<7	<4	<8	10
	MW-15		7	2															#N/A
	MW-15		10	2															#N/A
	MW-15		15	2															#N/A
	MW-15		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A

FOX-2 - Upper Site Landfill Lobe A - Summary of Monitoring Soil Analytical Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd* (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Cr* (mg/kg)	As (mg/kg)	Hg* (mg/kg)	Total PCB (mg/kg)	F1 C_6-C_{10} (mg/kg)	F2 C_{10}-C_{16} (mg/kg)	F3 C_{16}-C_{34} (mg/kg)	Modified TPH^ - Total C6-C34 (mg/kg)
	MW-15 depth																		
12-19410[1]/11[2]	MW-15	2012	1	1	30-40	**57**	**45**	14	<0.50	**10**	**97.4**	**80**	*34*	0.013	<0.020	<5.0	<10	55	63
2013-F2-15-B	MW-15	2013	2	1	40-50	**72**	**43**	13	<0.10	**11**	82	37	*34*	<0.050	<0.010	<10	<10	<10	15
F2-MW-15-S-B-2014	MW-15	2014	3	1	40-50	50	**50**	**14**	<0.5	8.0	81	**66**	*34*	<0.1	<0.02	<10	<10	50	60
Not sampled, refusal	MW-15	2015	4	1															#N/A
Not sampled - refusal	MW-15	2016	5	1															#N/A
	MW-15		7	2															#N/A
	MW-15		10	2															#N/A
	MW-15		15	2															#N/A
	MW-15		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A
	MW-16 surface																		
12-19412[1]/13[2]	MW-16	2012	1	1	0-10	**88**	**58**	**14**	<0.50	**13**	**120**	**61**	*58*	0.0011	<0.020	<5.0	<10	<50	33
2013-F2-16-A	MW-16	2013	2	1	0-10	**72**	**49**	**14**	0.20	**16**	**93**	45	*45*	<0.050	0.018	<10	<10	220	**230**
F2-MW-16-S-A-2014	MW-16	2014	3	1	0-10	**63**	**47**	11	<0.5	9.0	**84**	**56**	*41*	<0.1	<0.02	<10	<10	<20	20
MW-16 (0-15)	MW-16	2015	4	1	0-15	**73.1**	**73.6**	**20.1**	<0.5	**10.5**	**101**	**52.4**	*33.4*	<0.1	<0.05	<7	<4	44	50
MW-16b	MW-16	2016	5	1	0-15	**56**	**42**	9	<0.5	**11**	60	43	*32*	<0.1	<0.05	<7	<4	<8	10
	MW-16		7	2															#N/A
	MW-16		10	2															#N/A
	MW-16		15	2															#N/A
	MW-16		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A

FOX-2 - Upper Site Landfill Lobe A - Summary of Monitoring Soil Analytical Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd* (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Cr* (mg/kg)	As (mg/kg)	Hg* (mg/kg)	Total PCB (mg/kg)	F1 C_6-C_{10} (mg/kg)	F2 C_{10}-C_{16} (mg/kg)	F3 C_{16}-C_{34} (mg/kg)	Modified TPH^ - Total C6-C34 (mg/kg)
	MW-16 depth																		
12-19414[1]/15[2]	MW-16	2012	1	1	30-40	**69**	**52**	**20**	<0.50	**12**	**100**	**54**	*45*	<0.010	<0.020	<5.0	<10	95	103
2013-F2-16-B	MW-16	2013	2	1	40-50	**58**	**42**	13	0.10	**11**	82	42	*37*	<0.050	0.013	<10	<10	440	**450**
F2-MW-16-S-B-2014	MW-16	2014	3	1	40-50	**73**	**63**	**29**	<0.5	**10**	**92**	**86**	*46*	<0.1	<0.02	<10	<10	<20	20
MW-16 (40-50)	MW-16	2015	4	1	40-50	49.2	**52.5**	**16**	<0.5	**10.8**	**84.8**	**60.8**	*45.2*	<0.1	<0.05	<7	<4	<8	10
MW-16a	MW-16	2016	5	1	30-40	51	39	9	<0.5	**10**	59	40	*31*	<0.1	<0.05	<7	<4	<8	10
	MW-16		7	2															#N/A
	MW-16		10	2															#N/A
	MW-16		15	2															#N/A
	MW-16		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A

Legend

XX sample exceeds background

XX **sample exceeds baseline**

XX *sample exceeds DLCU Tier I criteria*

XX *sample exceeds DLCU Tier II criteria*

Note: Modified TPH Total (C_6-C_{34}) has been calculated by adding results for F1, F2 and F3.

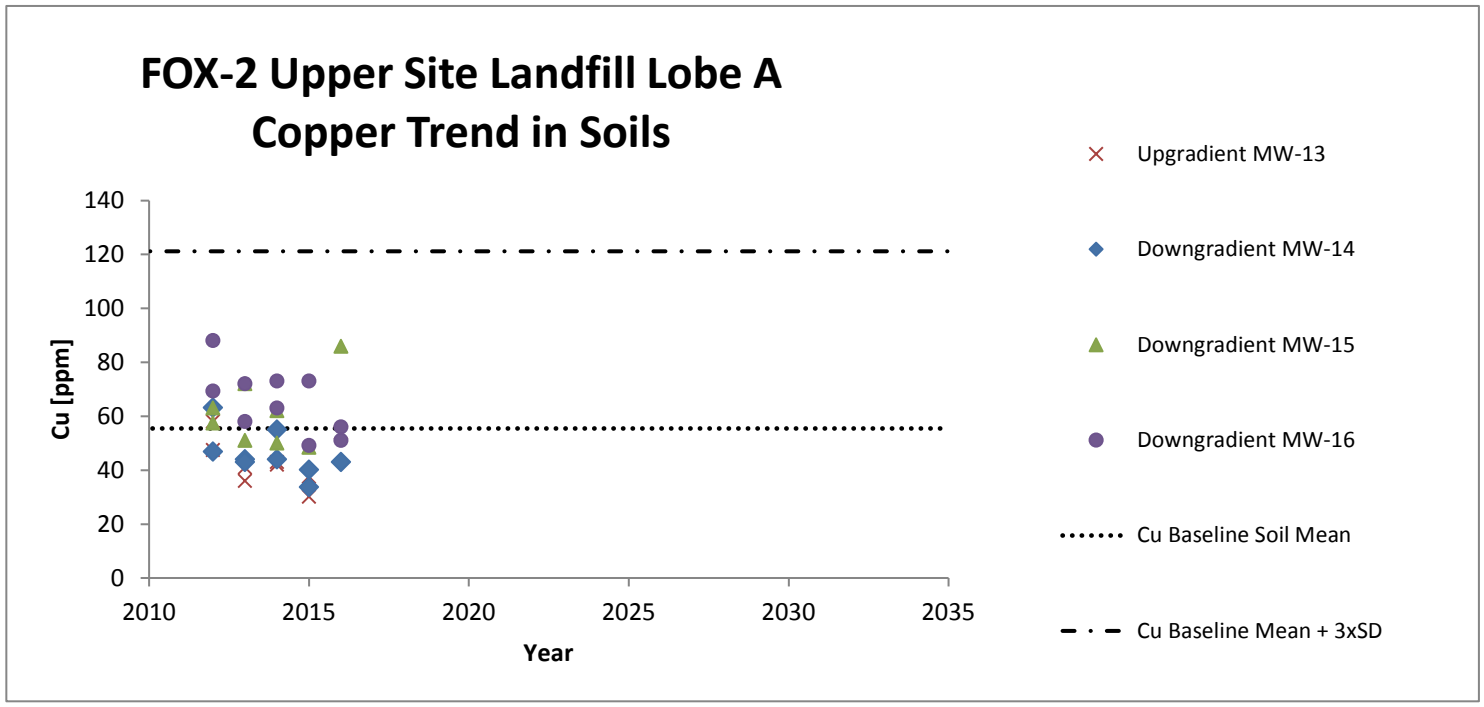
[1] - soil sample analyzed for inorganics and PCBs

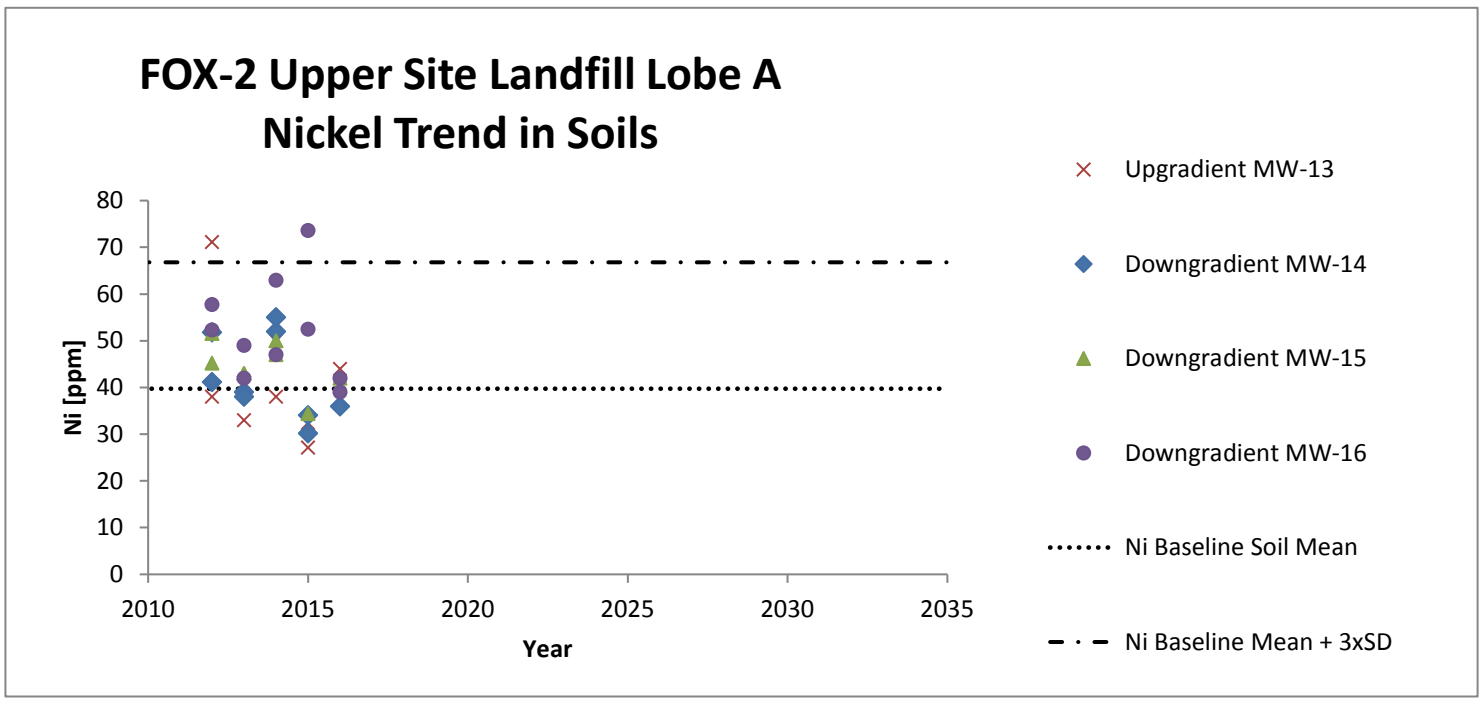
[2] - soil sample analyzed for F1-F3 fraction PHCs

FOX-2 Upper Site Landfill Lobe A Trends in Soil Inorganics, PCBs and PHCs (modified TPH)

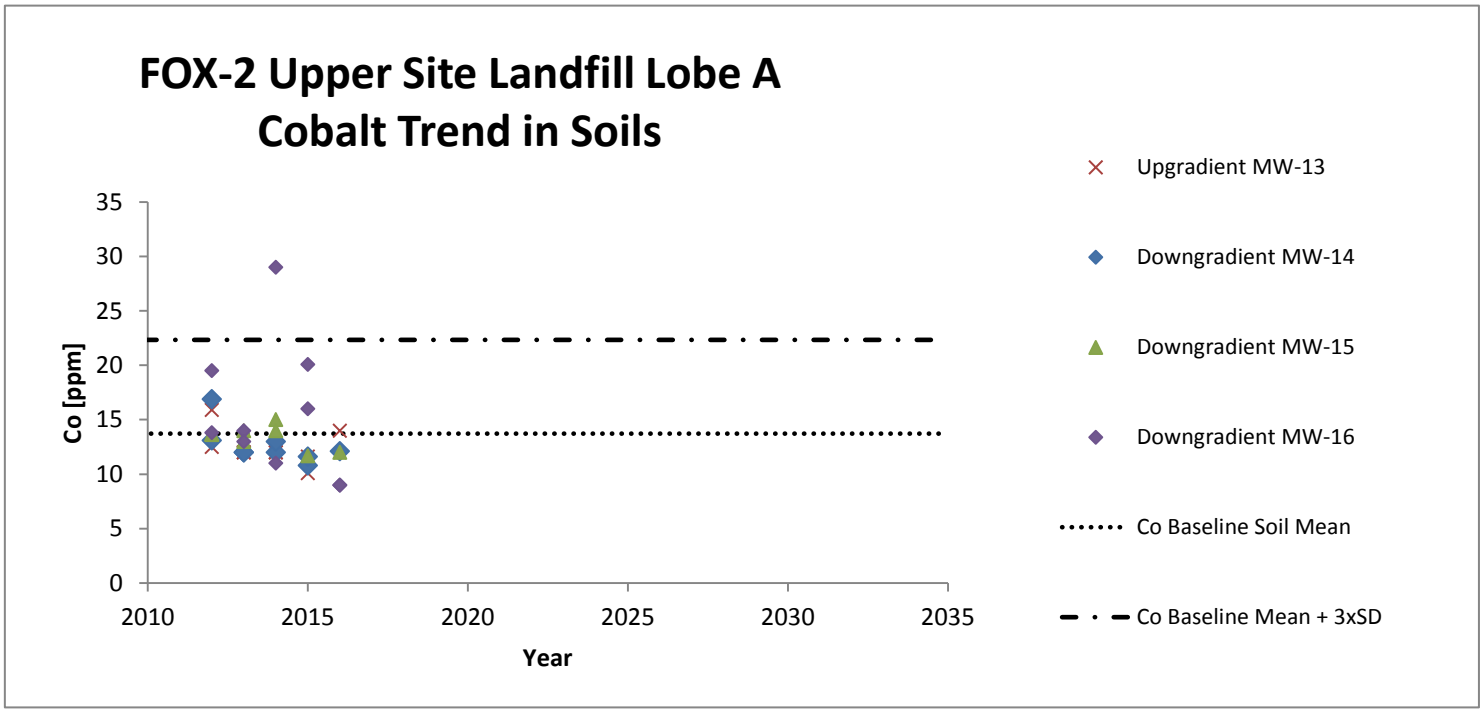
Where results are below detection, half of the detection limit has been used in the charts for the sample points.

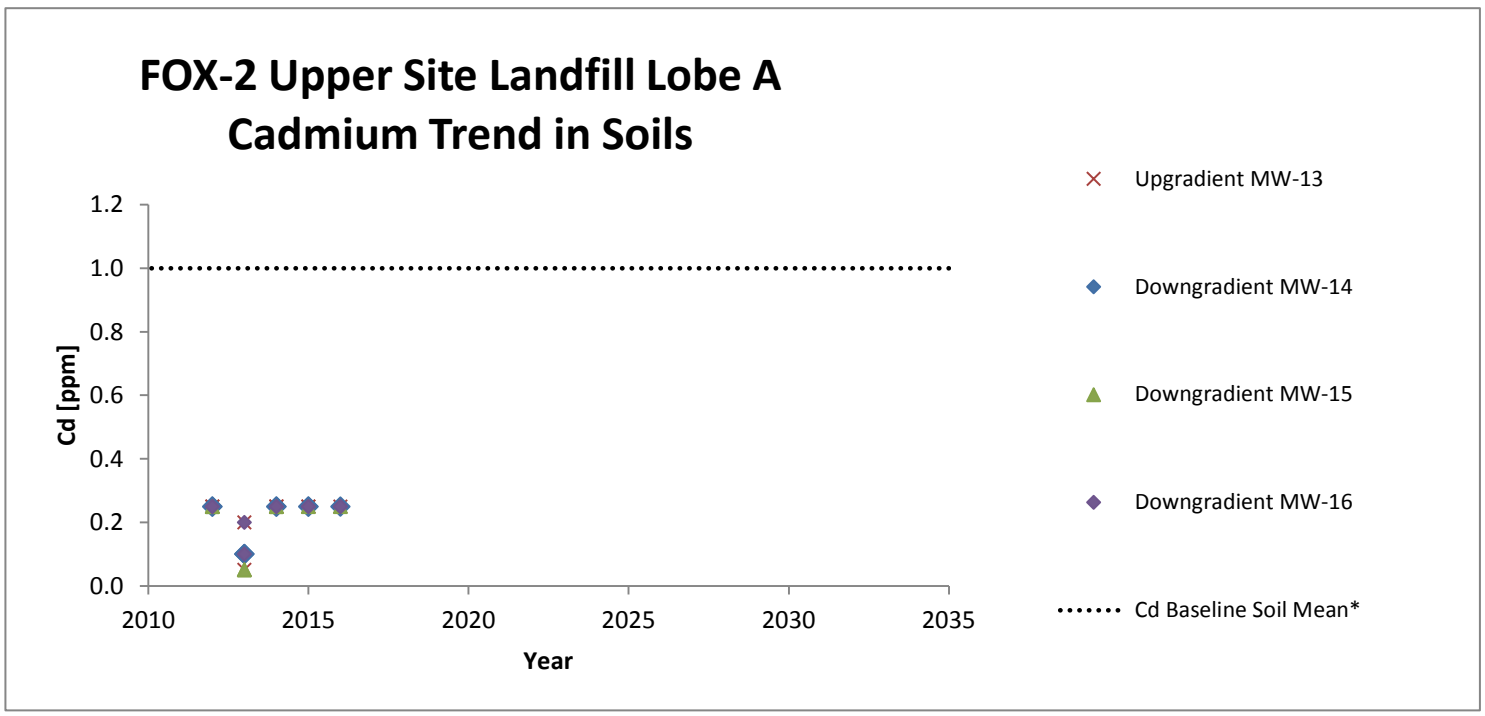
Trendlines are intended for visual interpretation of temporal trends. When all monitoring results are below detection, trendlines are a reflection of changes in detection limit. Users should refer to data tables.





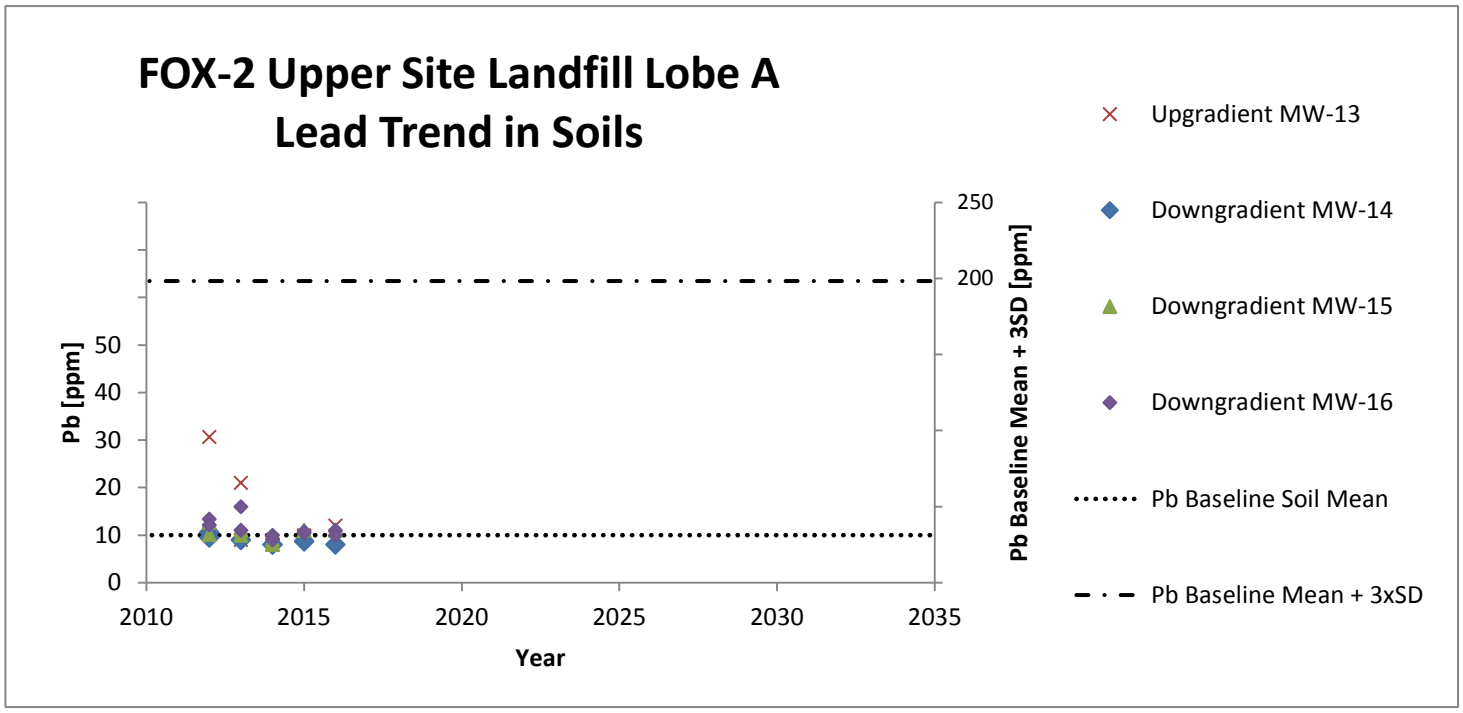
FOX-2 Upper Site Landfill Lobe A Trends in Soil Inorganics, PCBs and PHCs (modified TPH)



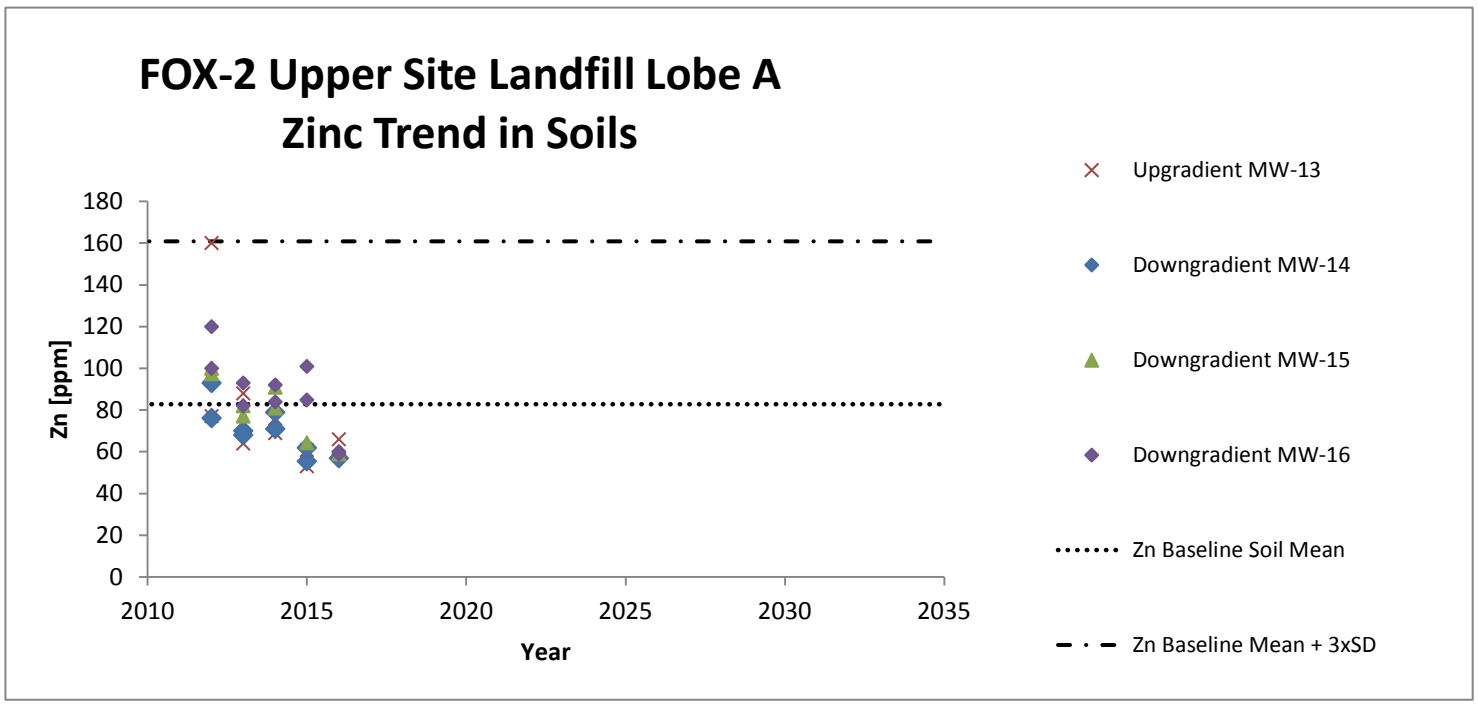


*Cd Baseline Arithmetic Mean is equal to the baseline detection limit.
*Cd Baseline SD = 0

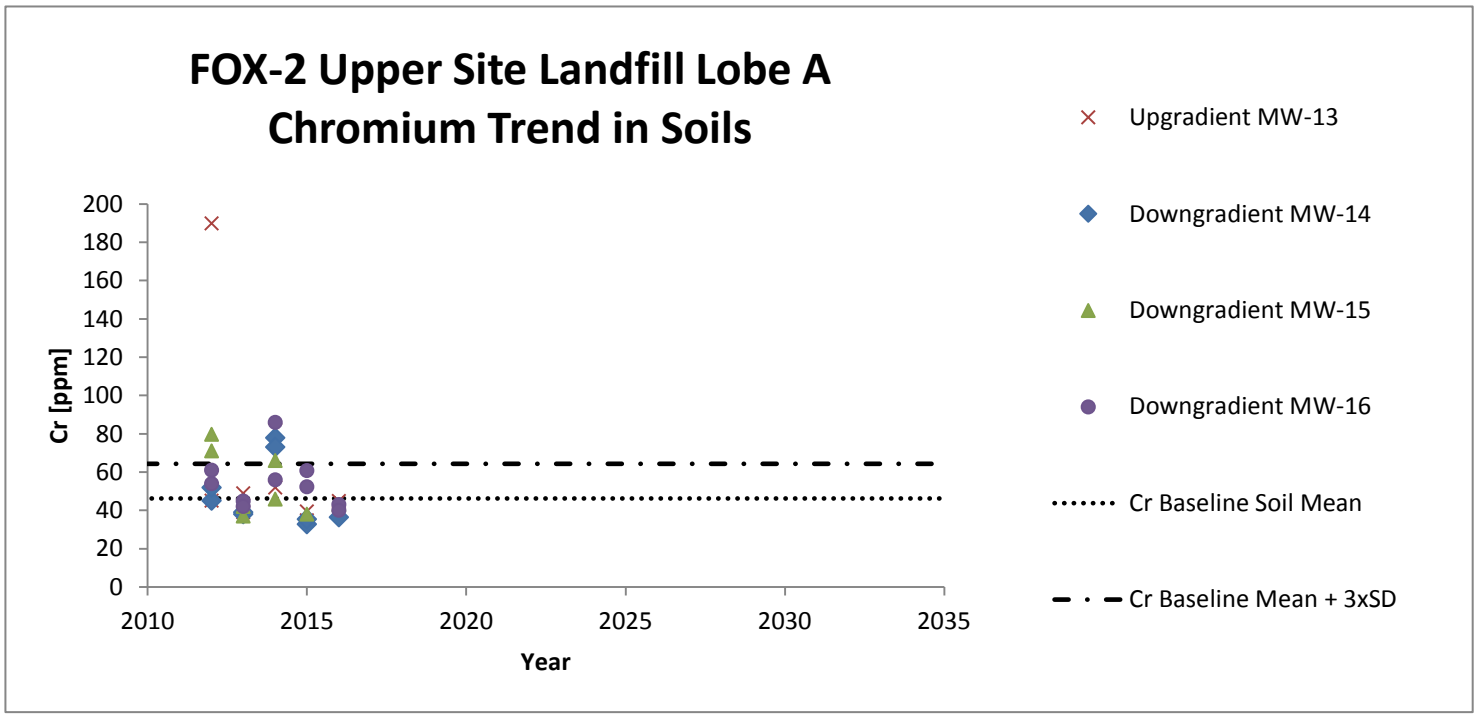
FOX-2 Upper Site Landfill Lobe A Trends in Soil Inorganics, PCBs and PHCs (modified TPH)

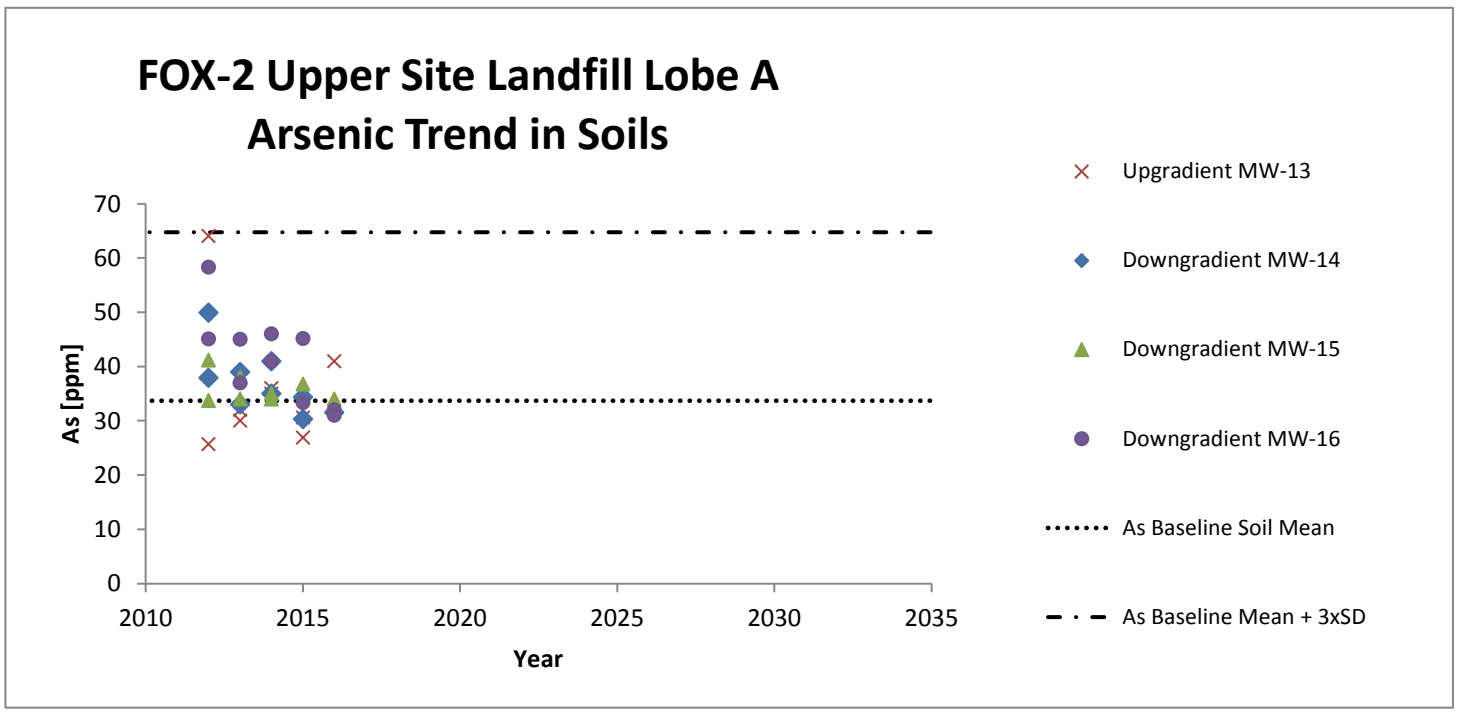


*Pb Baseline arithmetic mean is equal to the baseline detection limit.

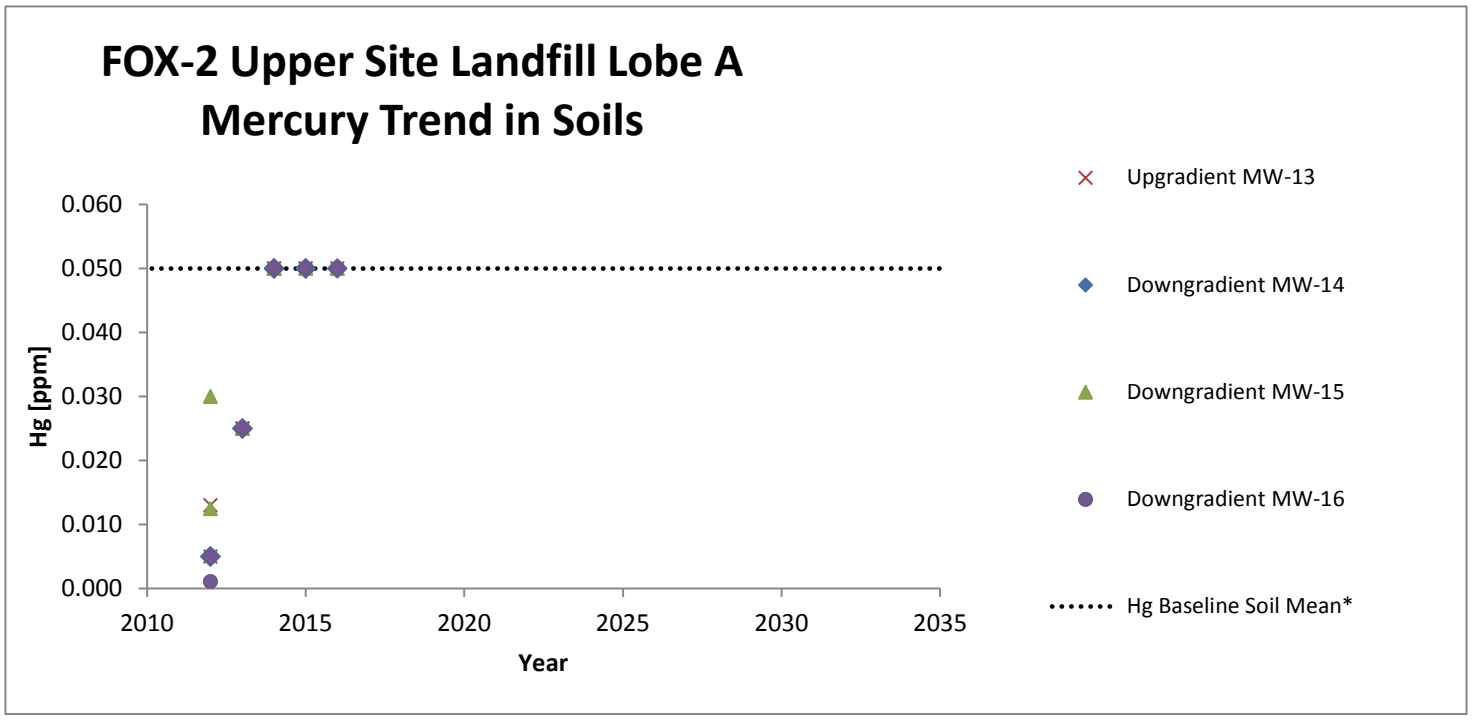


FOX-2 Upper Site Landfill Lobe A Trends in Soil Inorganics, PCBs and PHCs (modified TPH)

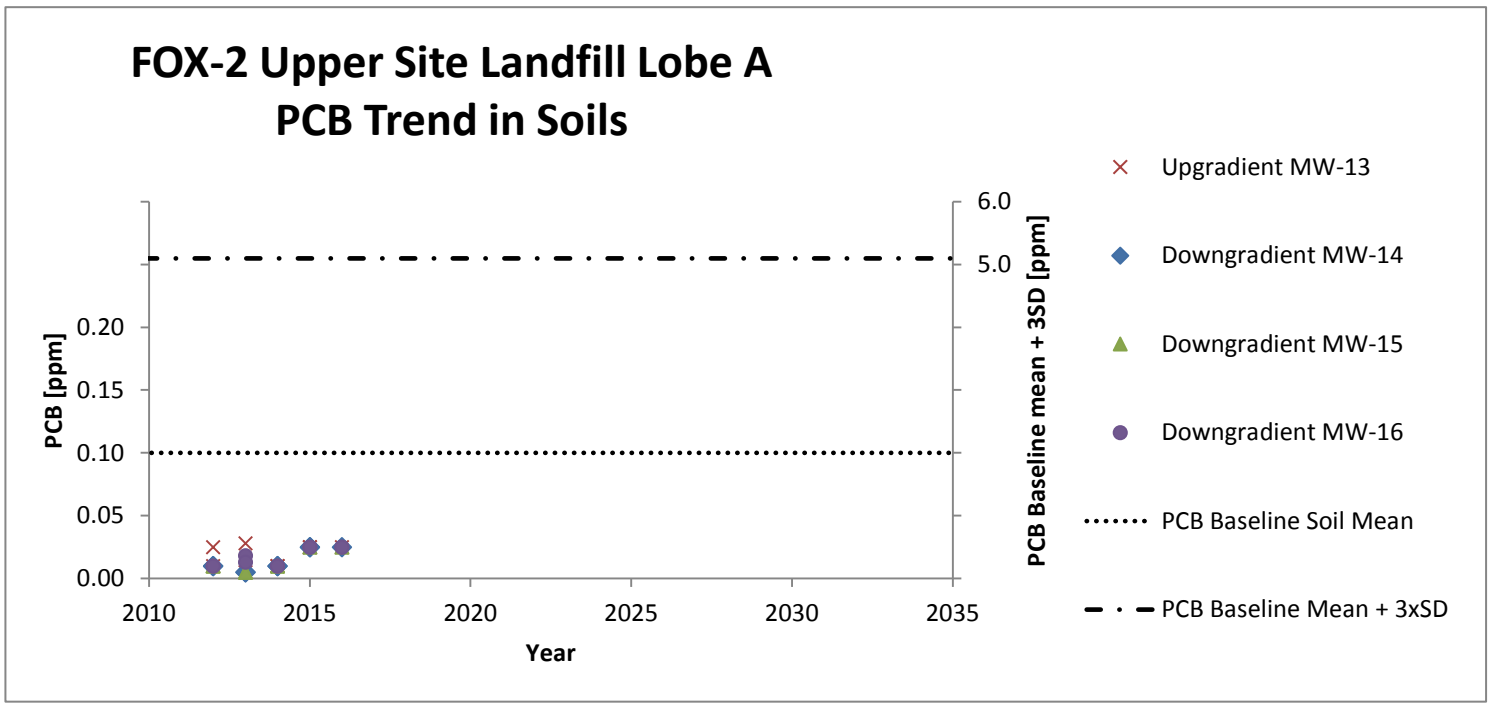




FOX-2 Upper Site Landfill Lobe A Trends in Soil Inorganics, PCBs and PHCs (modified TPH)

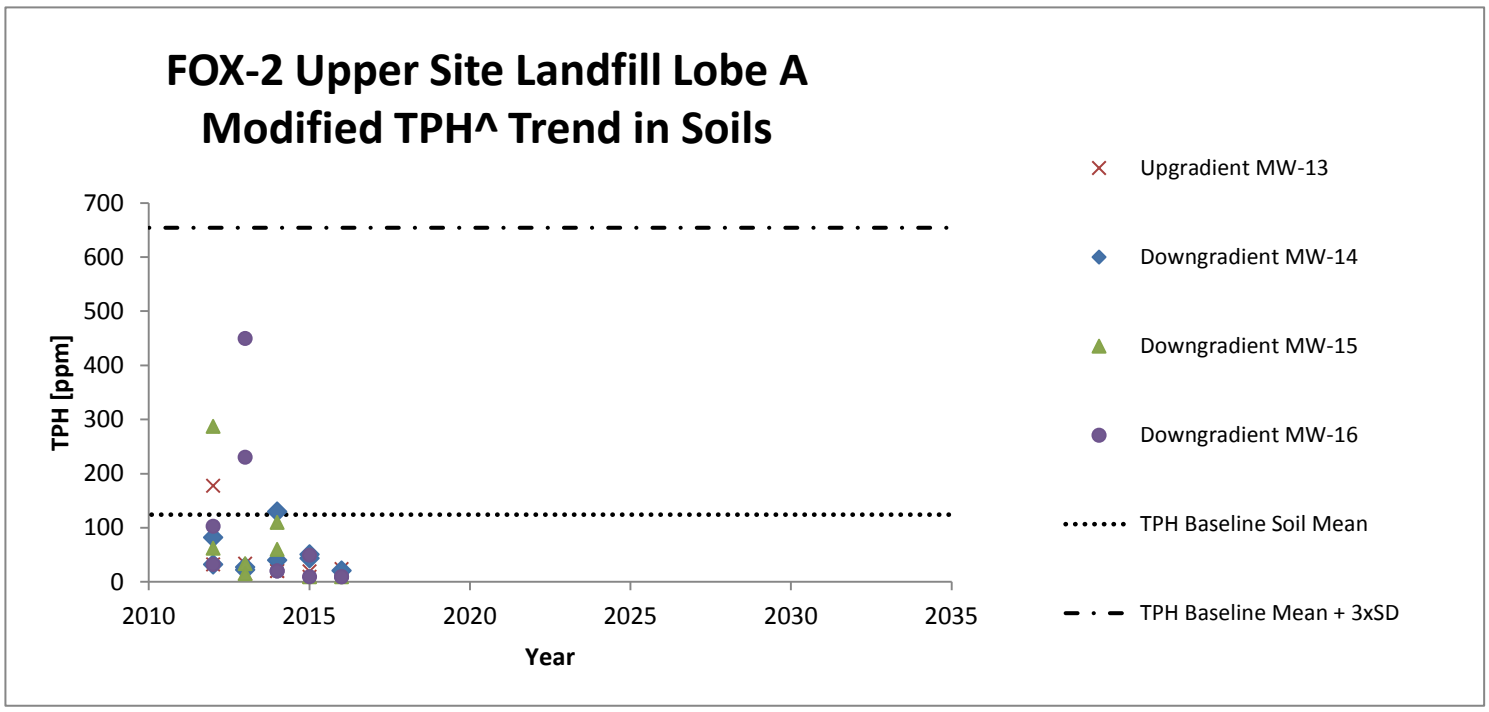


*Hg Baseline Arithmetic Mean is equal to the baseline detection limit.
Hg baseline SD = 0



PCB Baseline arithmetic mean equals the baseline detection limit

FOX-2 Upper Site Landfill Lobe A Trends in Soil Inorganics, PCBs and PHCs (modified TPH)



^ Modified TPH is Sum of F1, F2 and F3 fractions (C_6 - C_{34})

FOX-2 - Upper Site Landfill Lobe A - Summary of Monitoring Groundwater Analytical Data

Sample ID	Location	Date	Monitoring Year	Monitoring Phase	Cu (mg/L)	Ni (mg/L)	Co (mg/L)	Cd (mg/L)	Pb (mg/L)	Zn (mg/L)	Cr (mg/L)	As (mg/L)	Hg (mg/L)	Total PCB (mg/L)	F1 C_6-C_{10} (mg/L)	F2 C_{10}-C_{16} (mg/L)	F3 C_{16}-C_{34} (mg/L)	Modified TPH^ - Total C6-C34 (mg/L)
Baseline Data																		
Upgradient:																		
not sampled - well dry	MW-13	2009																#N/A
not sampled - well dry	MW-13	2010																#N/A
not sampled - well dry	MW-13	2011																#N/A
																		#N/A
Downgradient:																		
09-20056	MW-14	2009			0.014	0.17	0.038	<0.0010	<0.0010	0.045	0.034	0.0030	<0.00040	<0.000020	<0.050	<0.50	<1.0	0.78
10-20153	MW-14	2010			0.019	0.21	0.035	<0.0010	<0.0010	0.037	0.063	<0.0030	<0.00040	<0.000020	<0.050	<0.50	<1.0	0.78
10-20158	MW-15	2010			0.012	0.22	0.013	<0.0010	<0.0010	0.012	0.34	<0.0030	<0.00040	<0.000020	0.10	<0.50	<1.0	0.85
11-09260	MW-14	2011			0.12	0.15	0.038	<0.0010	0.012	0.32	0.12	0.019	<0.00040	<0.0030	<0.050	<0.50	<1.0	0.78
11-09265	MW-15	2011			0.11	0.29	0.056	<0.0010	<0.0010	0.086	0.20	<0.0030	<0.00040	<0.0030	<0.050	<0.50	<1.0	0.78
11-09270	MW-16	2011			0.29	0.22	0.084	0.0010	0.045	0.69	0.23	0.086	<0.00040	<0.0030	<0.050	<0.50	<1.0	0.78
		N value			6	6	6	6	6	6	6	6	6	6				10
Arithmetic Mean Corrected for Detection Limits					**0.095**	**0.21**	**0.044**	**0.0010**	**0.001**	**0.20**	**0.16**	**0.019**	**0.0004**	**0.003**				**1.0**
	Standard Deviation				0.11	0.049	0.024	0.00020	0.018	0.27	0.11	0.034	0.0	0.00082				0.031
Arithmetic Mean + 3xStandard Deviation					0.42	0.36	0.116	0.0016	0.054	1.0	0.50	0.12	0.00040	0.0054				1.09
	Detection Limit				<0.0050	<0.010	<0.0050	<0.0010	<0.0010	<0.0050	<0.0050	<0.0030	<0.00040	<0.0030				<1.0
Monitoring Data																		
Upgradient - MW- 13																		
12-15130	MW-13	2012	1	1	0.070	0.20	0.034	0.00032	**0.0055**	0.063	0.043	0.0068	<0.00010	0.0001	<0.025	<0.10	<0.25	0.19
not sampled - insufficient water	MW-13	2013	2	1														#N/A
Not sampled, insufficient water	MW-13	2014	3	1														#N/A
MW13	MW-13	2015	4	1	0.0166	0.077	0.0221	0.0002	0.0006	0.021	0.004	0.003	<0.0001	<0.00005	<0.025	<0.1	<0.1	0.1
MW-13	MW-13	2016	5	1	0.0141	0.069	0.012	<0.0001	<0.0001	0.012	0.001	<0.001	<0.0001	**N/A**	<0.025	N/A	N/A	0.0
	MW-13		7	2														#N/A
	MW-13		10	2														#N/A
	MW-13		15	2														#N/A
	MW-13		25	2														#N/A
																		#N/A
																		#N/A
																		#N/A

Modified TPH TOTAL will appear when F1, F2, F3 fraction results are entered.

FOX-2 - Upper Site Landfill Lobe A - Summary of Monitoring Groundwater Analytical Data

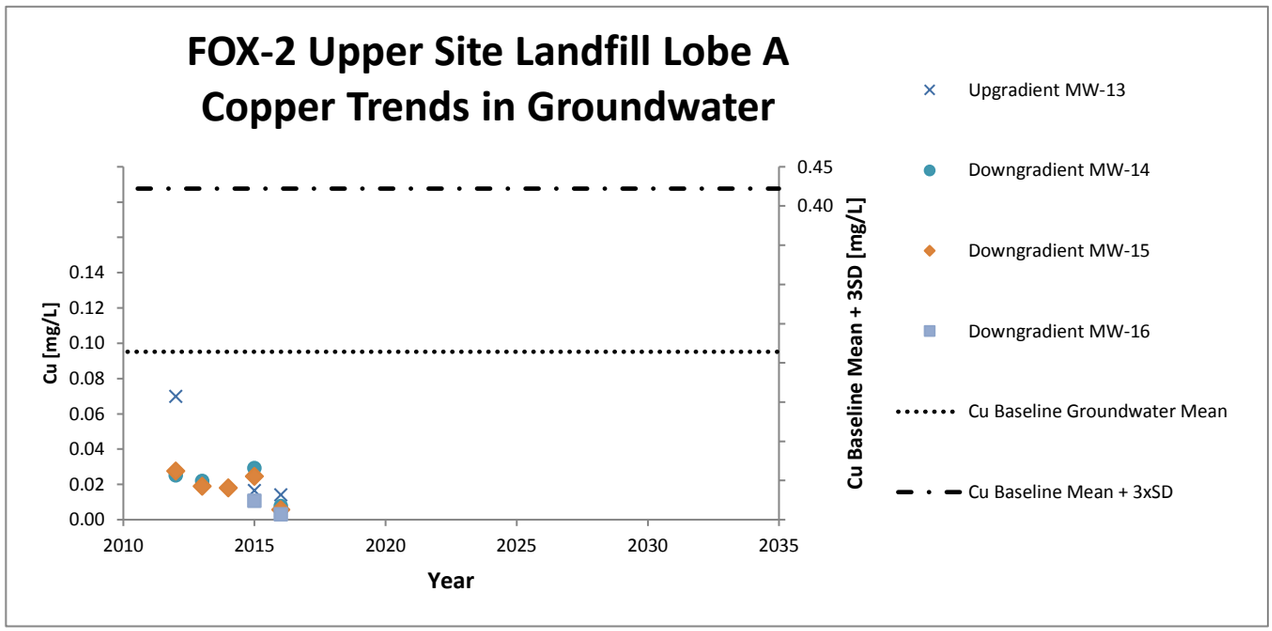
Sample ID	Location	Date	Monitoring Year	Monitoring Phase	Cu (mg/L)	Ni (mg/L)	Co (mg/L)	Cd (mg/L)	Pb (mg/L)	Zn (mg/L)	Cr (mg/L)	As (mg/L)	Hg (mg/L)	Total PCB (mg/L)	F1 C_6-C_{10} (mg/L)	F2 C_{10}-C_{16} (mg/L)	F3 C_{16}-C_{34} (mg/L)	Modified TPH^ - Total C6-C34 (mg/L)
Downgradient - MW-14																		
12-15131	MW-14	2012	1	1	0.025	0.080	0.022	0.00024	**0.0027**	0.048	0.012	0.0035	<0.00040	<0.000020	<0.025	<0.10	<0.25	0.19
2013-F2-MW-14	MW-14	2013	2	1	0.022	0.073	0.019	0.00018	**0.0021**	0.060	0.015	0.0040	<0.000010	<0.000010	<0.025	<0.10	<0.10	0.11
F2-MW-14-2014*	MW-14	2014	3	1	**0.26**	**0.28**	**0.06**	<0.008	**0.03**	**0.55**	**0.20**	**0.06**	<0.0001	<0.0001				#N/A
MW14 (Dup Avg)	MW-14	2015	4	1	0.029	0.065	0.018	0.0004	<0.001	0.0615	<0.004	<0.003	<0.0001	<0.00005	<0.025	<0.1	<0.1	0.1
MW-14	MW-14	2016	5	1	0.0078	0.042	0.0133	0.0001	<0.0001	0.025	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	0.1
	MW-14		7	2														#N/A
	MW-14		10	2														#N/A
	MW-14		15	2														#N/A
	MW-14		25	2														#N/A
																		#N/A
																		#N/A
																		#N/A
Downgradient - MW-15																		
12-15132	MW-15	2012	1	1	0.028	0.095	0.017	0.00083	**0.0052**	0.051	0.024	<0.0010	<0.0001	<0.00002	<0.025	<0.10	<0.25	0.19
2013-F2-MW-15	MW-15	2013	2	1	0.019	0.11	0.013	0.00053	**0.0023**	0.035	0.11	0.00090	<0.00001	<0.00001	<0.025	<0.10	<0.10	0.11
F2-MW-15-2014**	MW-15	2014	3	1	0.018	0.042	0.0105	0.0007	**0.004**	0.03	0.002	<0.001	<0.0001	<0.0001	<0.025	<0.10	<0.2	0.2
MW15	MW-15	2015	4	1	0.0246	0.015	0.0028	0.0005	**0.0057**	0.03	<0.005	<0.005	<0.0001	<0.00005	<0.025	<0.1	<0.1	0.1
MW-15	MW-15	2016	5	1	0.0056	0.036	0.0094	0.0003	<0.0001	0.024	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	0.1
	MW-15		7	2														#N/A
	MW-15		10	2														#N/A
	MW-15		15	2														#N/A
	MW-15		25	2														#N/A
																		#N/A
																		#N/A
																		#N/A
																		#N/A
Downgradient - MW-16																		
not sampled - well frozen	MW-16	2012	1	1														#N/A
not sampled - insufficient water	MW-16	2013	2	1														#N/A
F2-MW-16-2014*	MW-16	2014	3	1	**0.43**	**0.35**	**0.09**	<0.008	**0.06**	**4.37**	**0.32**	**0.22**	<0.0001	<0.0001				#N/A
MW16	MW-16	2015	4	1	0.0107	0.041	0.0315	<0.0005	0.0009	**2.44**	<0.005	<0.005	<0.0001	<0.00005	<0.025	<0.1	<0.1	0.1
MW-16	MW-16	2016	5	1	0.0031	0.033	0.0128	<0.0001	<0.0001	**0.759**	<0.001	<0.001	<0.0001	**N/A**	<0.025	<0.216	<0.216	0.2
	MW-16		7	2														#N/A
	MW-16		10	2														#N/A
	MW-16		15	2														#N/A
	MW-16		25	2														#N/A
																		#N/A
																		#N/A
																		#N/A
																		#N/A

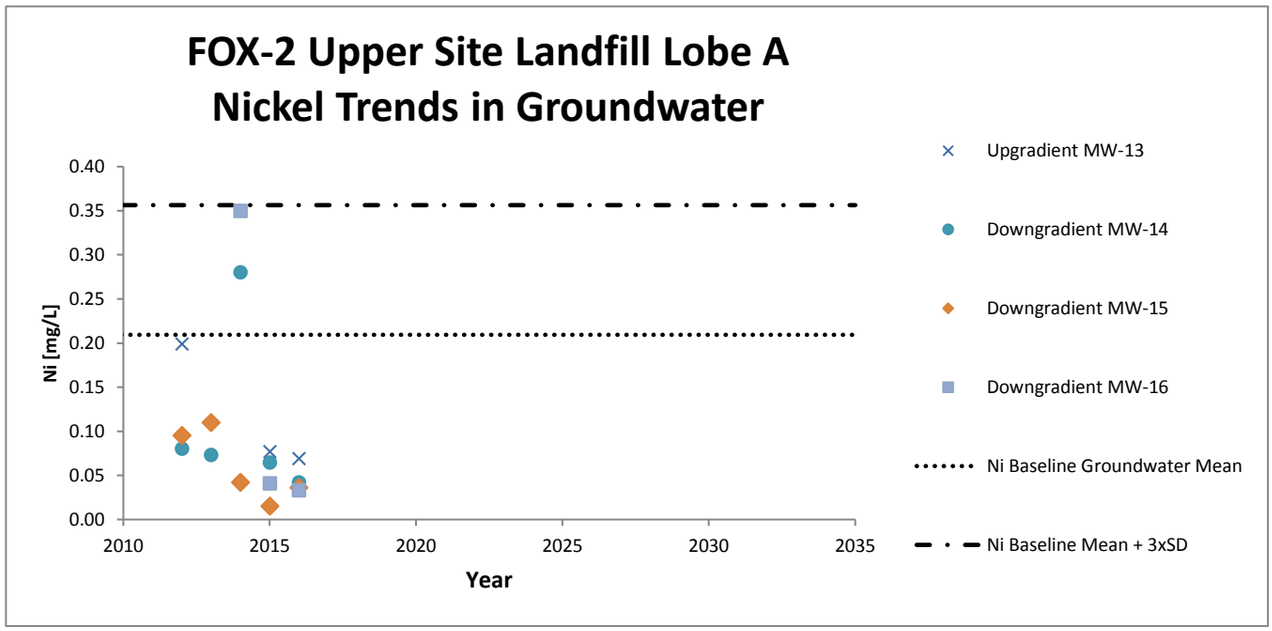
Note: Modified TPH Total (C_6-C_{34}) has been calculated by adding results for F1, F2 and F3.

* in 2014, there was insufficient water in MW 14 and MW-16 to analyze for PHC fractions F1, F2 and F3

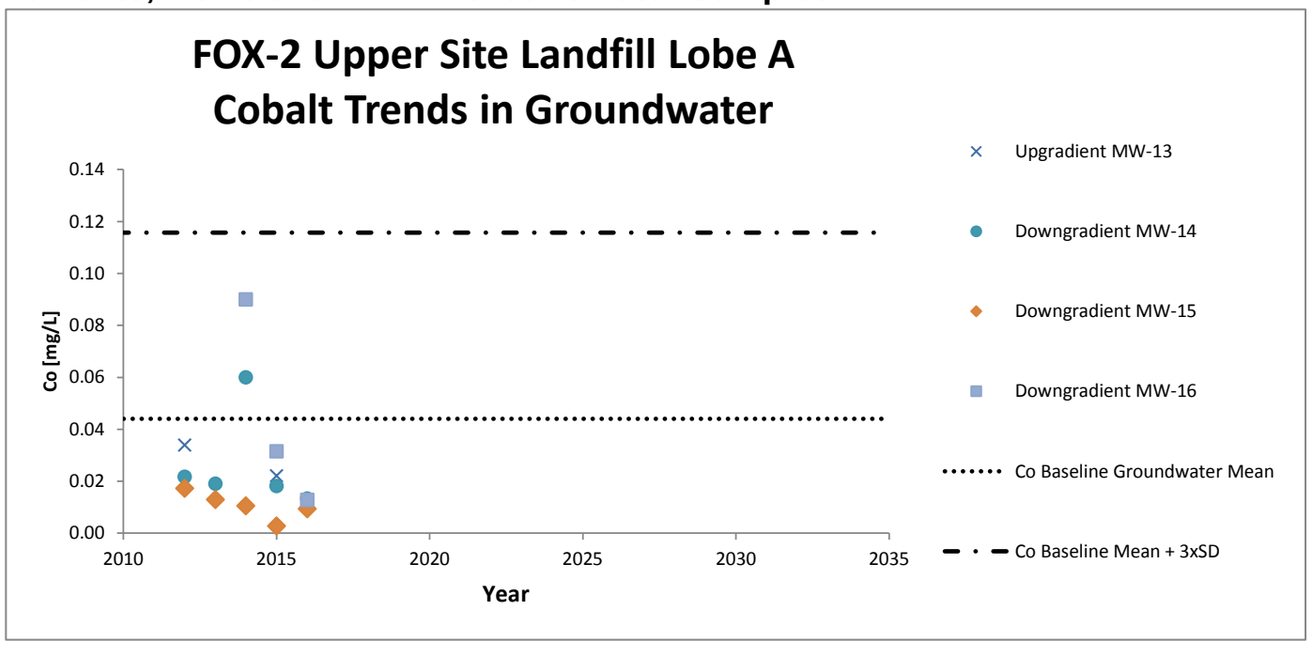
FOX-2 Upper Site Landfill Lobe A Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples

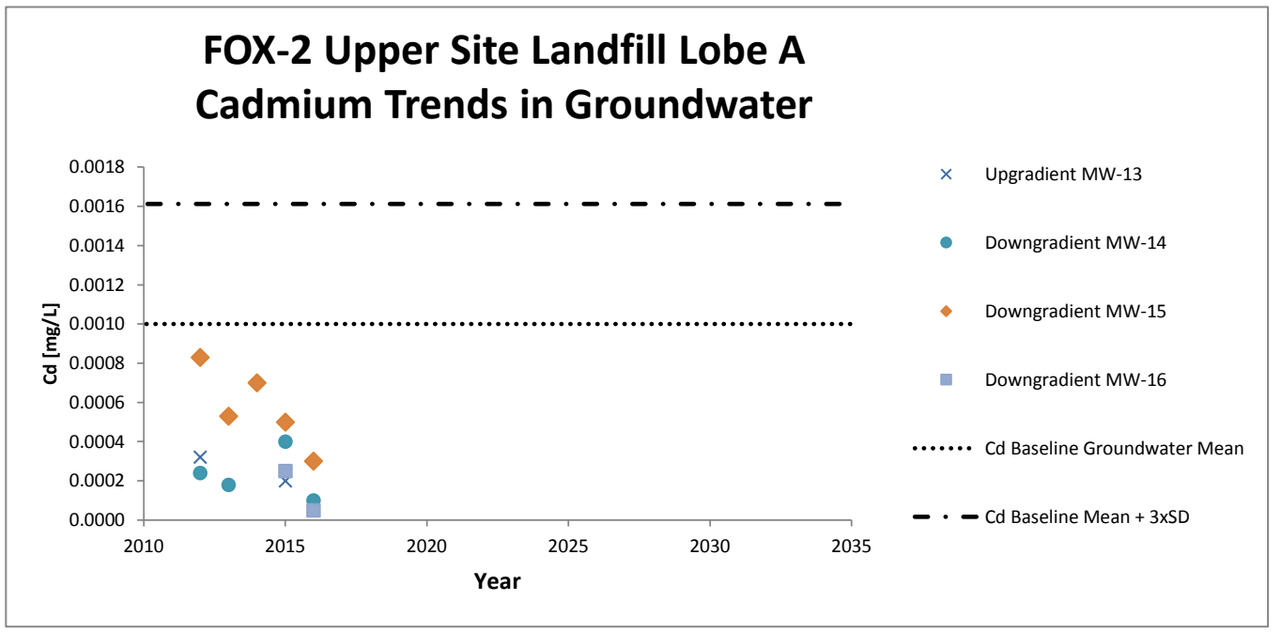
Where results are below detection, half of the detection limit has been used in the charts for the sample points. Trendlines are intended for visual interpretation of temporal trends. When all monitoring results are below detection, trendlines are a reflection of changes in detection limit. Users should refer to data tables.





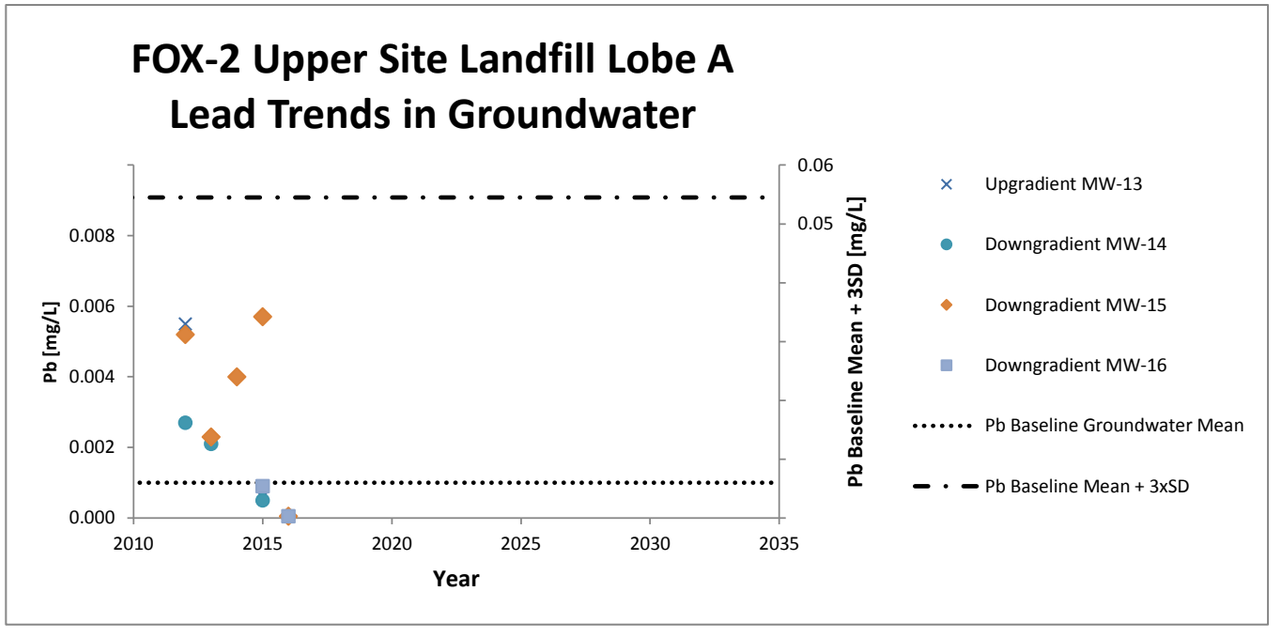
FOX-2 Upper Site Landfill Lobe A Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples



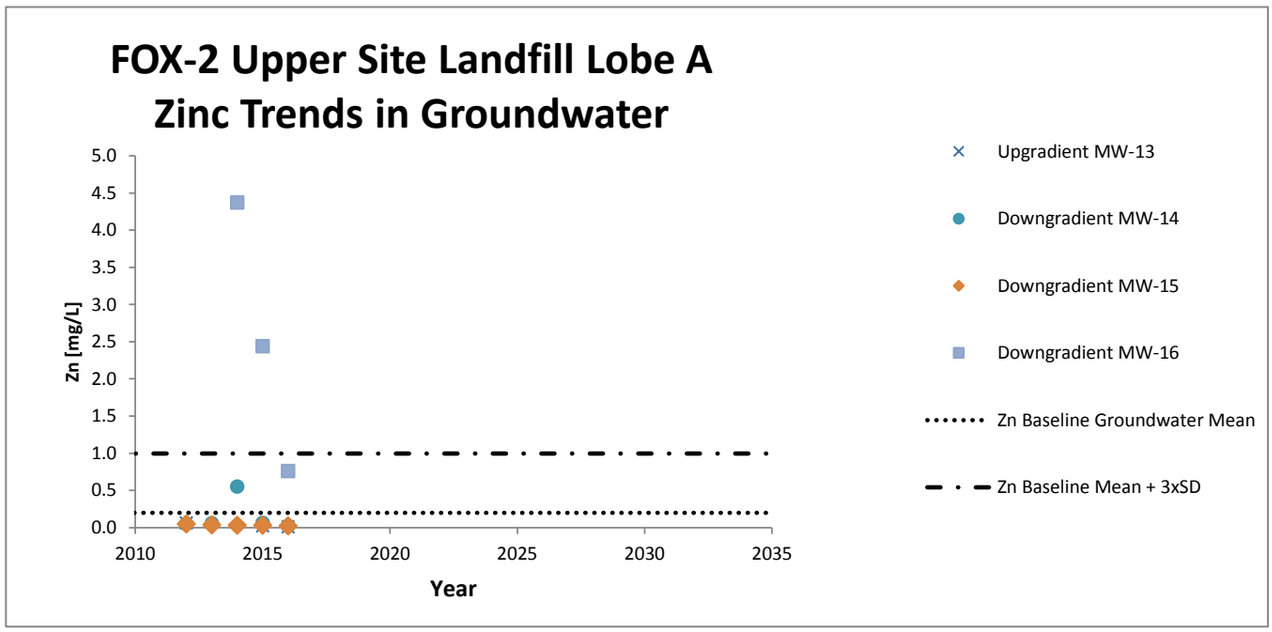


Cd Baseline Mean equals the baseline detection limit

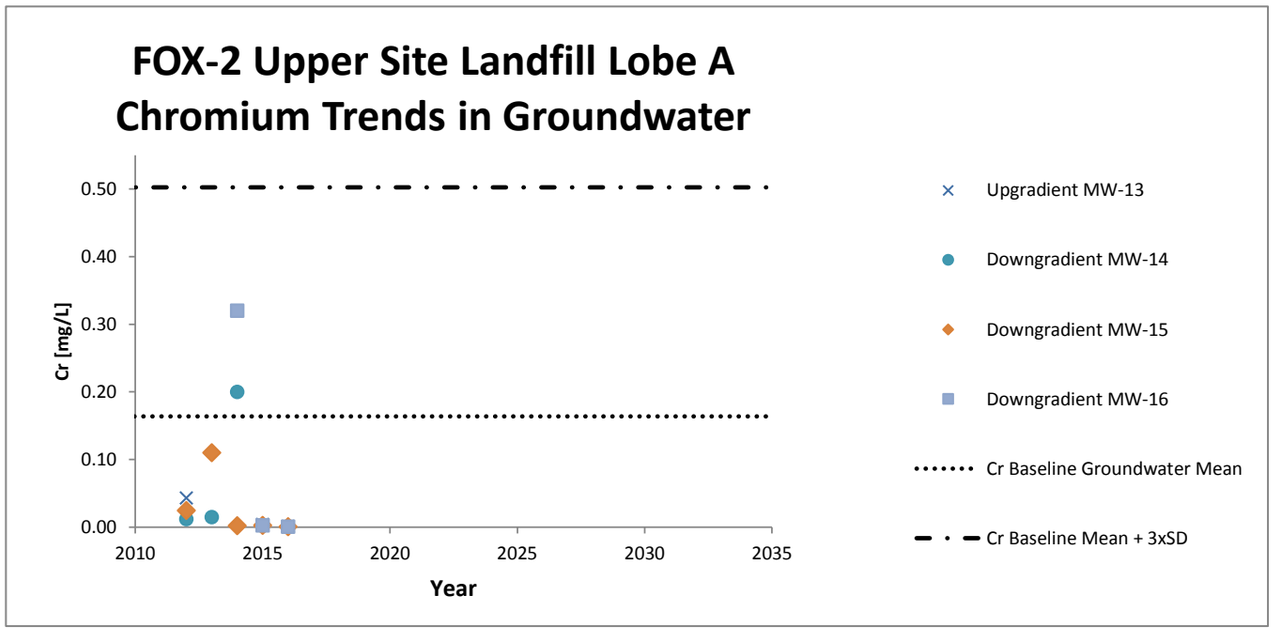
FOX-2 Upper Site Landfill Lobe A Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples

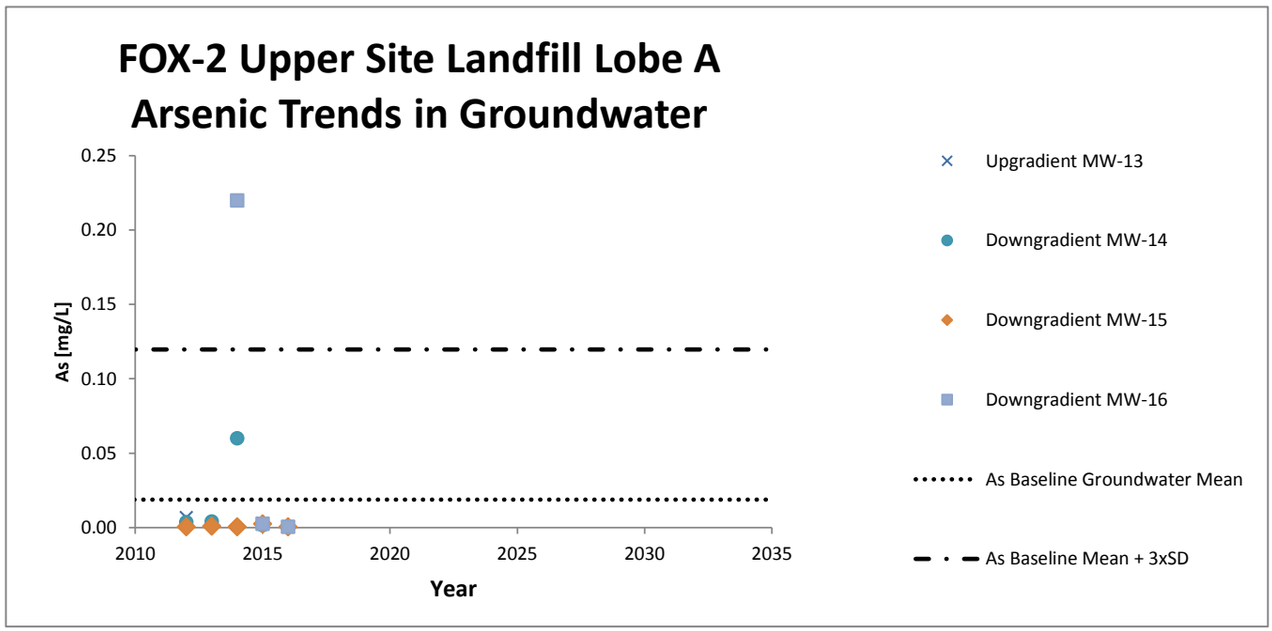


Pb Baseline Mean equals the baseline detection limit.

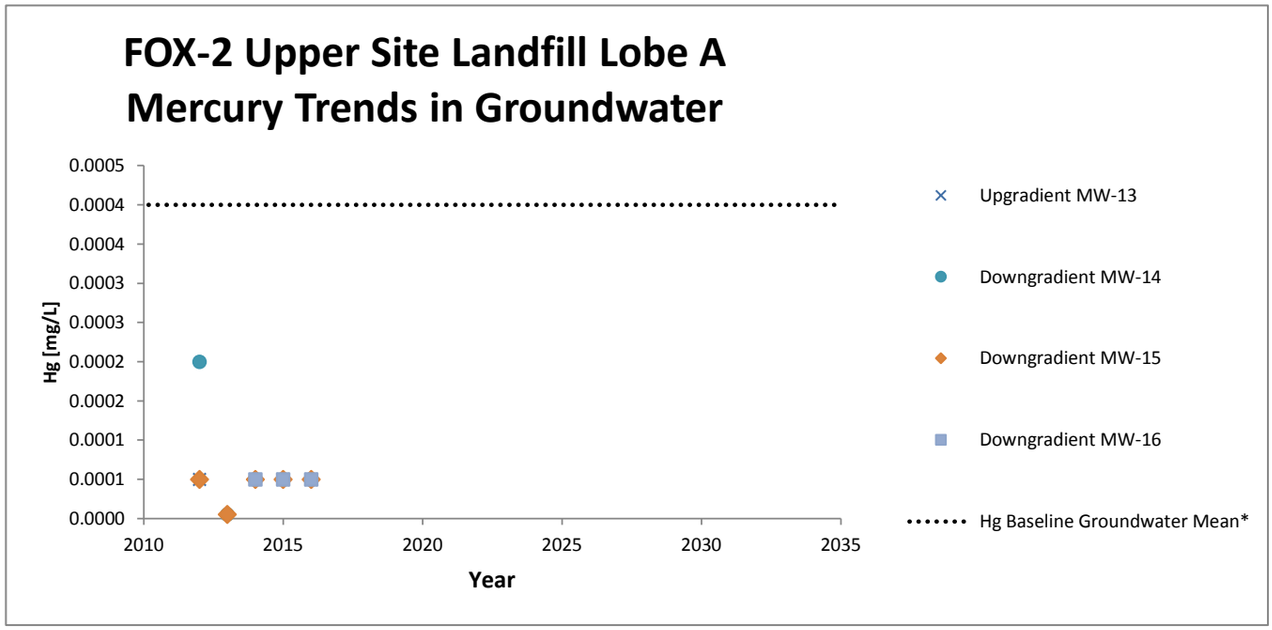


FOX-2 Upper Site Landfill Lobe A Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples

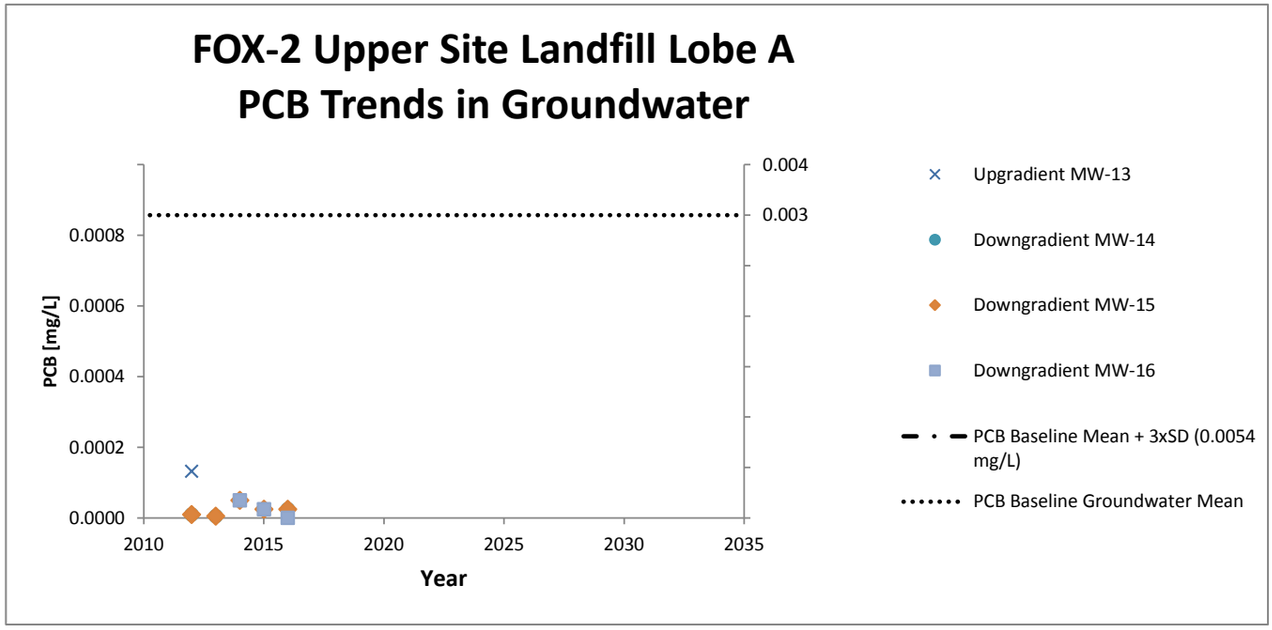




FOX-2 Upper Site Landfill Lobe A Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples

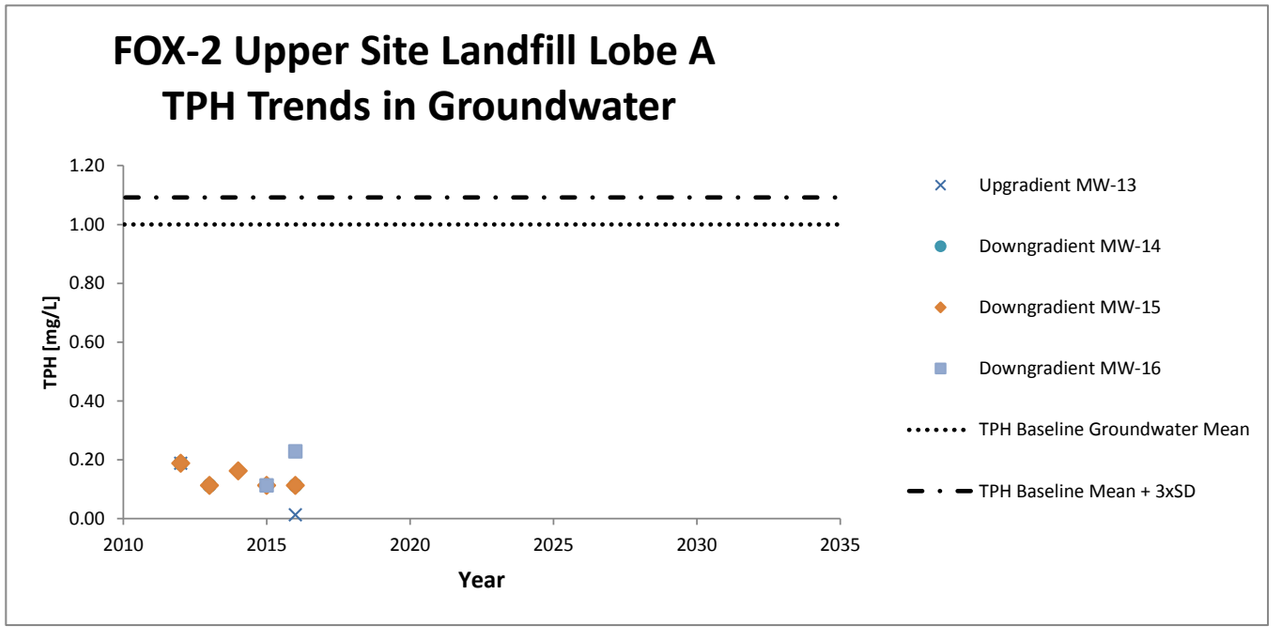


*Hg Baseline Mean is equal to the baseline detection limit.
*Hg Baseline SD = 0



PCB Baseline Mean equals the baseline detection limit.
PCB baseline mean + 3SD (0.0054 mg/L) not shown on the chart

FOX-2 Upper Site Landfill Lobe A Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples



TPH Baseline Mean equals the baseline detection limit.

FOX-2 - Airstrip Landfill Lobe A - Summary of Monitoring Soil Analytical Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd* (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Cr (mg/kg)	As (mg/kg)	Hg* (mg/kg)	Total PCB (mg/kg)	F1 C_6-C_{10} (mg/kg)	F2 C_{10}-C_{16} (mg/kg)	F3 C_{16}-C_{34} (mg/kg)	Modified TPH^ - Total C6-C34 (mg/kg)
Background Data - Arithmetic Mean*						55	46	17	1.0	10	84	59	23						
Baseline Data - Arithmetic Mean*						**45**	**41**	**15**	**1.0**	**10**	**78**	**51**	**25**	**0.10**	**0.10**				**10**
Baseline Data - Standard Deviation						17	11	3.9	0.0	5.8	14	5.2	9.2	0.0	0.02				12
Baseline Data Mean + 3xStandard Deviation						97	74	27		27	121	67	53		0.16				47
**** If baseline or background arithmetic mean was below the detection limit, the mean has been modified to match the detection limit value.***																			
DEW Line Cleanup Tier I Criteria										*200*					*1*				
DEW Line Cleanup Tier II Criteria & Hydrocarbon Action Level						*100*	*100*	*50*	*5*	*500*	*500*	*250*	*30*	*2.0*	*5*				*2500*
Monitoring Data																			**TPH Sum will appear when F1, F2 and F3 fractions are entered.**
Upgradient																			
	F2-6 surface																		
12-19468[1]/69[2]	F2-6	2012	1	1	0-10	**52**	**58**	**17**	<0.5	**11**	**110**	**73**	*32*	0.020	<0.020	<5.0	<10	<50	**33**
F2-6-A-2014	F2-6	2014	3	1	0-10	**91**	**96**	**19**	<0.5	**10**	**143**	**79**	*39*	<0.1	<0.02	<10	<10	<20	**20**
F2-6 (0-15)	F2-6	2015	4	1	0-15	29.3	**44.8**	14.4	<0.5	8.5	**106**	**69.7**	19.4	<0.1	<0.05	<7	<4	<8	10
F2-6b	F2-6	2016	5	1	0-15	27	**44**	13	<0.5	8	**78**	**64**	18	<0.1	<0.05	<7	<4	<8	10
	F2-6		10	2															#N/A
	F2-6		15	2															#N/A
	F2-6		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A
	F2-6 depth																		
12-19470/71	F2-6	2012	1	1	30-40	44	**58**	**17**	<0.50	**12**	**120**	**82**	*48*	0.013	<0.020	<5.0	<10	<50	**33**
F2-6-B-2014	F2-6	2014	3	1	40-50	**74**	**62**	13	<0.5	4.0	**95**	**107**	21	<0.1	<0.02	<10	<10	<20	**20**
F2-6 (40-50)	F2-6	2015	4	1	40-50	27.7	34.5	10.3	<0.5	8.1	56.1	**58.4**	17.5	<0.1	<0.05	<7	<4	<8	10
F2-6a	F2-6	2016	5	1	30-40	27	41	12	<0.5	7	76	**69**	17	<0.1	<0.05	<7	<4	<8	10
	F2-6		10	2															#N/A
	F2-6		15	2															#N/A
	F2-6		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A

FOX-2 - Airstrip Landfill Lobe A - Summary of Monitoring Soil Analytical Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd* (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Cr (mg/kg)	As (mg/kg)	Hg* (mg/kg)	Total PCB (mg/kg)	F1 C_6-C_{10} (mg/kg)	F2 C_{10}-C_{16} (mg/kg)	F3 C_{16}-C_{34} (mg/kg)	Modified TPH^ - Total C6-C34 (mg/kg)
Downgradient																			
	F2-7 surface																		
12-19472/73	F2-7	2012	1	1	0-10	**63**	**55**	14	<0.50	**10**	**81**	46	*76*	<0.010	<0.020	<5.0	<10	<50	**33**
F2-7-A-2014	F2-7	2014	3	1	0-10	**50**	**52**	14	<0.5	9	**93**	**86**	*39*	<0.1	<0.02	<10	<10	<20	**20**
F2-7 (0-15)	F2-7	2015	4	1	0-15	40.9	35.5	11.8	<0.5	**10.3**	51.7	31.8	*61.2*	<0.1	<0.05	<7	<4	<8	10
F2-7b	F2-7	2016	5	1	0-15	**57**	**52**	**16**	<0.5	**11**	73	48	*53*	<0.1	<0.05	<7	<4	<8	10
	F2-7		10	2															#N/A
	F2-7		15	2															#N/A
	F2-7		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A
	F2-7 depth																		
12-19474[1]/75[2]	F2-7	2012	1	1	30-40	**87**	**68**	**19**	<0.50	**12**	**120**	**76**	*47*	<0.010	<0.020	<5.0	<10	<50	**33**
F2-7-B-2014	F2-7	2014	3	1	40-50	**46**	**48**	14	<0.5	9.0	**95**	**61**	*31*	<0.1	<0.02	<10	<10	<20	**20**
F2-7 (40-50)	F2-7	2015	4	1	40-50	42.2	39.2	12.5	<0.5	**10.4**	66.5	38.1	*58.4*	<0.1	<0.05	<7	<4	<8	10
F2-7a (Dup Avg)	F2-7	2016	5	1	40-50	45	**51**	14	0.5	**11**	**82**	**55**	*34*	<0.1	<0.05	<6	<7	<29	**21**
	F2-7		10	2															#N/A
	F2-7		15	2															#N/A
	F2-7		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A
	F2-8 surface																		
12-19476[1]/77[2]	F2-8	2012	1	1	0-10	**85**	*100*	**25**	<0.50	**18**	**140**	**73**	*58*	0.011	<0.020	<5.0	<10	<50	**33**
F2-8-A-2014	F2-8	2014	3	1	0-10	**50**	**58**	14	<0.5	9	**92**	**93**	*42*	<0.1	<0.02	<10	<10	<20	**20**
F2-8 (0-15)	F2-8	2015	4	1	0-15	44.4	40.4	13.4	<0.5	**11.5**	72.9	47.6	*49.2*	<0.1	<0.05	<7	<4	<8	10
F2-8b	F2-8	2016	5	1	0-15	**54**	**58**	**16**	<0.5	**11**	**81**	50	*42*	<0.1	<0.05	<7	<4	<8	10
	F2-8		10	2															#N/A
	F2-8		15	2															#N/A
	F2-8		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A

FOX-2 - Airstrip Landfill Lobe A - Summary of Monitoring Soil Analytical Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd* (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Cr (mg/kg)	As (mg/kg)	Hg* (mg/kg)	Total PCB (mg/kg)	F1 C_6-C_{10} (mg/kg)	F2 C_{10}-C_{16} (mg/kg)	F3 C_{16}-C_{34} (mg/kg)	Modified TPH^ - Total C6-C34 (mg/kg)
	F2-8 depth																		
12-19478[1]/79[2]	F2-8	2012	1	1	30-40	**47**	**45**	12	<0.50	8.7	**83**	**53**	*48*	<0.010	<0.020	<5.0	<10	110	**118**
F2-8-B-2014	F2-8	2014	3	1	40-50	**55**	**61**	**16**	<0.5	**10**	**89**	**101**	*108*	<0.1	<0.02	<10	<10	<20	**20**
F2-8 (40-50)	F2-8	2015	4	1	40-50	39.4	33.1	11.2	<0.5	8.6	66.9	44.9	*32.1*	<0.1	<0.05	<7	<4	<8	10
F2-8a	F2-8	2016	5	1	40-50	**48**	**46**	14	<0.5	**10**	69	47	*44*	<0.1	<0.05	<7	<4	11	**17**
	F2-8		10	2															#N/A
	F2-8		15	2															#N/A
	F2-8		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A
	F2-9 surface																		
12-19480[1]/81[2]	F2-9	2012	1	1	0-10	**84**	**72**	**21**	<0.50	**15**	**150**	**88**	*60*	<0.010	<0.050	<5.0	<10	<50	**33**
F2-9-A-2014	F2-9	2014	3	1	0-10	**69**	**82**	**24**	<0.5	**24**	**132**	**121**	*46*	<0.1	<0.02	<10	<10	80	**90**
F2-9 (0-15)	F2-9	2015	4	1	0-15	**50.9**	**42.5**	13.3	<0.5	**11.5**	**84.2**	47.2	*39.7*	<0.1	<0.05	<7	<4	<8	10
F2-9b	F2-9	2016	5	1	0-15	**71**	**57**	**17**	<0.5	**26**	**97**	**61**	*33*	<0.1	<0.05	<7	31	318	**353**
	F2-9		10	2															#N/A
	F2-9		15	2															#N/A
	F2-9		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A
	F2-9 depth																		
12-19482[1]/83[2]	F2-9	2012	1	1	30-40	**74**	**68**	**17**	<0.50	**14**	**130**	**73**	*51*	<0.010	<0.020	<5.0	<10	<50	**33**
F2-9-B-2014	F2-9	2014	3	1	40-50	**65**	**85**	**17**	<0.5	**11**	**119**	**151**	*35*	<0.1	<0.02	<10	<10	<20	**20**
F2-9 (40-50)	F2-9	2015	4	1	40-50	**55.4**	40.4	12.5	<0.5	9.8	**82.9**	46.1	*36.1*	<0.1	<0.05	<7	<4	<8	10
F2-9a	F2-9	2016	5	1	40-50	**76**	**60**	**16**	<0.5	**14**	**112**	**64**	*32*	<0.1	<0.05	<7	<4	<8	10
	F2-9		10	2															#N/A
	F2-9		15	2															#N/A
	F2-9		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A

Legend

XX	sample exceeds background
XX	**sample exceeds baseline**
XX	*sample exceeds DLCU Tier I criteria*
XX	*sample exceeds DLCU Tier II criteria*

Note: Modified TPH Total (C_6-C_{34}) has been calculated by adding results for F1, F2 and F3.

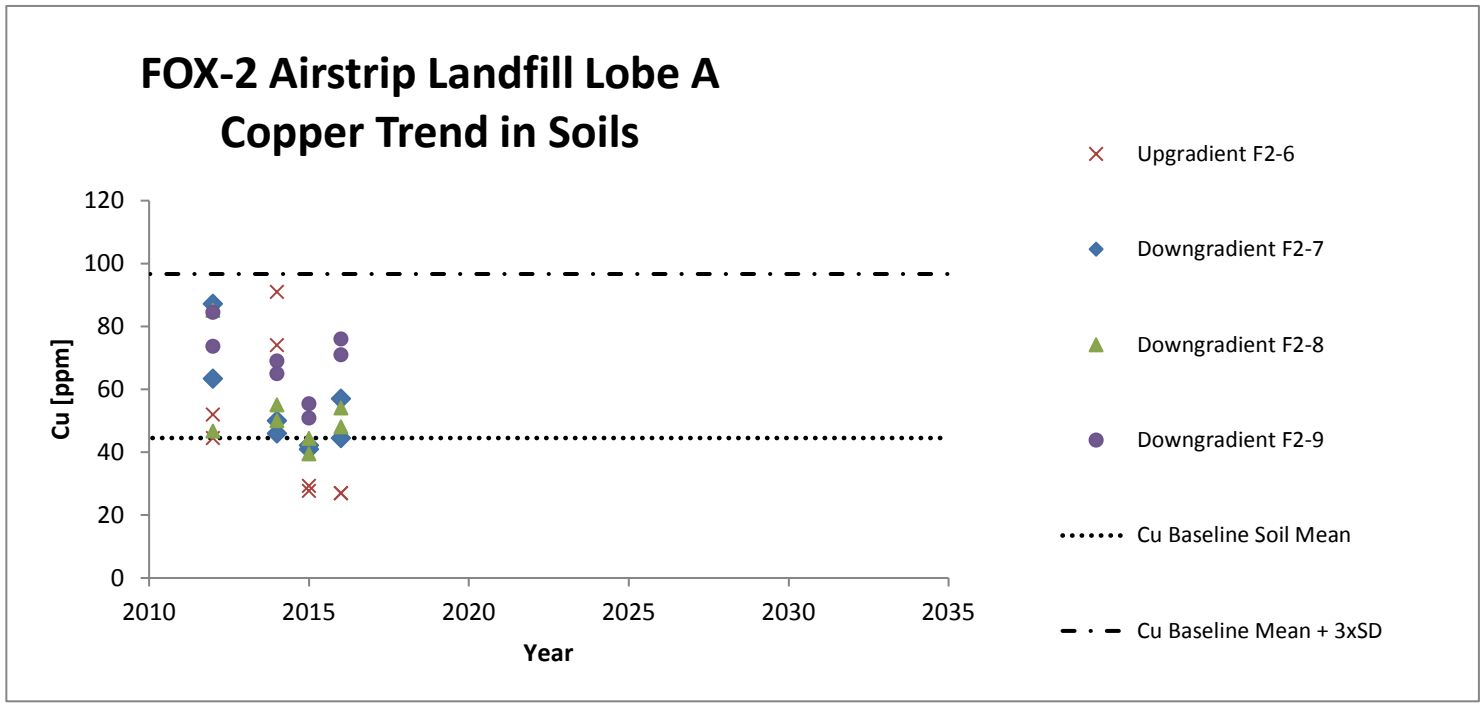
1 - soil sample analyzed for inorganics and PCBs

2 - soil sample analyzed for F1-F3 fraction PHCs

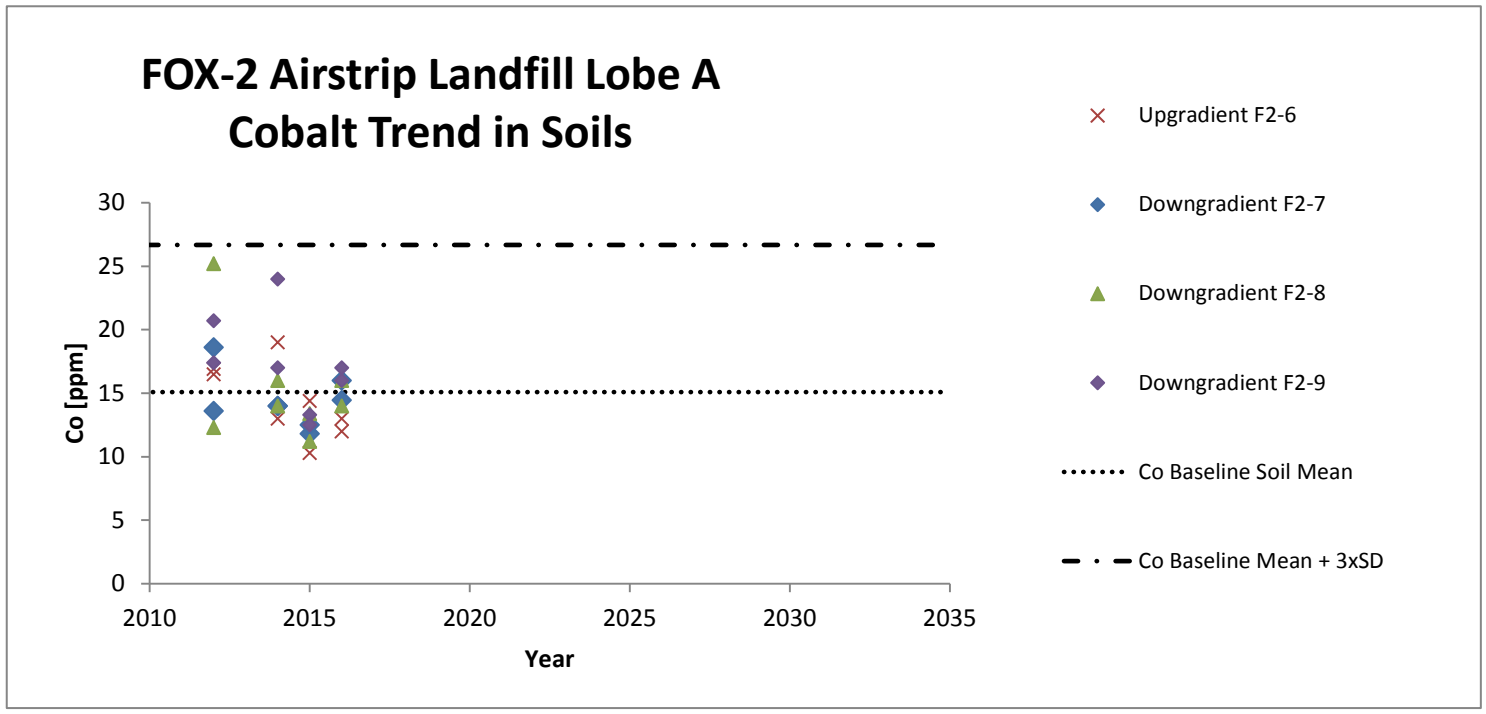
FOX-2 Airstrip Landfill Lobe A Trends in Soil Inorganics, PCBs and PHCs (modified TPH)

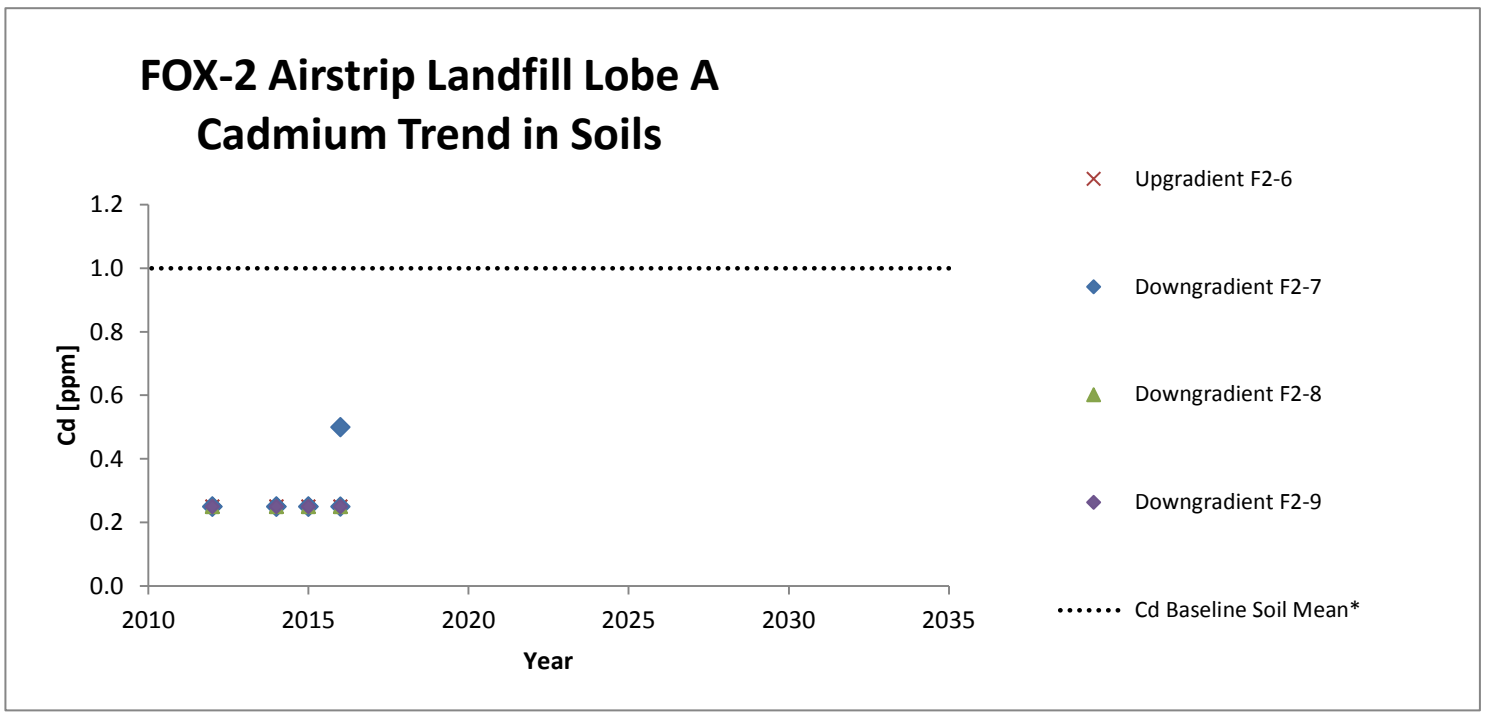
Where results are below detection, half of the detection limit has been used in the charts for the sample points.

Trendlines are intended for visual interpretation of temporal trends. When all monitoring results are below detection, trendlines are a reflection of changes in detection limit. Users should refer to data tables.



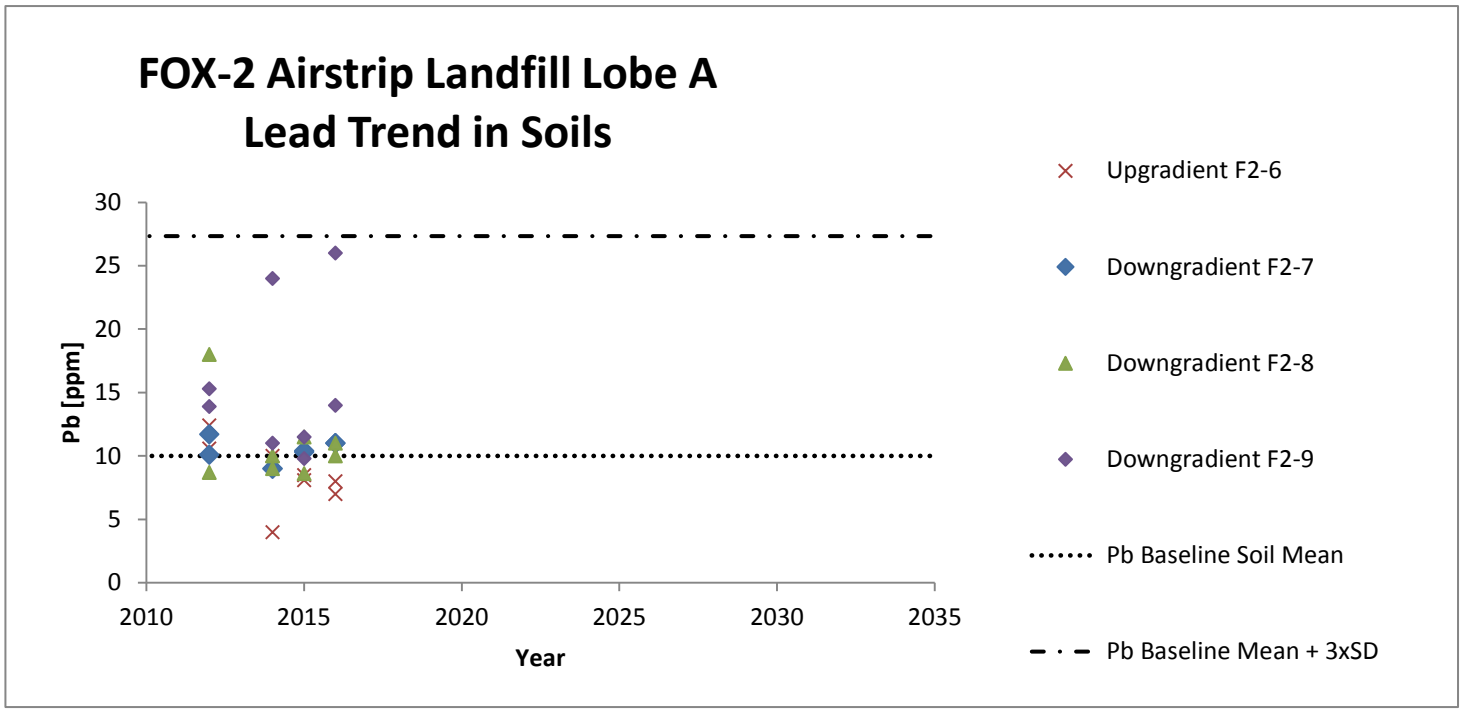
FOX-2 Airstrip Landfill Lobe A Trends in Soil Inorganics, PCBs and PHCs (modified TPH)



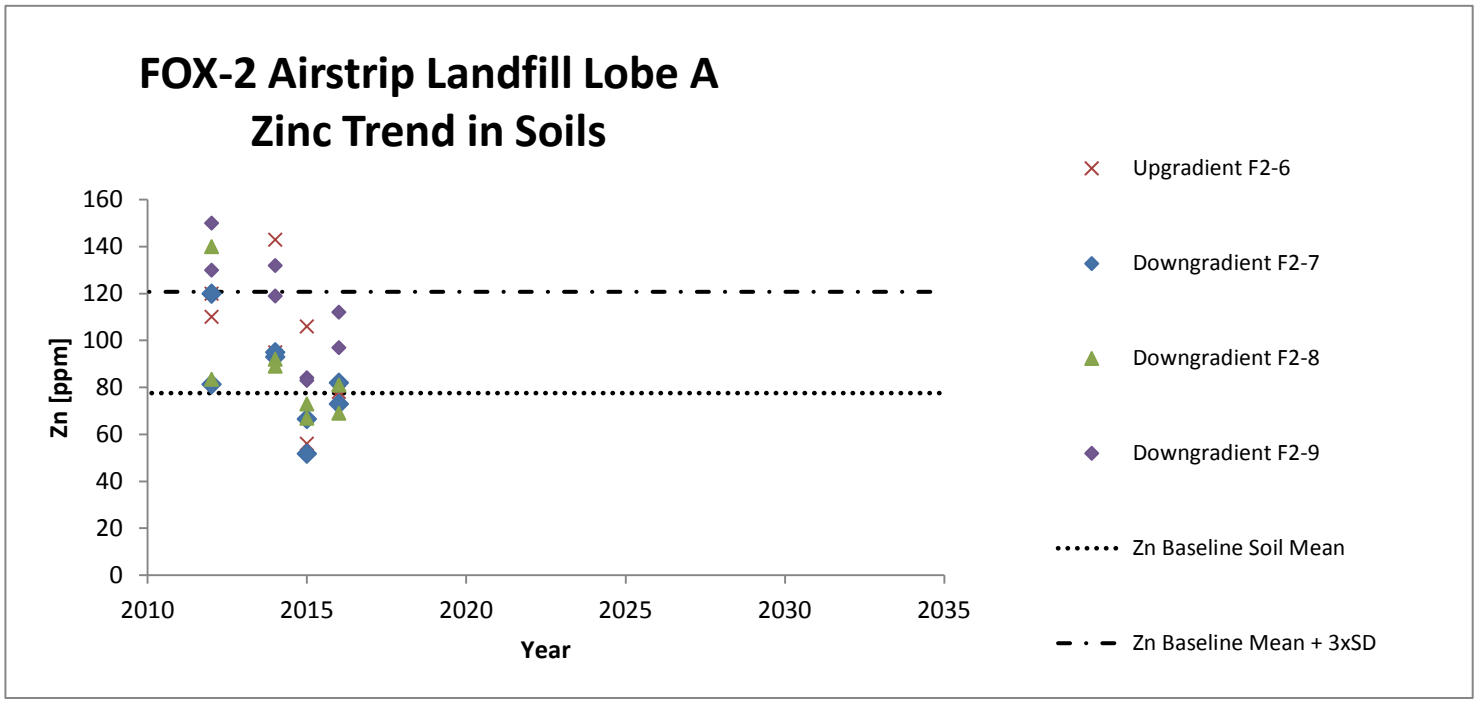


*Cd Baseline Arithmetic Mean is equal to the baseline detection limit.
*Cd Baseline SD = 0

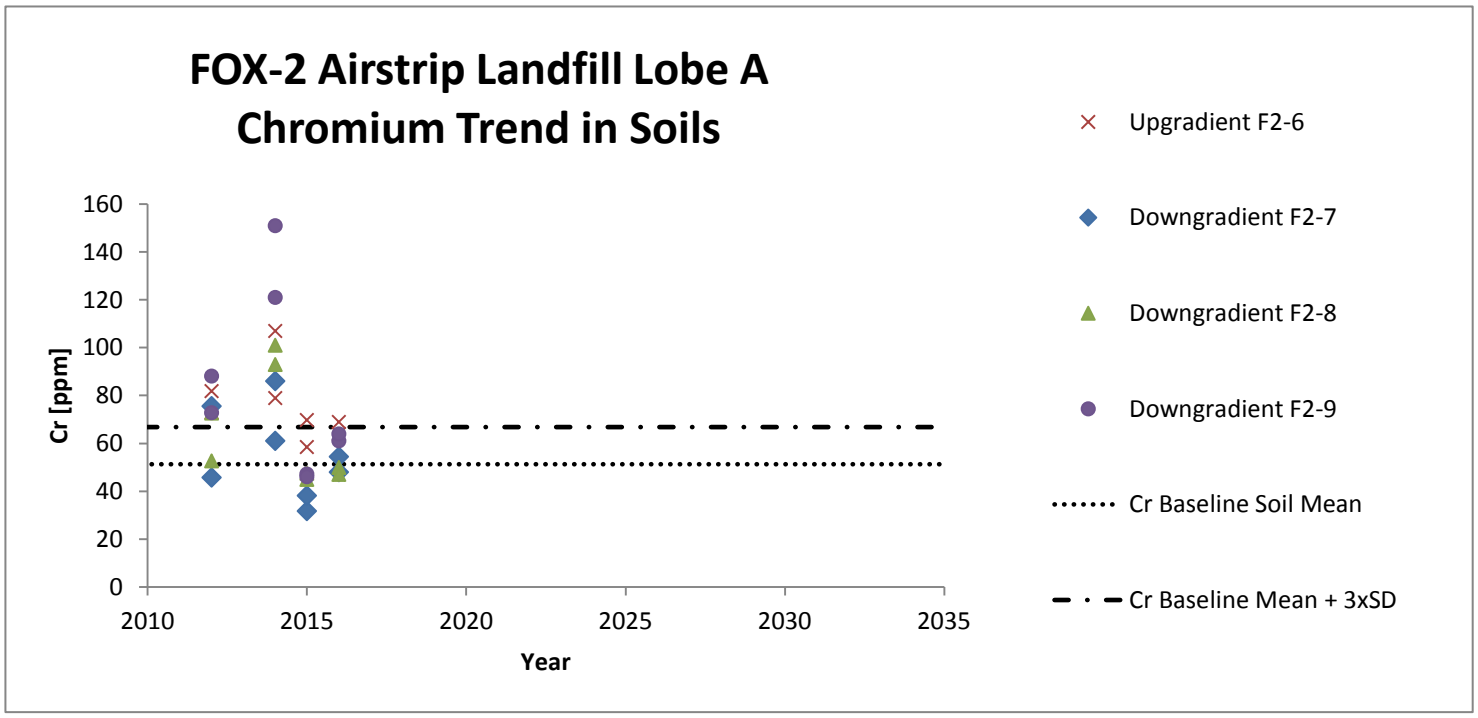
FOX-2 Airstrip Landfill Lobe A Trends in Soil Inorganics, PCBs and PHCs (modified TPH)

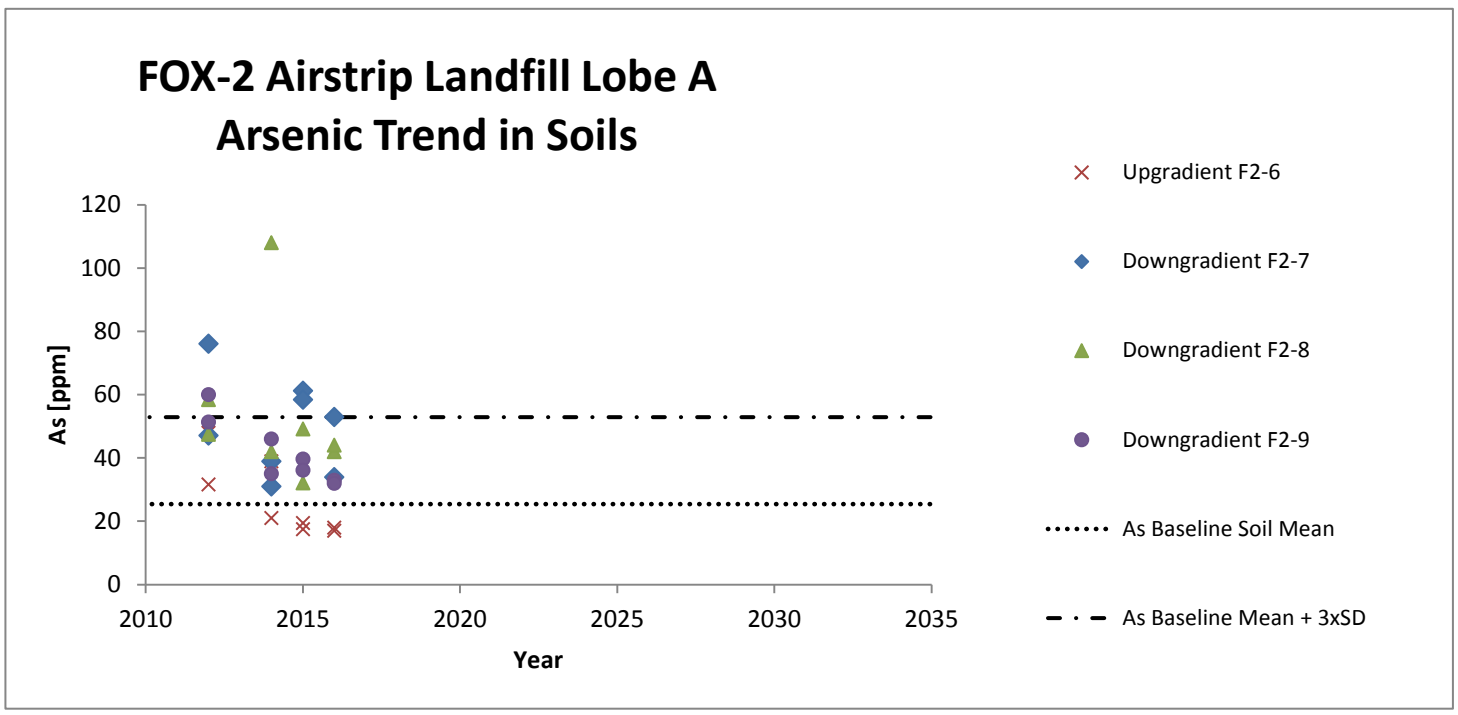


Pb Baseline mean equals the baseline detection limit

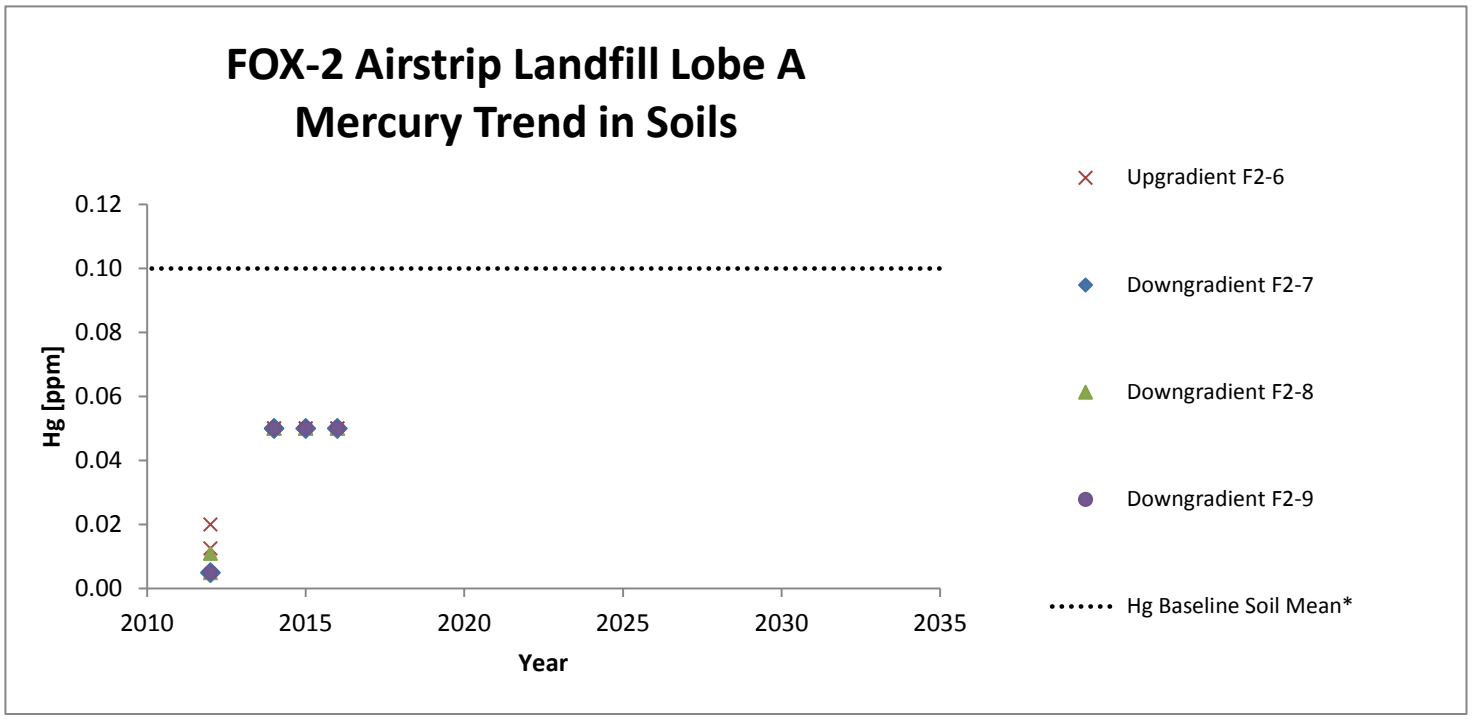


FOX-2 Airstrip Landfill Lobe A Trends in Soil Inorganics, PCBs and PHCs (modified TPH)

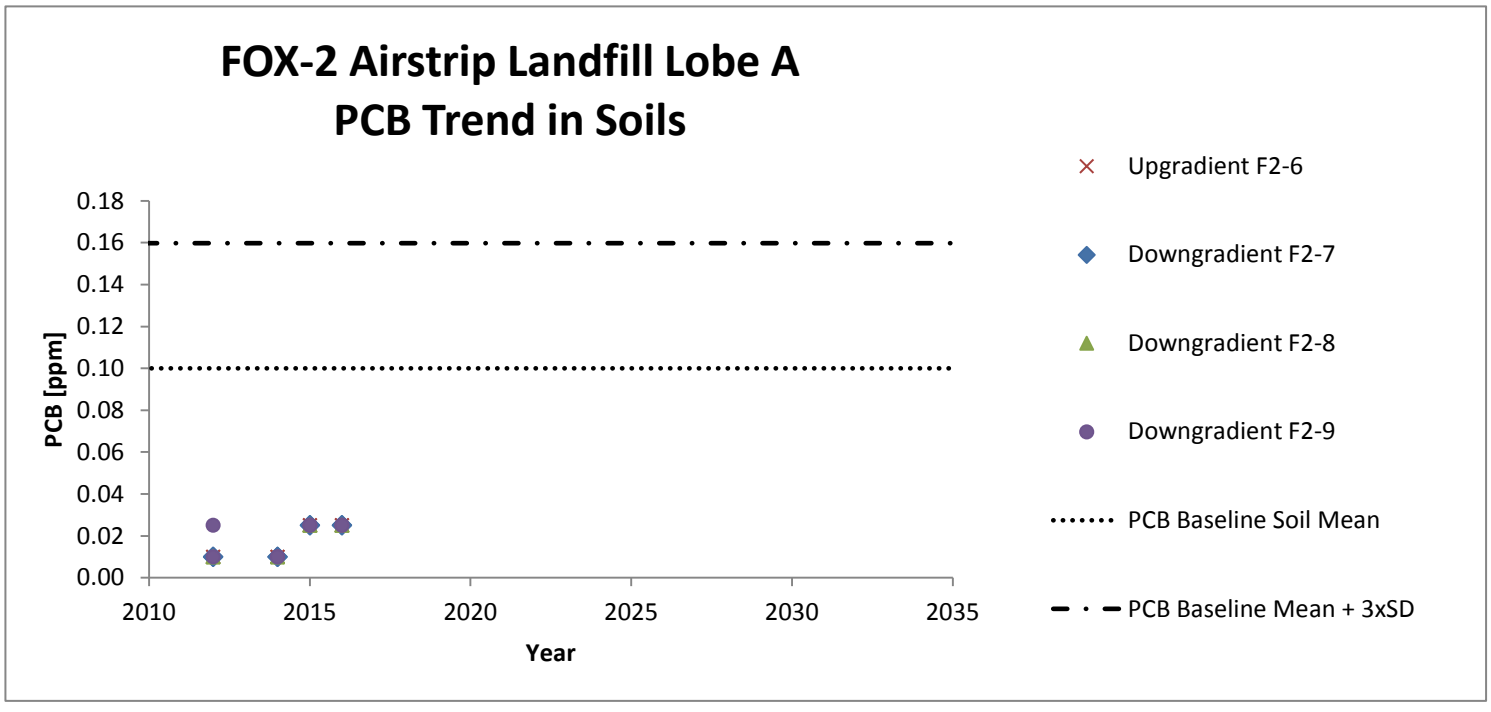




FOX-2 Airstrip Landfill Lobe A Trends in Soil Inorganics, PCBs and PHCs (modified TPH)

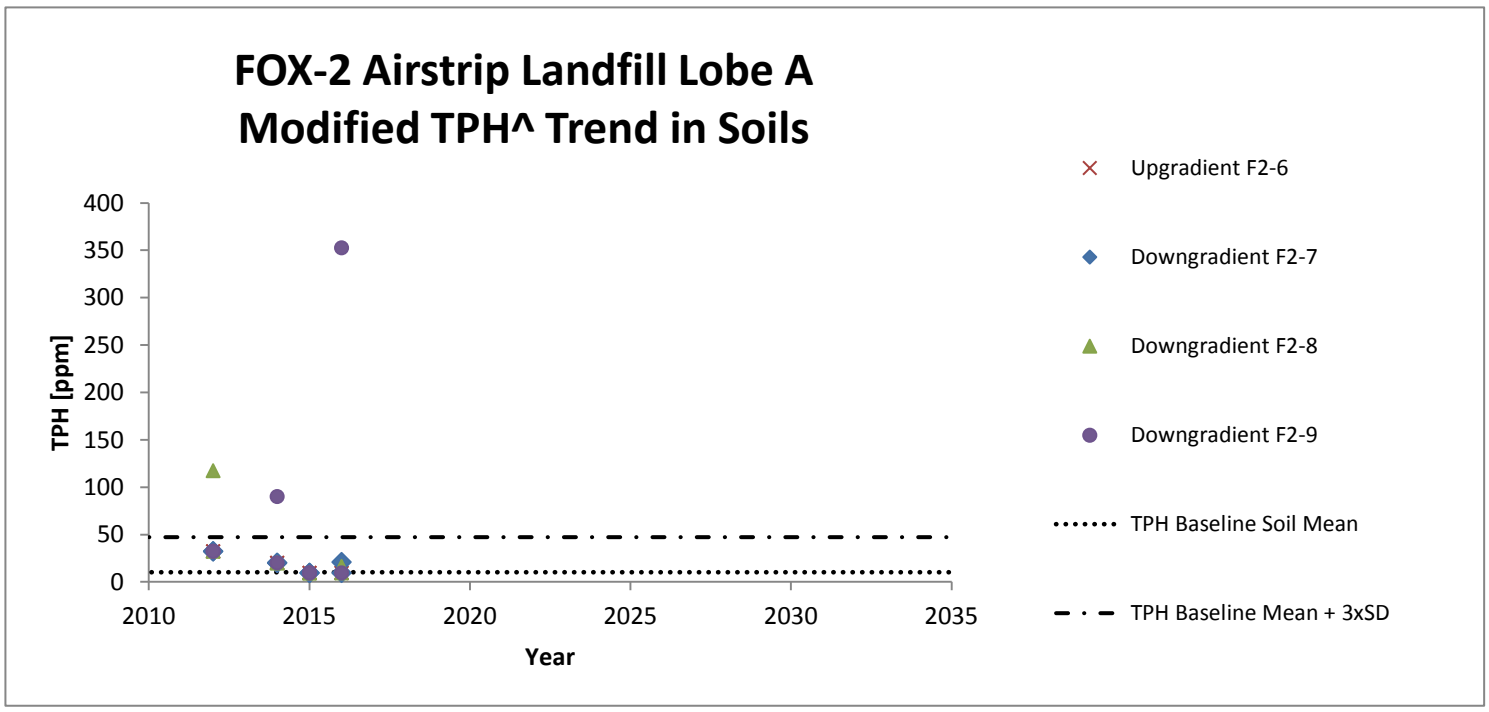


*Hg Baseline Arithmetic Mean is equal to the baseline detection limit.



PCB Baseline mean equals the baseline detection limit.

FOX-2 Airstrip Landfill Lobe A Trends in Soil Inorganics, PCBs and PHCs (modified TPH)



^ Modified TPH is Sum of F1, F2 and F3 fractions (C_6 - C_{34})
TPH baseline mean equals the baseline detection limit.

FOX-2 - West Landfill Lobe E - Summary of Monitoring Soil Analytical Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd* (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Cr (mg/kg)	As (mg/kg)	Hg* (mg/kg)	Total PCB (mg/kg)	F1 C_6-C_{10} (mg/kg)	F2 C_{10}-C_{16} (mg/kg)	F3 C_{16}-C_{34} (mg/kg)	Modified TPH^ - Total C6-C34 (mg/kg)
Background Data - Arithmetic Mean*						55	46	17	1.0	10	84	59	23						
Baseline Data - Arithmetic Mean*						**118**	**93**	**34**	**1.0**	**10**	**165**	**57**	**30**	**0.10**	**0.10**				**40**
Baseline Data - Standard Deviation						120	63	24	0.0	6.5	105	15	19	0.0	0.021				14
Baseline Data Mean + 3xStandard Deviation						477	282	105	1.00	30	479	101	86	0.100	0.163				81
**** If baseline or background arithmetic mean was below the detection limit, the mean has been modified to match the detection limit value.***																			
DEW Line Cleanup Tier I Criteria										*200*					*1*				
DEW Line Cleanup Tier II Criteria & Hydrocarbon Action Level						*100*	*100*	*50*	*5*	*500*	*500*	*250*	*30*	*2.0*	*5*				*2500*
Monitoring Data																			**TPH Sum will appear when F1, F2 and F3 fractions are entered.**
Upgradient																			
	F2-1 surface																		
12-19432[1]/33[2]	F2-1	2012	1	1	0-10	52	47	30	<0.50	**9.1**	**120**	17	7.0	**0.37**	<0.060	<5.0	<10	100	**108**
F2-1-A-2014	F2-1	2014	3	1	0-10	47	**95**	19	<0.5	7	121	**167**	12	<0.1	<0.02	<10	<10	<20	20
F2-1 (0-15)	F2-1	2015	4	1	0-15	73.7	64.9	23.1	0.5	**11.1**	122	**58.7**	*56.2*	<0.1	<0.05	<7	<4	<8	10
F2-1a	F2-1	2016	5	1	0-15	75	63	22	<0.5	**10**	97	**65**	14	<0.1	<0.05	<7	<4	<8	10
	F2-1		10	2															#N/A
	F2-1		15	2															#N/A
	F2-1		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A
	F2-1 depth																		
12-19434[1]/35[2]	F2-1	2012	1	1	30-40	85	*120*	29	0.53	**14**	**200**	**91**	*31*	0.019	<0.020	<5.0	<10	<50	33
not sampled, bedrock reached at 0.1m	F2-1	2014	3	1															#N/A
F2-1 (30-40)	F2-1	2015	4	1	30-40	80.5	73.8	28.4	<0.5	**13.2**	138	**57.4**	27.6	<0.1	<0.05	<7	<4	<8	10
Not sampled - refusal	F2-1	2016	5	1															#N/A
	F2-1		10	2															#N/A
	F2-1		15	2															#N/A
	F2-1		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A

FOX-2 - West Landfill Lobe E - Summary of Monitoring Soil Analytical Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd* (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Cr (mg/kg)	As (mg/kg)	Hg* (mg/kg)	Total PCB (mg/kg)	F1 C_6-C_{10} (mg/kg)	F2 C_{10}-C_{16} (mg/kg)	F3 C_{16}-C_{34} (mg/kg)	Modified TPH^ - Total C6-C34 (mg/kg)
																			#N/A
	F2-2 surface																		
12-19436[1]/37[2]	F2-2	2012	1	1	0-10	*160*	33	10	<0.50	**30**	120	**81**	*32*	0.031	<0.020	<5.0	<10	<50	33
not sampled, bedrock outcrop	F2-2	2014	3	1															#N/A
not sampled, ice/snow	F2-2	2015	4	1															#N/A
F2-2a (Dup Avg)	F2-2	2016	5	1	0-15	84	31	13	<0.5	**11**	92	**80**	5	<0.1	<0.05	<6	<7	76	**83**
	F2-2		10	2															#N/A
	F2-2		15	2															#N/A
	F2-2		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A
	F2-2 depth																		
12-19438[1]/39[2]	F2-2	2012	1	1	30-40	*230*	49	16	<0.50	**48**	160	**88**	*51*	0.031	<0.020	<5.0	<10	150	**158**
not sampled, bedrock outcrop	F2-2	2014	3	1															#N/A
not sampled, ice/snow	F2-2	2015	4	1															#N/A
Not sampled - refusal	F2-2	2016	5	1															#N/A
	F2-2		10	2															#N/A
	F2-2		15	2															#N/A
	F2-2		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A
Downgradient																			
	F2-3 surface																		
12-19440[1]/41[2]	F2-3	2012	1	1	0-10	62	44	12	<0.50	**10**	92	**110**	*32*	0.014	<0.050	<5.0	<10	110	**118**
F2-3-A-2014	F2-3	2014	3	1	0-10	*316*	*357*	*64*	**1.6**	4	**236**	17	6.0	<0.1	<0.02	<10	<10	360	**370**
F2-3 (0-15)	F2-3	2015	4	1	0-15	*146*	*144*	**44.1**	0.5	**15.2**	**373**	**61.7**	*47.5*	<0.1	<0.05	<7	<4	<8	10
F2-3b	F2-3	2016	5	1	0-15	54	65	18	<0.5	**10**	124	**70**	27	<0.1	<0.05	<7	<4	<8	10
	F2-3		10	2															#N/A
	F2-3		15	2															#N/A
	F2-3		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A

FOX-2 - West Landfill Lobe E - Summary of Monitoring Soil Analytical Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd* (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Cr (mg/kg)	As (mg/kg)	Hg* (mg/kg)	Total PCB (mg/kg)	F1 C_6-C_{10} (mg/kg)	F2 C_{10}-C_{16} (mg/kg)	F3 C_{16}-C_{34} (mg/kg)	Modified TPH^ - Total C6-C34 (mg/kg)
	F2-3 depth																		
12-19442[1]/43[2]	F2-3	2012	1	1	30-40	*140*	*190*	**44**	<0.50	**17**	**460**	**120**	*71*	<0.010	<0.020	<5.0	<10	<50	33
not sampled, bedrock reached at 0.1m	F2-3	2014	3	1															#N/A
F2-3 (30-40)	F2-3	2015	4	1	30-40	85.3	*104*	25.5	<0.5	**10.1**	**243**	49.9	**29.4**	<0.1	<0.05	<7	<4	<8	10
F2-3a	F2-3	2016	5	1	30-40	57	56	16	<0.5	9	90	52	27	<0.1	<0.05	<7	<4	<8	10
	F2-3		10	2															#N/A
	F2-3		15	2															#N/A
	F2-3		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A
	F2-4 surface																		
12-19444[1]/45[2]	F2-4	2012	1	1	0-10	*160*	*200*	33	0.72	8.0	**190**	55	15	0.050	<0.040	<5.0	<10	<50	33
F2-4-A-2014	F2-4	2014	3	1	0-10	70	*114*	27	<0.5	6	**176**	**96**	15	<0.1	<0.02	<10	<10	150	**160**
F2-4 (0-15)	F2-4	2015	4	1	0-15	74.3	40.1	16.9	<0.5	9.6	123	39.8	27.9	<0.1	<0.05	<7	<4	<8	10
F2-4a	F2-4	2016	5	1	0-15	80	39	13	<0.5	8	76	41	17	<0.1	<0.05	<7	<4	<8	10
	F2-4		10	2															#N/A
	F2-4		15	2															#N/A
	F2-4		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A
	F2-4 depth																		
12-19446[1]/47[2]	F2-4	2012	1	1	30-40	*130*	59	20	<0.50	**12**	**230**	**68**	*43*	<0.010	<0.020	<5.0	<10	<50	33
not sampled, bedrock reached at 0.1m	F2-4	2014	3	1															#N/A
F2-4 (30-40)	F2-4	2015	4	1	30-40	46.9	24	7.4	<0.5	5.9	62	28.3	11.1	<0.1	<0.05	<7	<4	<8	10
Not sampled - refusal	F2-4	2016	5	1															#N/A
	F2-4		10	2															#N/A
	F2-4		15	2															#N/A
	F2-4		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A

FOX-2 - West Landfill Lobe E - Summary of Monitoring Soil Analytical Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd* (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Cr (mg/kg)	As (mg/kg)	Hg* (mg/kg)	Total PCB (mg/kg)	F1 C_6-C_{10} (mg/kg)	F2 C_{10}-C_{16} (mg/kg)	F3 C_{16}-C_{34} (mg/kg)	Modified TPH^ - Total C6-C34 (mg/kg)
	F2-5 surface																		
12-19448[1]/49[2]	F2-5	2012	1	1	0-10	*510*	*370*	*160*	**1.5**	8.4	130	33	*30*	0.088	<0.060	<5.0	<10	340	**348**
F2-5-A-2014	F2-5	2014	3	1	0-10	64	56	20	<0.5	7.0	120	**76**	*77*	<0.1	<0.02	<10	<10	100	**110**
F2-5 (0-15)	F2-5	2015	4	1	0-15	78	58.4	26.4	<0.5	8.7	113	56.4	*44*	<0.1	<0.05	<7	<4	65	**71**
F2-5a	F2-5	2016	5	1	0-10	37	39	12	<0.5	7	93	**59**	*71*	<0.1	<0.05	<7	<4	73	**79**
	F2-5		10	2															#N/A
	F2-5		15	2															#N/A
	F2-5		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A
	F2-5 depth																		
12-19450/51	F2-5	2012	1	1	30-40	64	56	19	<0.50	10	120	**94**	*61*	<0.010	<0.020	<5.0	<10	<50	33
not sampled, bedrock reached at 0.1m	F2-5	2014	3	1															#N/A
Not sampled, refusal	F2-5	2015	4	1															#N/A
Not sampled - refusal	F2-5	2016	5	1															#N/A
	F2-5		10	2															#N/A
	F2-5		15	2															#N/A
	F2-5		25	2															#N/A
																			#N/A
																			#N/A
																			#N/A
																			#N/A

Note: Modified TPH Total (C_6-C_{34}) has been calculated by adding results for F1, F2 and F3.

[1] - soil sample analyzed for inorganics and PCBs

[2] - soil sample analyzed for F1-F3 fraction PHCs

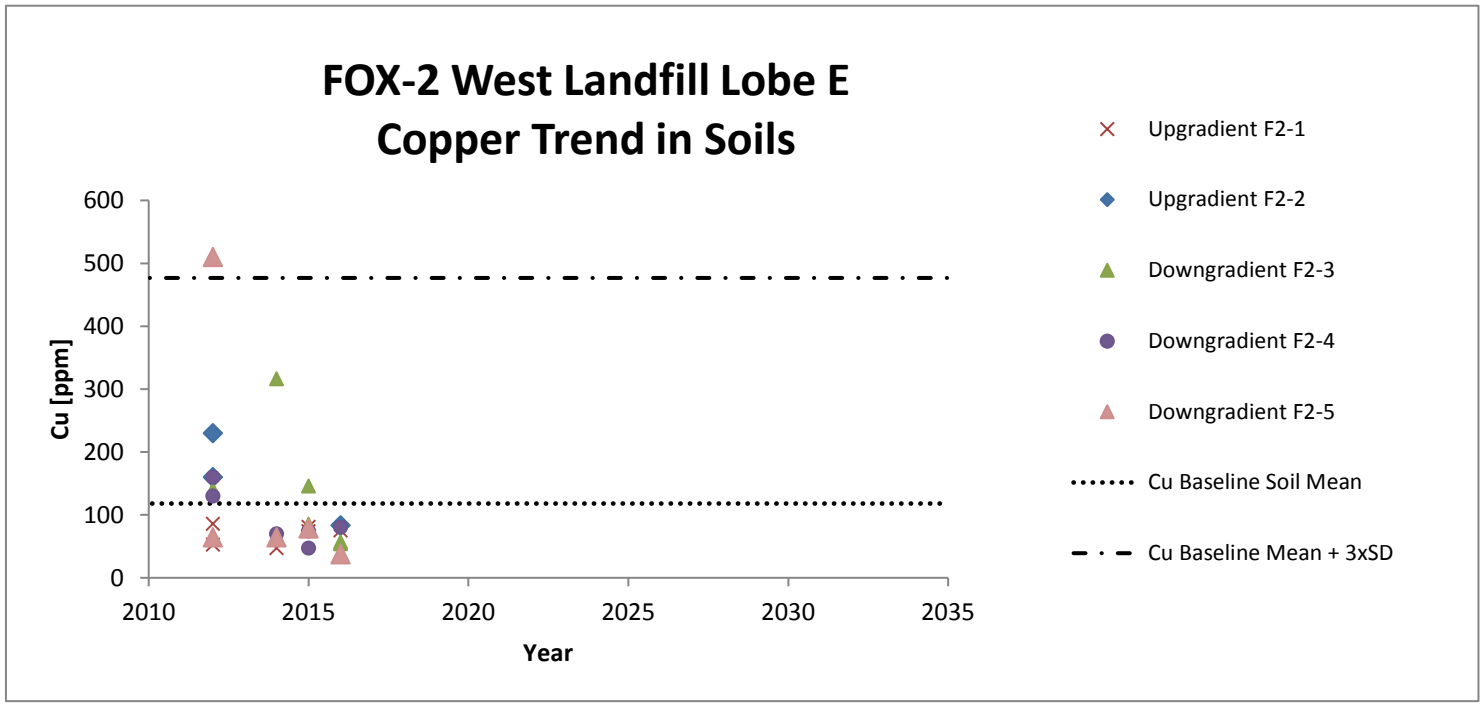
Legend

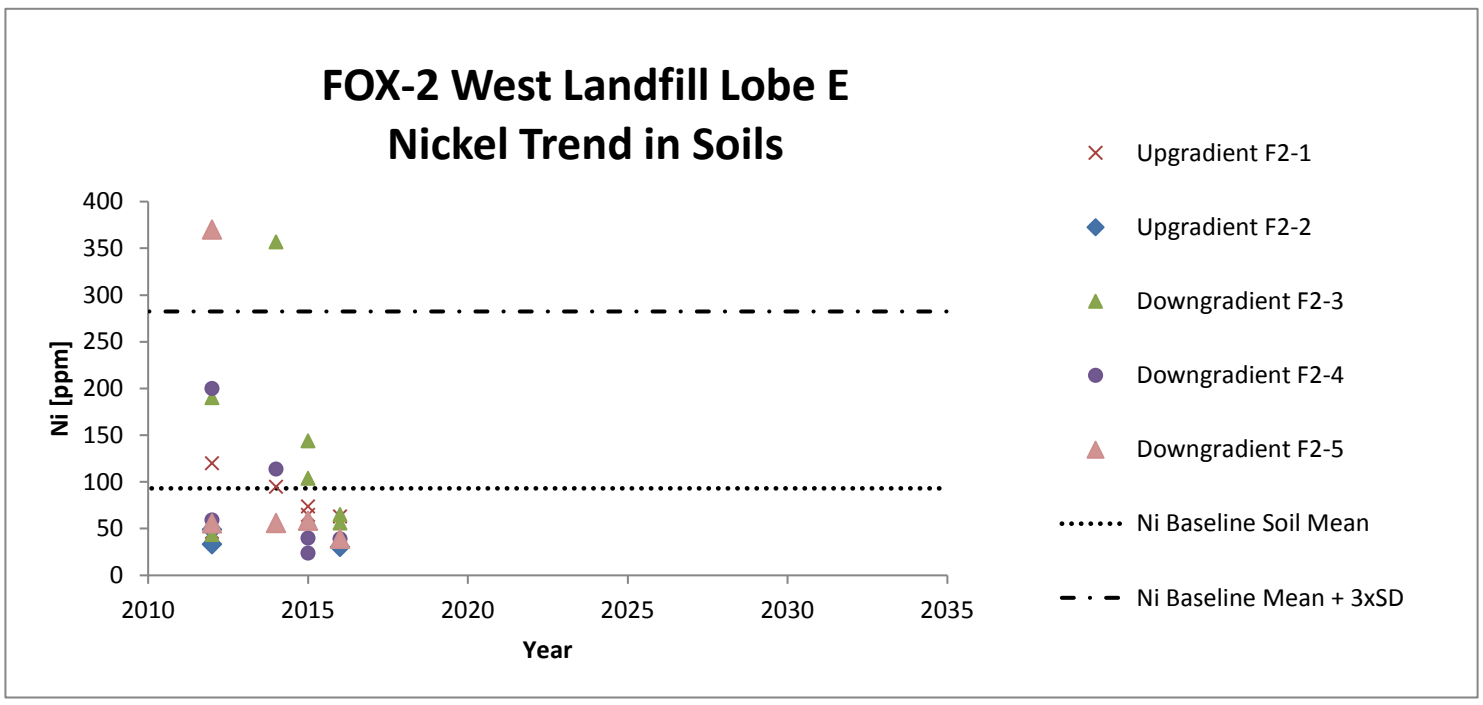
XX	sample exceeds background
XX	**sample exceeds baseline**
XX	*sample exceeds DLCU Tier I criteria*
XX	*sample exceeds DLCU Tier II criteria*

FOX-2 West Landfill Lobe E Trends in Soil Inorganics, PCBs and PHCs (modified TPH)

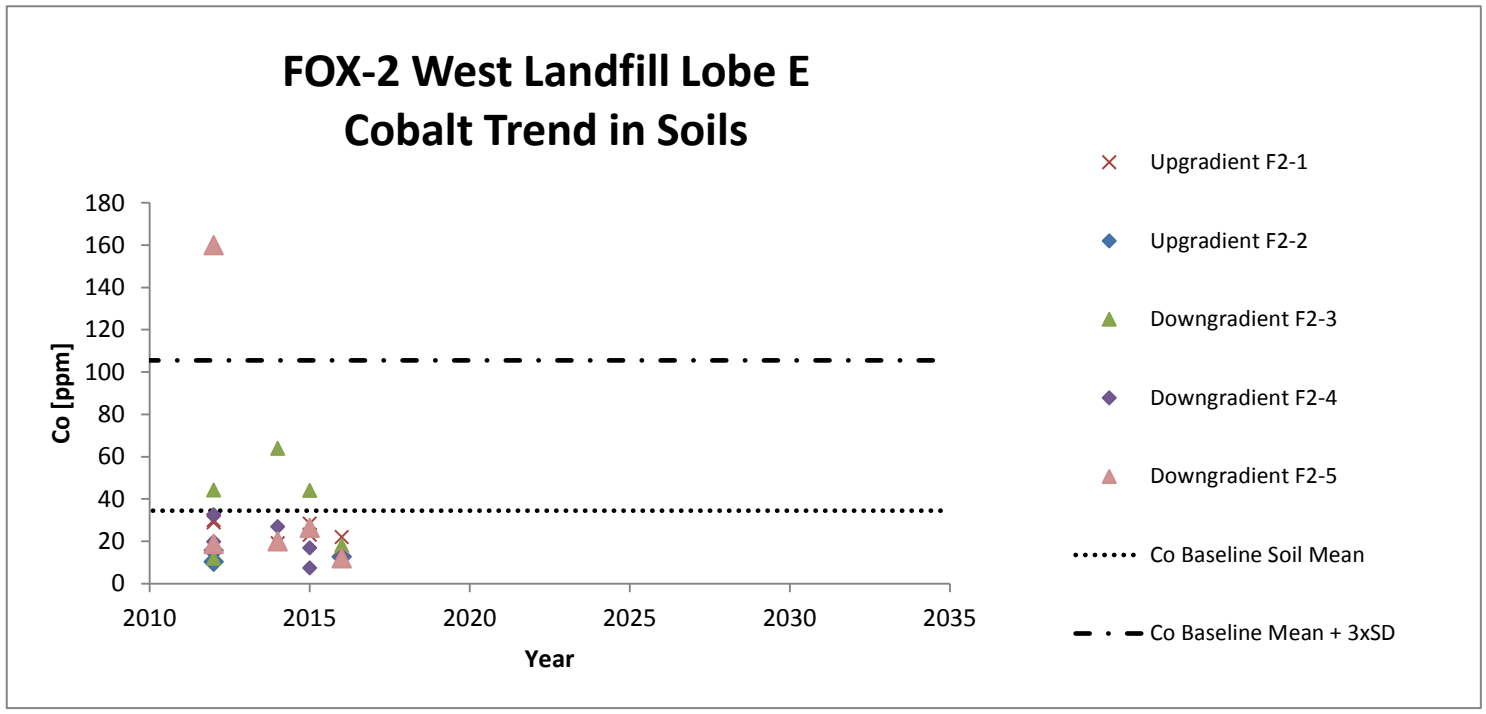
Where results are below detection, half of the detection limit has been used in the charts for the sample points.

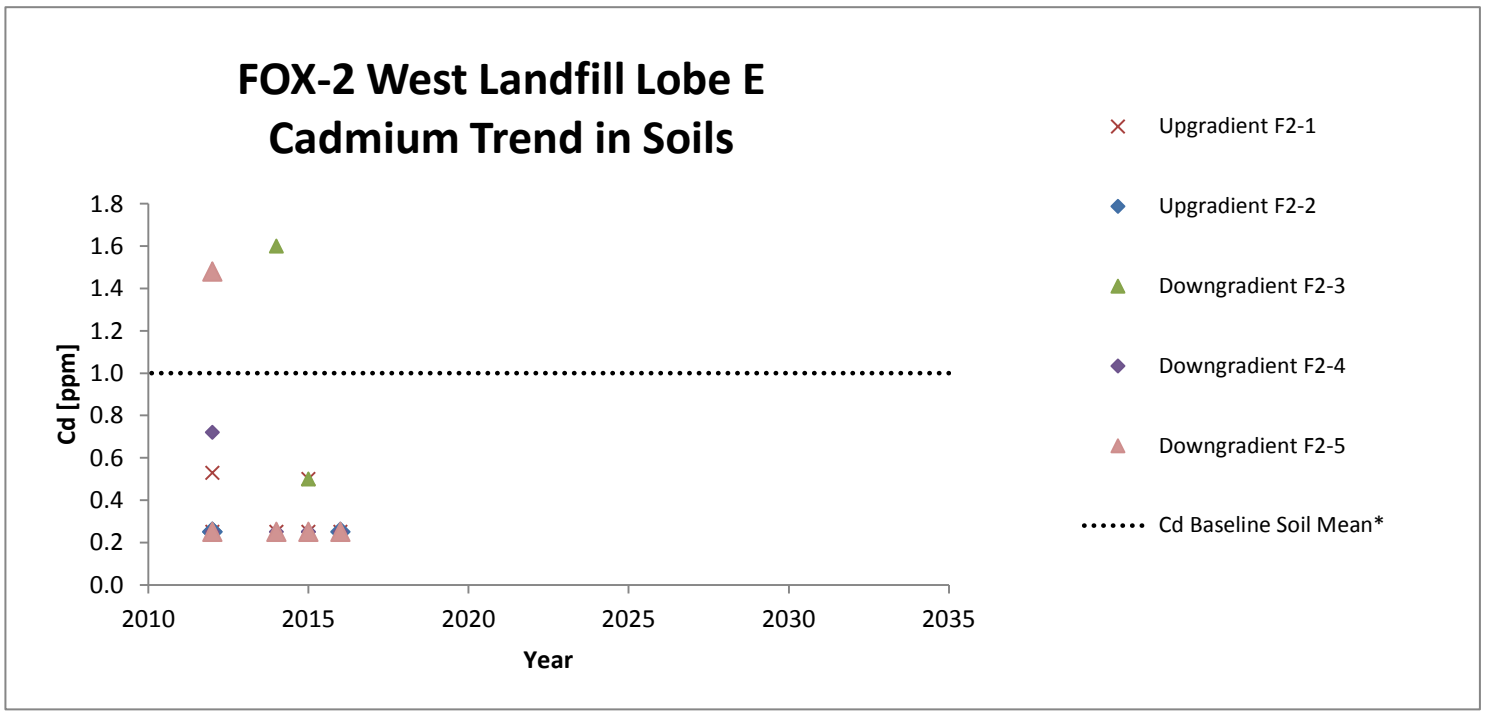
Trendlines are intended for visual interpretation of temporal trends. When all monitoring results are below detection, trendlines are a reflection of changes in detection limit. Users should refer to data tables.





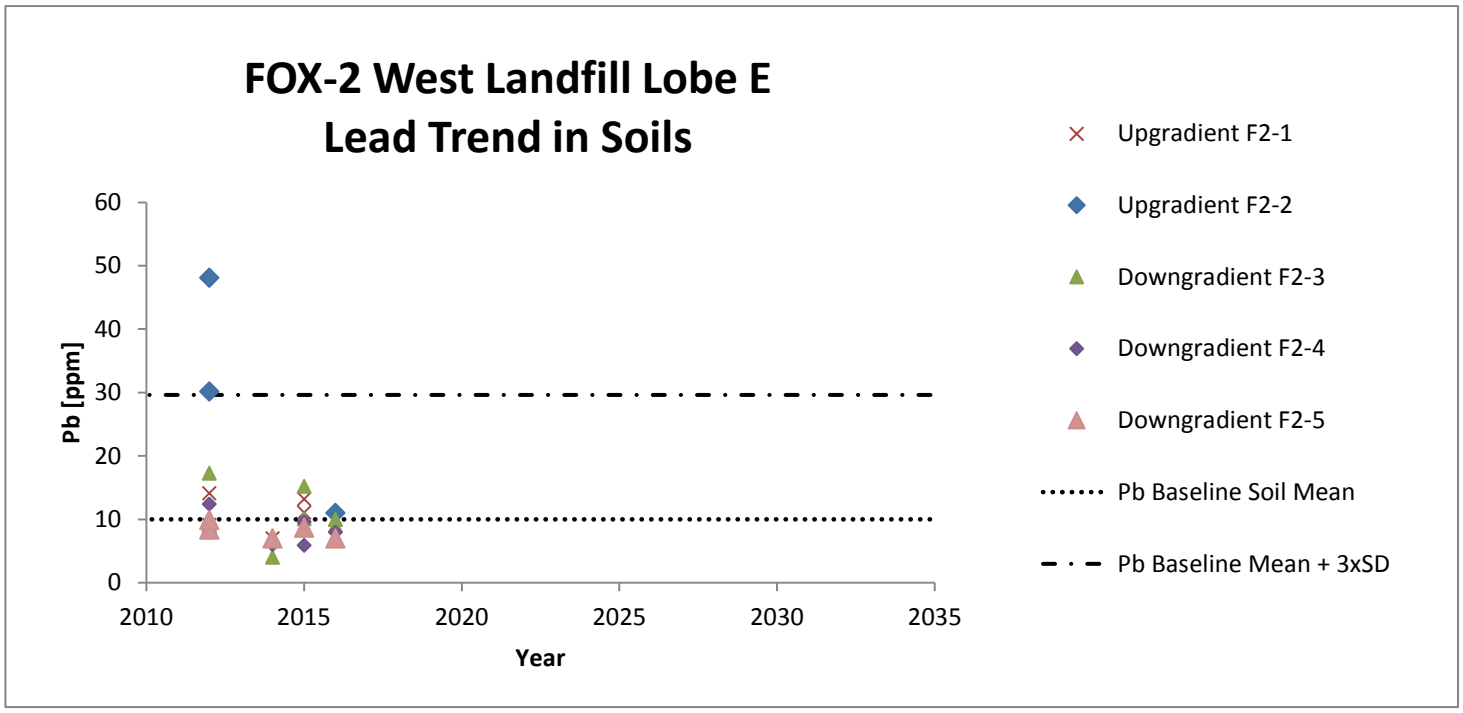
FOX-2 West Landfill Lobe E Trends in Soil Inorganics, PCBs and PHCs (modified TPH)



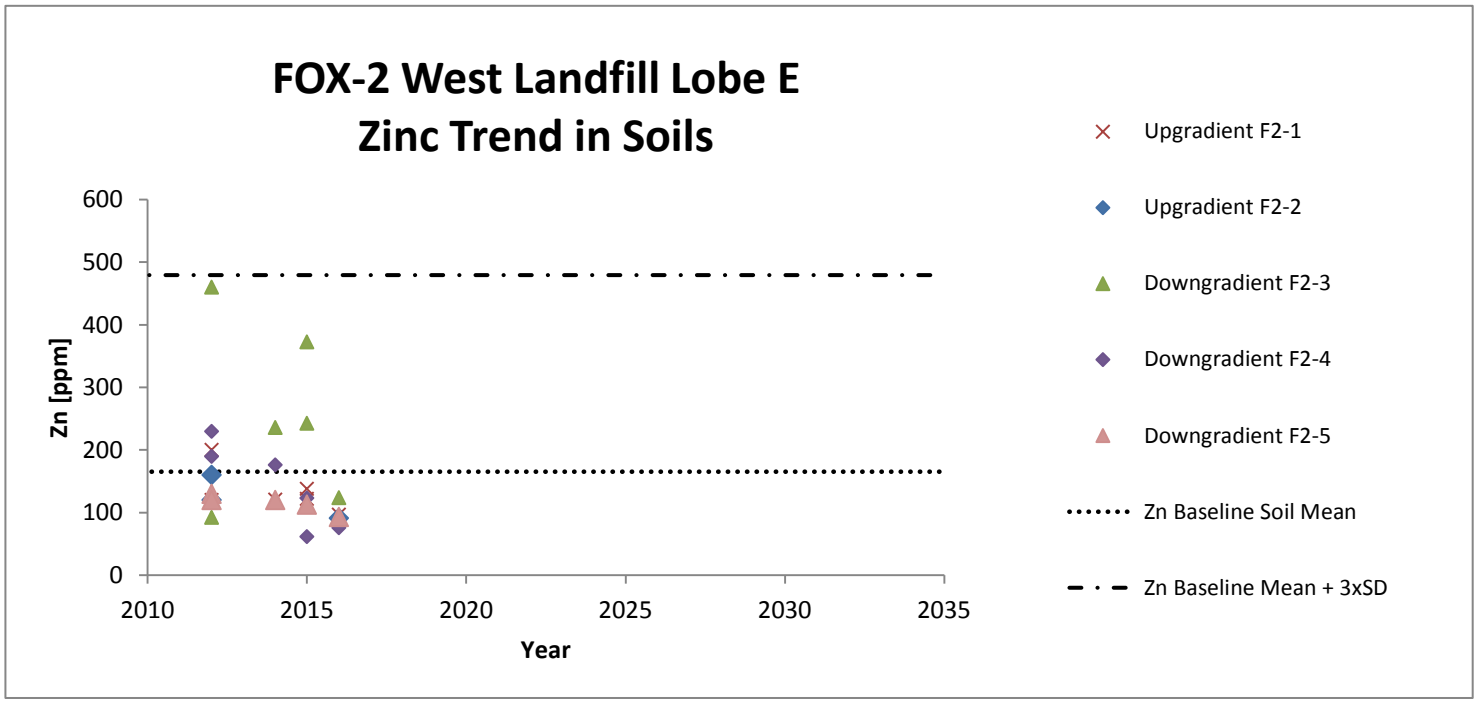


*Cd Baseline Arithmetic Mean is equal to the baseline detection limit.
*Cd Baseline SD = 0

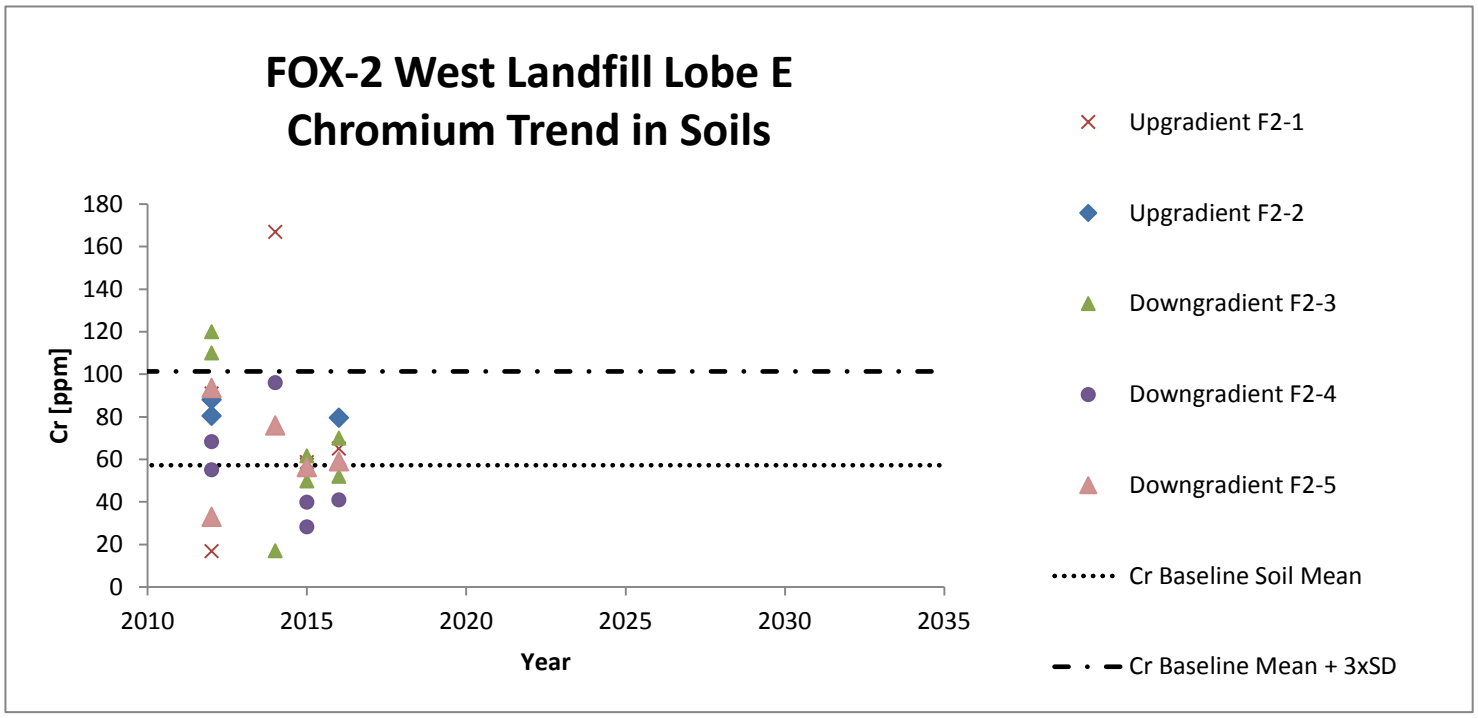
FOX-2 West Landfill Lobe E Trends in Soil Inorganics, PCBs and PHCs (modified TPH)

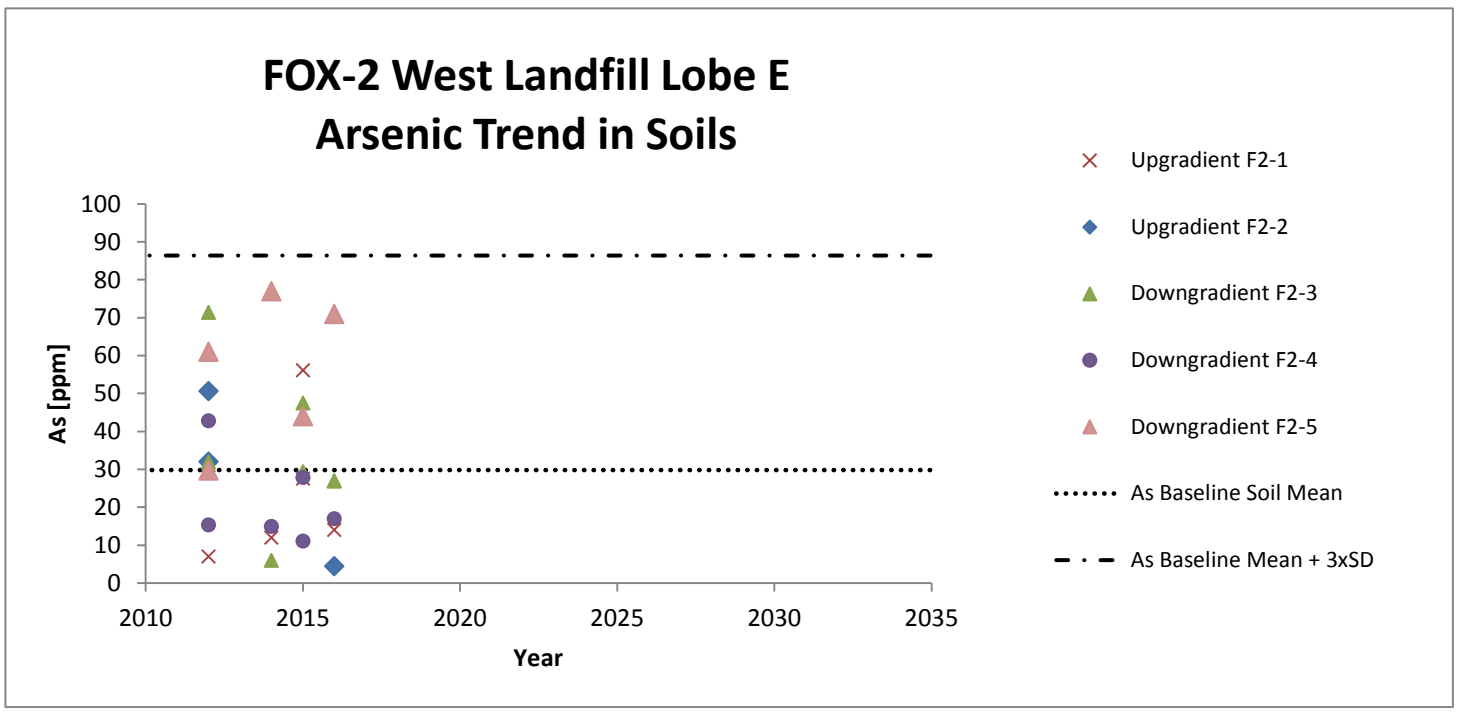


Pb Baseline Arithmetic Mean is equal to the baseline detection limit.

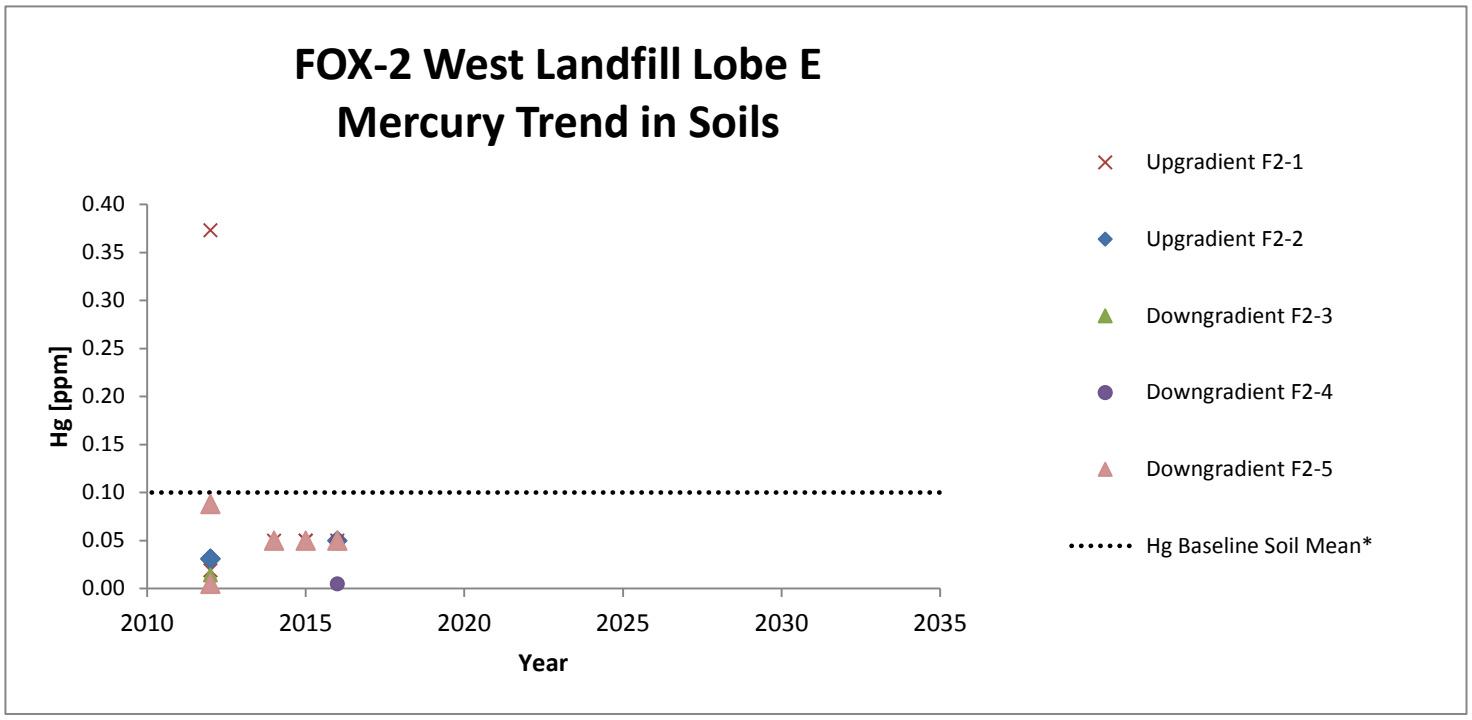


FOX-2 West Landfill Lobe E Trends in Soil Inorganics, PCBs and PHCs (modified TPH)

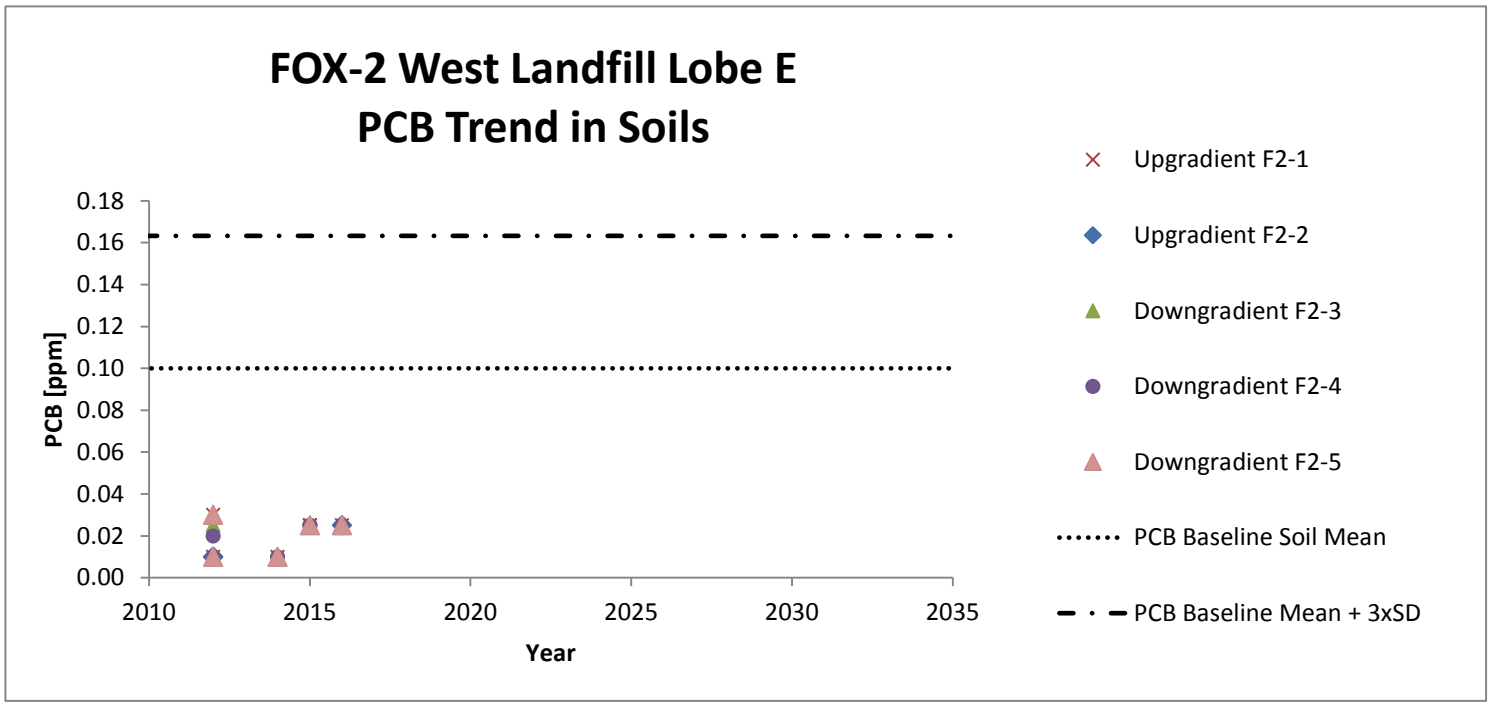




FOX-2 West Landfill Lobe E Trends in Soil Inorganics, PCBs and PHCs (modified TPH)

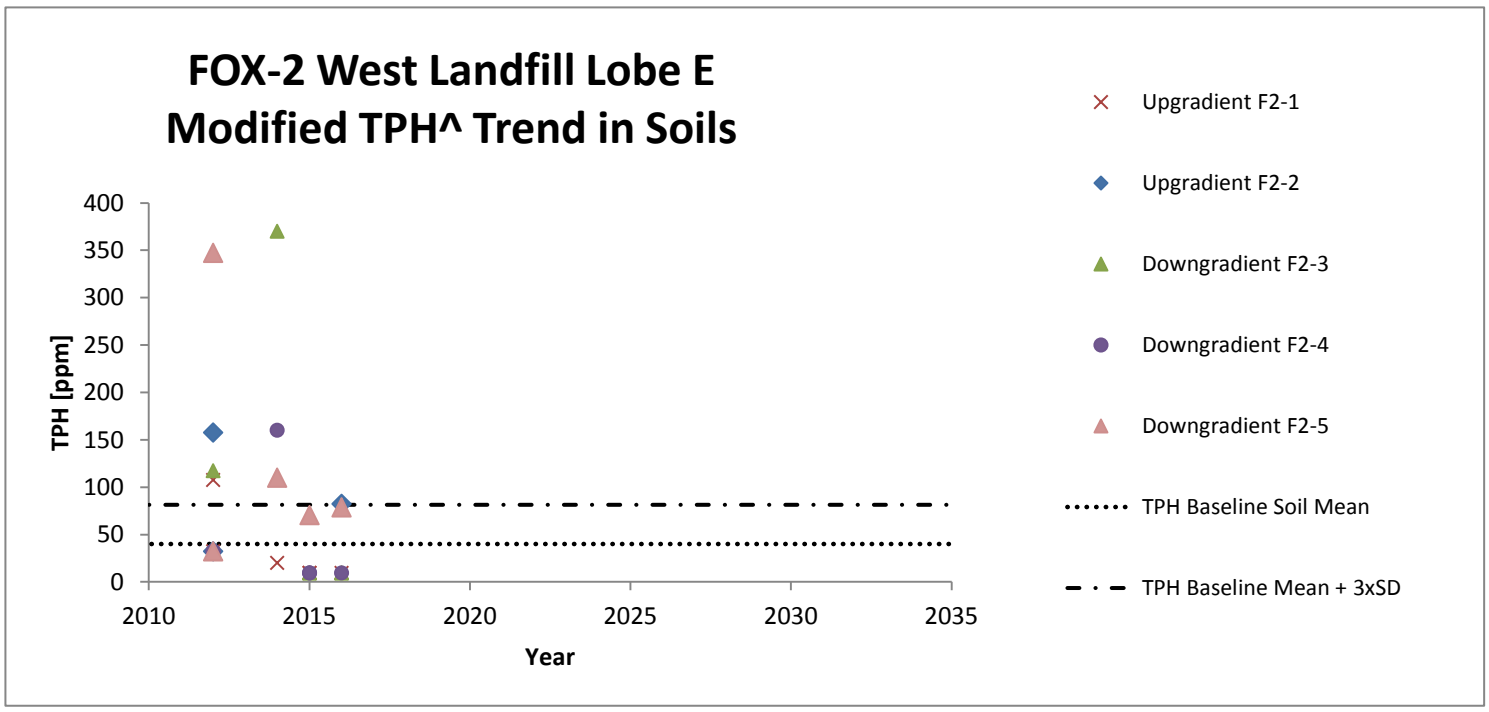


*Hg Baseline Arithmetic Mean is equal to the baseline detection limit.



PCB Baseline Arithmetic Mean is equal to the baseline detection limit.

FOX-2 West Landfill Lobe E Trends in Soil Inorganics, PCBs and PHCs (modified TPH)



^ Modified TPH is Sum of F1, F2 and F3 fractions (C_6 - C_{34})

TPH Baseline Arithmetic Mean is equal to the baseline detection limit.

FOX-2 Landfill Monitoring, Extra Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co* [mg/kg]	Cd* [mg/kg]	Pb* [mg/kg]	Zn [mg/kg]	Cr* [mg/kg]	As [mg/kg]	Hg* [mg/kg]	Total PCB* [mg/kg]	F1 C_6-C_{10} [mg/kg]	F2 C_{10}-C_{16} [mg/kg]	F3 C_{16}-C_{34} [mg/kg]	Modified TPH^ - Total C6-C34 [mg/kg]	TPH Identity	
																				% Fuel Oil	% Lube Oil
Background Data - Arithmetic Mean																					
DEW Line Cleanup Tier I Criteria										*200*					*1*						
DEW Line Cleanup Tier II Criteria & Hydrocarbon Action Level						*100*	*100*	*50*	*5*	*500*	*500*	*250*	*30*	*2*	*5*				*2500*		
Monitoring Data																					
LOCATION															**TPH Sum will appear when F1, F2, F3 fractions are entered**						
																			#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
LOCATION																					
																			#N/A		
																			#N/A		
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LOCATION																					
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																			#N/A		
																			#N/A		

Legend

XX	sample exceeds background
XX	**sample exceeds baseline**
XX	*sample exceeds DLCU Tier I criteria*
XX	*sample exceeds DLCU Tier II criteria*

^Note: Total Hydrocarbons (C_6-C_{34}) has been calculated by adding results for F1, F2 and F3.

FOX-2 Landfill Monitoring Groundwater Extra Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Cu [mg/L]	Ni [mg/L]	Co [mg/L]	Cd [mg/L]	Pb* [mg/L]	Zn [mg/L]	Cr [mg/L]	As* [mg/L]	Hg* [mg/L]	Total PCB* [mg/L]	F1 C_6-C_{10} [mg/L]	F2 C_{10}-C_{16} [mg/L]	F3 C_{16}-C_{34} [mg/L]	Modified TPH^ - Total C6-C34 * [mg/L]	TPH Identity	
																			% Fuel Oil	% Lube Oil
Monitoring Data																				
LOCATION															**Total TPH will appear when F1, F2, F3 fractions are entered**					
																		#N/A		
																		#N/A		
																		#N/A		
																		#N/A		
																		#N/A		
																		#N/A		
																		#N/A		

APPENDIX D

Photograph Log

Visual Inspection Photographs

Thermistor Photographs

Monitoring Well Photographs

Soil Sampling Photographs

PHOTOS

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Photo 1: *FOX-2 – Airstrip Camp Landfill Lobe A – Cover surface, some sparse vegetation (Feature H), facing northeast (ATT94_Photo94.jpg)*



Photo 2: *FOX-2 – Airstrip Camp Landfill Lobe A – Cover surface, some sparse vegetation (Feature H), facing northeast (ATT95_Photo95.jpg)*

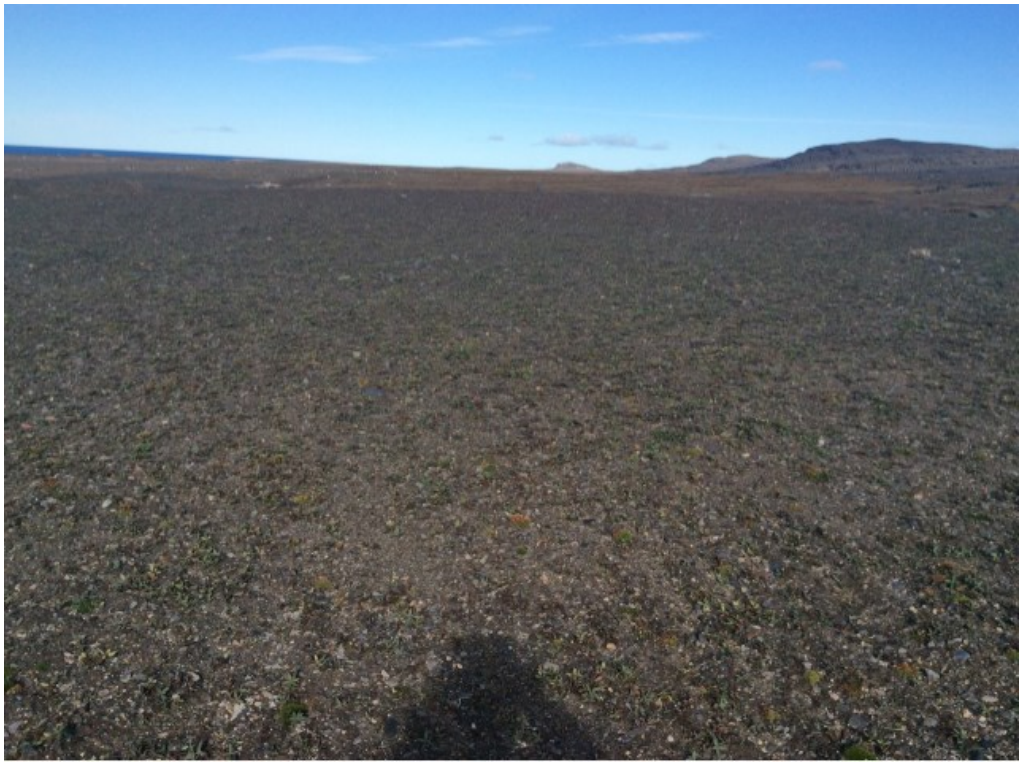


Photo 3: *FOX-2 – Airstrip Camp Landfill Lobe A – Cover surface, some sparse vegetation (Feature H), facing northwest (ATT97_Photo97.jpg)*



Photo 4: *FOX-2 – Airstrip Camp Landfill Lobe A – Cover surface, some sparse vegetation (Feature H), facing southwest (ATT98_Photo98.jpg)*



Photo 5: *FOX-2 – Airstrip Camp Landfill Lobe A – Cover surface, rough grading area (Feature A), facing southeast (ATT100_Photo100.jpg)*

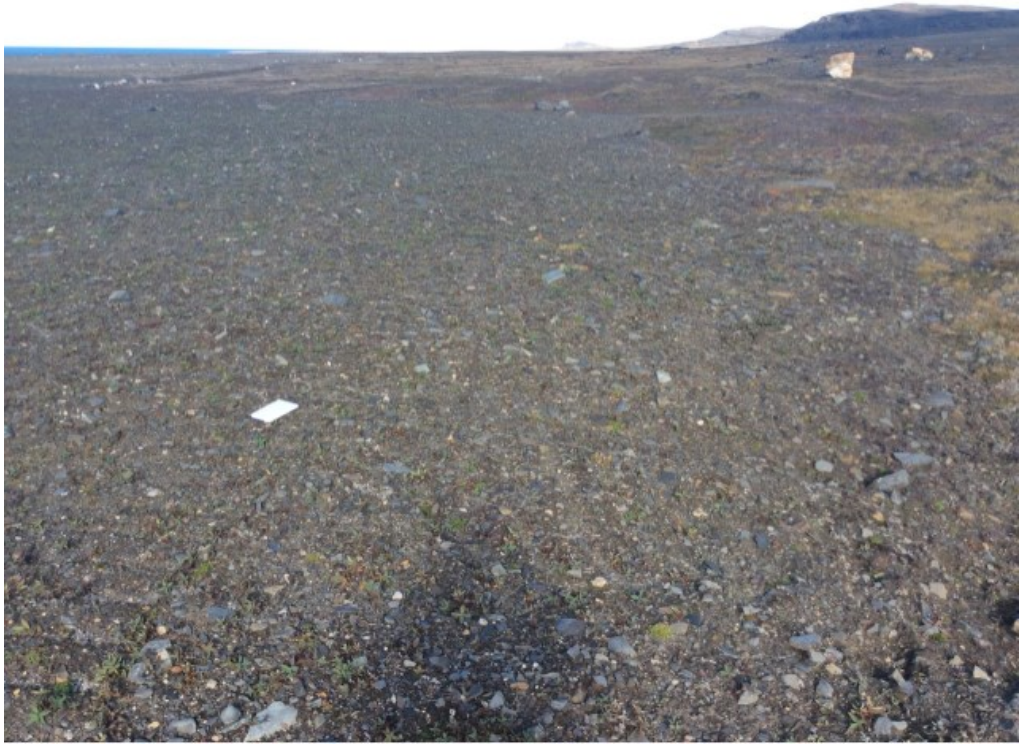


Photo 6: *FOX-2 – Airstrip Camp Landfill Lobe A – Northeast slope, facing northwest (ATT91_Photo91.jpg)*

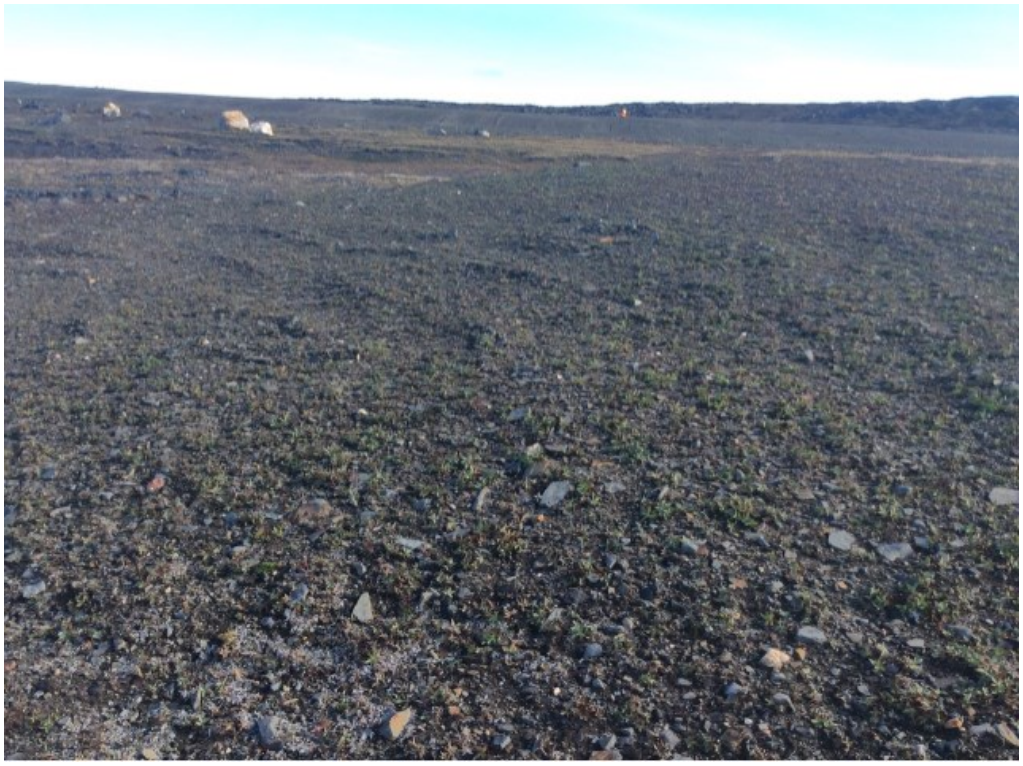


Photo 7: *FOX-2 – Airstrip Camp Landfill Lobe A – Northwest slope, some sparse vegetation (Feature H), facing northeast (ATT92_Photo92.jpg)*



Photo 8: *FOX-2 – Airstrip Camp Landfill Lobe A – Northwest slope, facing southwest (ATT99_Photo99.jpg)*

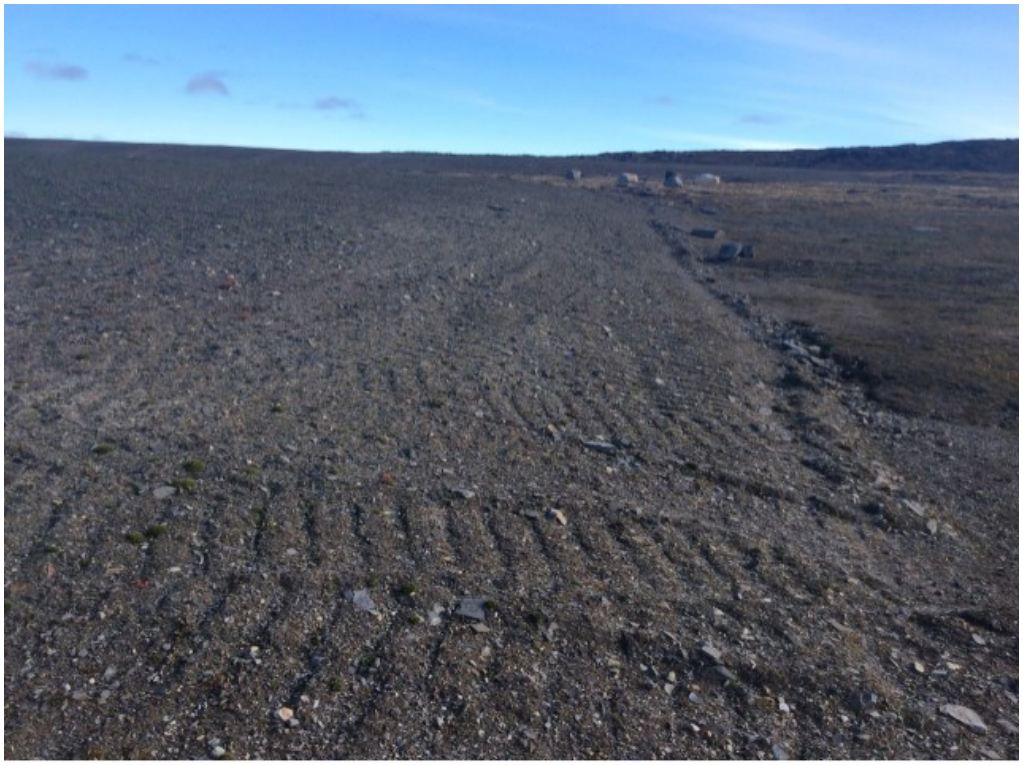


Photo 9: *FOX-2 – Airstrip Camp Landfill Lobe A – Southeast slope and toe, no ponded water along toe (previous Feature F), facing northeast (ATT90_Photo90.jpg)*



Photo 10: *FOX-2 – Airstrip Camp Landfill Lobe A – Southwest slope and toe, no ponded water along toe (previous Feature G), facing southeast (ATT93_Photo93.jpg)*

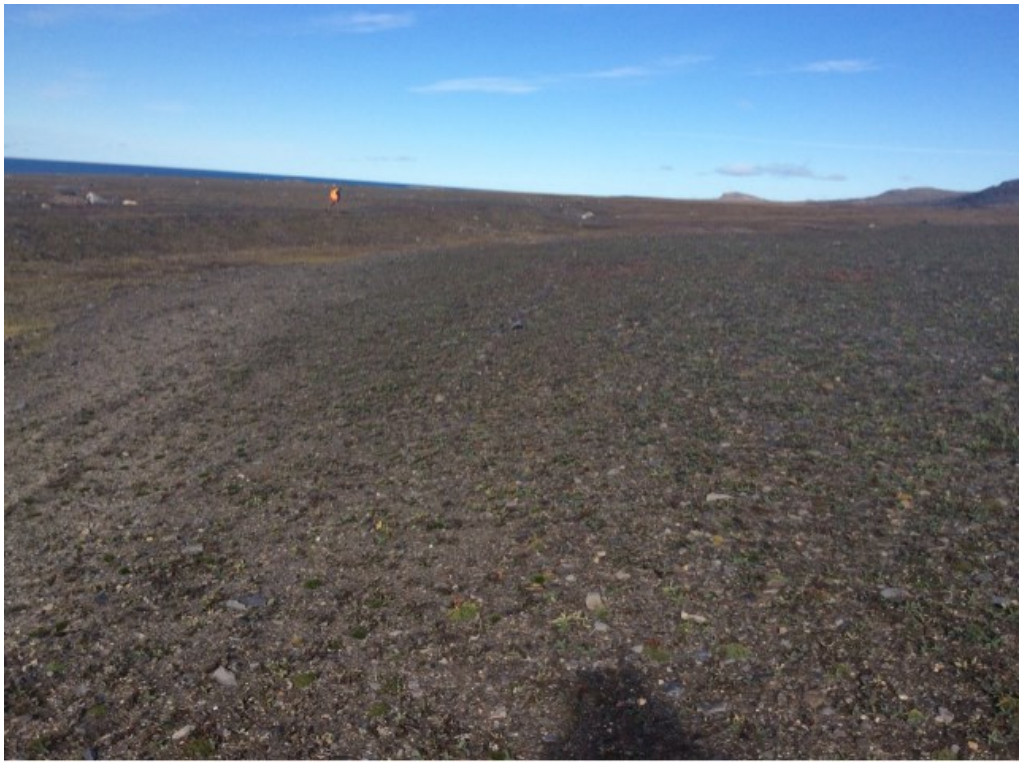


Photo 11: FOX-2 – Airstrip Camp Landfill Lobe A – Southwest slope and crest, facing northwest (ATT96_Photo96.jpg)

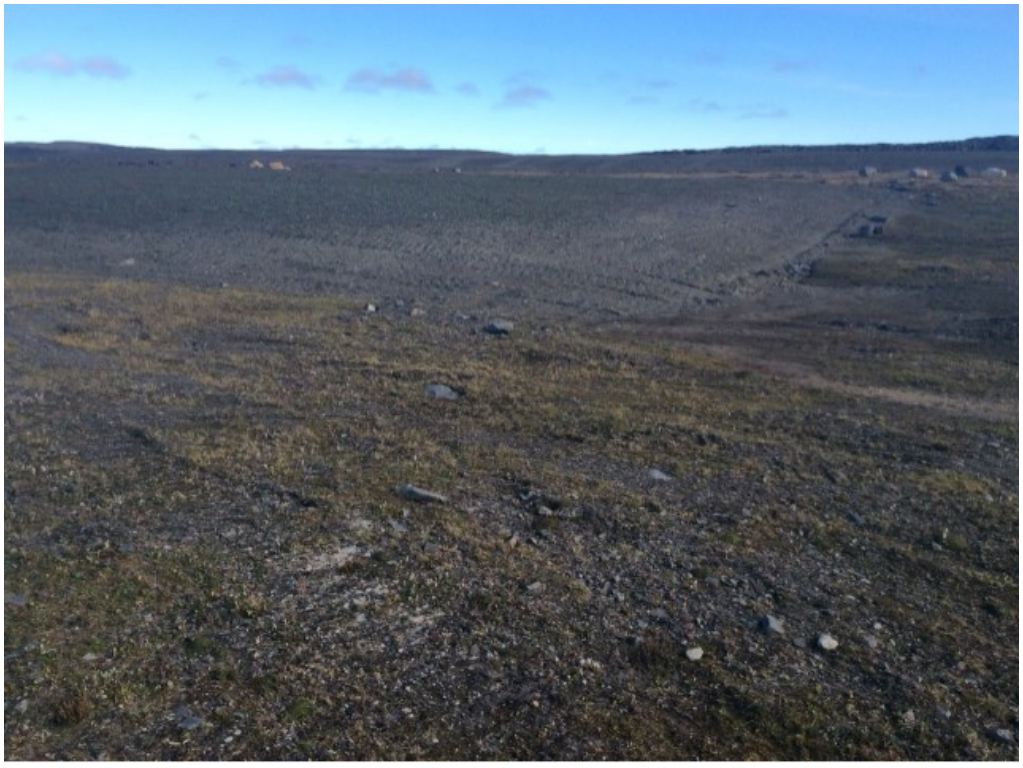


Photo 12: FOX-2 – Airstrip Camp Landfill Lobe A – Southwest and southeast toes – no ponded water along toes (previous Features F and G), facing northeast (ATT35_Photo35.jpg)



Photo 13: FOX-2 – Airstrip Camp Landfill Lobe A – Southeast toe – No ponded water along toe (previous Feature F), facing northeast (ATT36_Photo36.jpg)



Photo 14: FOX-2 – Airstrip Camp Landfill Lobe A – Southeast crest edge – Feature D – Linear depression, facing northeast (Acceptable) (ATT37_Photo37.jpg)



Photo 15: FOX-2 – Airstrip Camp Landfill Lobe A – Southeast crest edge – Feature C – Linear depression, facing northwest (Acceptable) (ATT38_Photo38.jpg)



Photo 16: FOX-2 – Airstrip Camp Landfill Lobe A – Cover surface – Feature B – Rough grading and/or minor settlement, facing northwest (Acceptable) (ATT39_Photo39.jpg)



Photo 17: *FOX-2 – Airstrip Camp Landfill Lobe A – Cover surface – Feature H – Sparse vegetation, facing southwest (Acceptable) (ATT40_Photo40.jpg)*



Photo 18: *FOX-2 – Airstrip Camp Landfill Lobe A – Northeast crest surface – Feature A – Rough grading and/or minor settlement, facing northeast (Acceptable) (ATT41_Photo41.jpg)*



Photo 19: FOX-2 – Airstrip Camp Landfill Lobe A – Northeast crest surface – Feature A – Rough grading and/or minor settlement, facing northeast (Acceptable) (ATT42_Photo42.jpg)



Photo 20: FOX-2 – Airstrip Camp Landfill Lobe A – Northwest crest surface – Feature E – Rough grading and/or minor settlement, facing northeast (Acceptable) (ATT43_Photo43.jpg)



Photo 21: FOX-2 – Airstrip Camp Landfill Lobe A – Soil sampling at F2-6 – before excavation (ATT49_Photo49.jpg)



Photo 22: FOX-2 – Airstrip Camp Landfill Lobe A – Soil sampling at F2-6 – after excavation (ATT50_Photo50.jpg)



Photo 23: FOX-2 – Airstrip Camp Landfill Lobe A – Soil sampling at F2-6 – after backfilling (ATT51_Photo51.jpg)



Photo 24: FOX-2 – Airstrip Camp Landfill Lobe A – Soil sampling at F2-7 – before excavation (ATT55_Photo55.jpg)



Photo 25: FOX-2 – Airstrip Camp Landfill Lobe A – Soil sampling at F2-7 – after excavation (ATT56_Photo56.jpg)



Photo 26: FOX-2 – Airstrip Camp Landfill Lobe A – Soil sampling at F2-7 – after backfilling (ATT57_Photo57.jpg)



Photo 27: FOX-2 – Airstrip Camp Landfill Lobe A – Soil sampling at F2-8 – before excavation (ATT58_Photo58.jpg)



Photo 28: FOX-2 – Airstrip Camp Landfill Lobe A – Soil sampling at F2-8 – after excavation (ATT59_Photo59.jpg)



Photo 29: FOX-2 – Airstrip Camp Landfill Lobe A – Soil sampling at F2-8 – after backfilling (ATT60_Photo60.jpg)



Photo 30: FOX-2 – Airstrip Camp Landfill Lobe A – Soil sampling at F2-9 – before excavation (ATT52_Photo52.jpg)



Photo 31: FOX-2 – Airstrip Camp Landfill Lobe A – Soil sampling at F2-9 – after excavation (ATT53_Photo53.jpg)



Photo 32: FOX-2 – Airstrip Camp Landfill Lobe A – Soil sampling at F2-9 – after backfilling (ATT54_Photo54.jpg)



Photo 33: FOX-2 – Non Hazardous Waste Landfill – Cover surface, some sparse vegetation (Feature I), facing north (ATT79_Photo79.jpg)



Photo 34: FOX-2 – Non Hazardous Waste Landfill – Cover surface, some sparse vegetation (Feature I), facing west (ATT82_Photo82.jpg)



Photo 35: *FOX-2 – Non Hazardous Waste Landfill – Cover surface, some sparse vegetation (Feature I), facing west (ATT83_Photo83.jpg)*



Photo 36: *FOX-2 – Non Hazardous Waste Landfill – Cover surface, some sparse vegetation (Feature I), facing east (ATT89_Photo89.jpg)*



Photo 37: FOX-2 – Non Hazardous Waste Landfill – East crest, facing north (ATT80_Photo80.jpg)



Photo 38: FOX-2 – Non Hazardous Waste Landfill – East slope, facing north (ATT81_Photo81.jpg)



Photo 39: FOX-2 – Non Hazardous Waste Landfill – North crest, facing west (ATT84_Photo84.jpg)



Photo 40: FOX-2 – Non Hazardous Waste Landfill – North slope and toe, facing west (ATT85_Photo85.jpg)



Photo 41: FOX-2 – Non Hazardous Waste Landfill – South crest, facing east (ATT78_Photo78.jpg)



Photo 42: FOX-2 – Non Hazardous Waste Landfill – South slope and toe, facing east (ATT76_Photo76.jpg)



Photo 43: FOX-2 – Non Hazardous Waste Landfill – West crest, facing north (ATT77_Photo77.jpg)



Photo 44: FOX-2 – Non Hazardous Waste Landfill – West crest, facing south (ATT86_Photo86.jpg)



Photo 45: FOX-2 – Non Hazardous Waste Landfill – West slope and toe, facing north (ATT75_Photo75.jpg)



Photo 46: FOX-2 – Non Hazardous Waste Landfill – West slope and toe, facing south (ATT87_Photo87.jpg)



Photo 47: FOX-2 – Non Hazardous Waste Landfill – West toe, facing south (ATT88_Photo88.jpg)



Photo 48: FOX-2 – Non Hazardous Waste Landfill – West slope – Feature D – Minor settlement (Acceptable), facing northeast (ATT23_Photo23.jpg)



Photo 49: FOX-2 – Non Hazardous Waste Landfill – South slope – Feature E – Minor settlement (Acceptable), facing south (ATT24_Photo24.jpg)



Photo 50: FOX-2 – Non Hazardous Waste Landfill – South slope – Feature F – Rough area and self-armouring erosion (Acceptable), facing south (ATT25_Photo25.jpg)



Photo 51: FOX-2 – Non Hazardous Waste Landfill – Southeast corner – Feature G – Rough area and settlement (Acceptable), facing east (ATT26_Photo26.jpg)



Photo 52: FOX-2 – Non Hazardous Waste Landfill – East toe – previously reported as wet area and ponded water (Feature H), no ponded water, facing northeast (ATT27_Photo27.jpg)



Photo 53: FOX-2 – Non Hazardous Waste Landfill – Cover surface – Feature A – Tire tracks and uneven ground (Acceptable), facing southwest (ATT28_Photo28.jpg)



Photo 54: FOX-2 – Non Hazardous Waste Landfill – Cover surface – Feature I – Sparse vegetation (Acceptable), facing west (ATT29_Photo29.jpg)



Photo 55: FOX-2 – Non Hazardous Waste Landfill – North crest – Feature C – 2 areas of minor settlement (Acceptable), facing east (ATT30_Photo30.jpg)



Photo 56: FOX-2 – Non Hazardous Waste Landfill – Cover surface – Feature M – Minor settlement (Acceptable), facing south (ATT31_Photo31.jpg)



Photo 57: FOX-2 – Non Hazardous Waste Landfill – Central crest surface – Feature L – Minor settlement (Acceptable), facing west (ATT32_Photo32.jpg)



Photo 58: FOX-2 – Non Hazardous Waste Landfill – Northwest crest edge – Feature K – Minor settlement (Acceptable), facing west (ATT33_Photo33.jpg)



Photo 59: FOX-2 – Non Hazardous Waste Landfill – Northwest toe – Previously reported as wet area (previous Feature J) not observed, facing northwest (ATT34_Photo34.jpg)



Photo 60: FOX-2 – Non Hazardous Waste Landfill – MW-08 – Monitoring Well (ATT61_Photo61.jpg)



Photo 61: FOX-2 – Non Hazardous Waste Landfill – Soil sampling at MW-08 – before excavation (ATT62_Photo62.jpg)



Photo 62: FOX-2 – Non Hazardous Waste Landfill – Soil sampling at MW-08 – after excavation (ATT63_Photo63.jpg)



Photo 63: FOX-2 – Non Hazardous Waste Landfill – Soil sampling at MW-08 – after backfilling (ATT64_Photo64.jpg)



Photo 64: FOX-2 – Non Hazardous Waste Landfill – MW-07 – Monitoring Well (ATT68_Photo68.jpg)



Photo 65: FOX-2 – Non Hazardous Waste Landfill – Soil sampling at MW-07 – before excavation (ATT65_Photo65.jpg)



Photo 66: FOX-2 – Non Hazardous Waste Landfill – Soil sampling at MW-07 – after excavation (ATT66_Photo66.jpg)



Photo 67: FOX-2 – Non Hazardous Waste Landfill – Soil sampling at MW-07 – after backfilling (ATT67_Photo67.jpg)



Photo 68: FOX-2 – Non Hazardous Waste Landfill – MW-06 – Monitoring Well (ATT72_Photo72.jpg)



Photo 69: FOX-2 – Non Hazardous Waste Landfill – Soil sampling at MW-06 – before excavation (ATT69_Photo69.jpg)



Photo 70: FOX-2 – Non Hazardous Waste Landfill – Soil sampling at MW-06 – after excavation (ATT70_Photo70.jpg)



Photo 71: FOX-2 – Non Hazardous Waste Landfill – Soil sampling at MW-06 – after backfilling (ATT71_Photo71.jpg)



Photo 72: FOX-2 – Non Hazardous Waste Landfill – MW-05 – Monitoring Well (ATT73_Photo73.jpg)



Photo 73: FOX-2 – Non Hazardous Waste Landfill – Soil sampling at MW-05 – before excavation (ATT74_Photo74.jpg)



Photo 74: FOX-2 – Non Hazardous Waste Landfill – Soil sampling at MW-05 – after excavation (ATT75_Photo75.jpg)



Photo 75: FOX-2 – Non Hazardous Waste Landfill – Soil sampling at MW-05 – after backfilling (ATT76_Photo76.jpg)



Photo 76: FOX-2 – Tier II Disposal Facility – Cover surface, facing west (ATT4_Photo4.jpg)



Photo 77: FOX-2 – Tier II Disposal Facility – Cover surface, facing south (ATT9_Photo9.jpg)

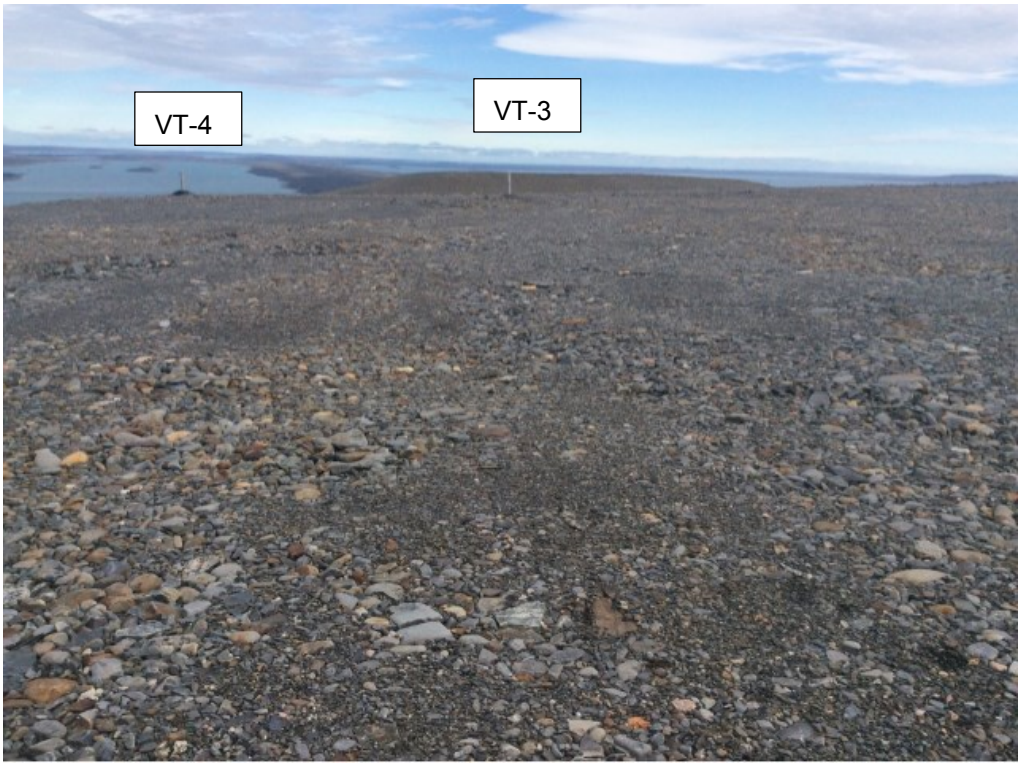


Photo 78: FOX-2 – Tier II Disposal Facility – Cover surface, facing east (ATT13_Photo13.jpg)



Photo 79: FOX-2 – Tier II Disposal Facility – Cover surface, facing north (ATT16_Photo16.jpg)



Photo 80: FOX-2 – Tier II Disposal Facility – East crest and slope, facing south (ATT6_Photo6.jpg)

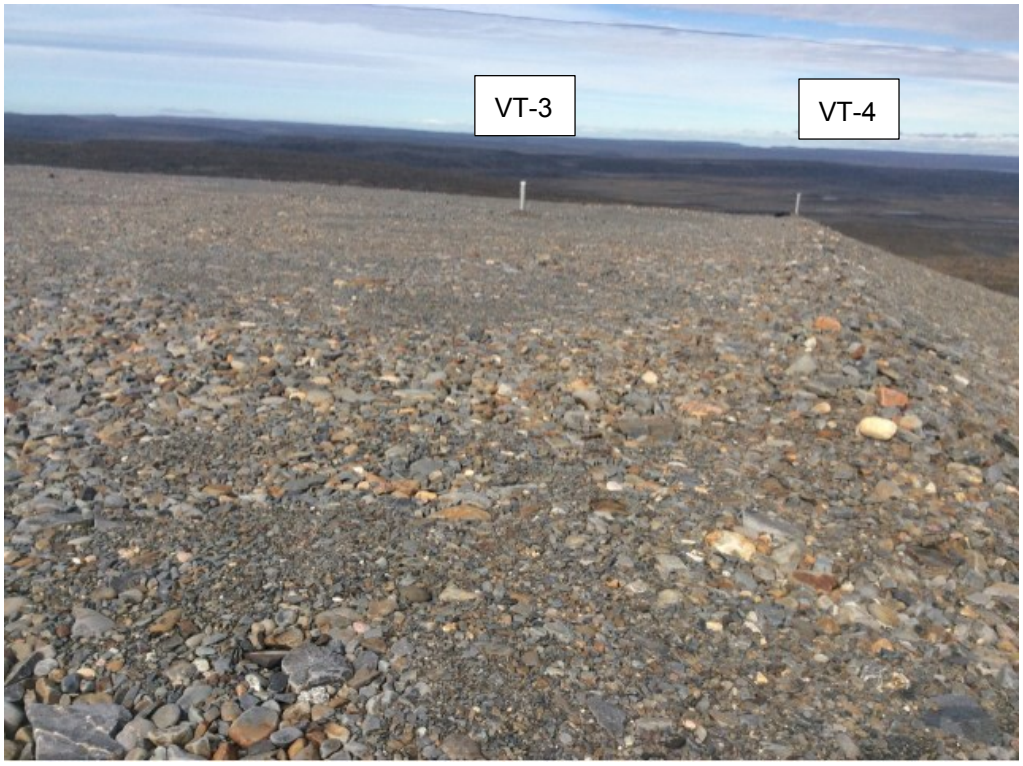


Photo 81: FOX-2 – Tier II Disposal Facility – East crest, facing north (ATT17_Photo17.jpg)



Photo 82: FOX-2 – Tier II Disposal Facility – East slope and toe, facing north (ATT18_Photo18.jpg)



Photo 83: FOX-2 – Tier II Disposal Facility – North crest, facing west (ATT7_Photo7.jpg)



Photo 84: FOX-2 – Tier II Disposal Facility – North slope and toe, facing east (ATT11_Photo11.jpg)



Photo 85: FOX-2 – Tier II Disposal Facility – Overview east slope, facing west (ATT19_Photo19.jpg)



Photo 86: FOX-2 – Tier II Disposal Facility – South crest, facing east (ATT14_Photo14.jpg)



Photo 87: FOX-2 – Tier II Disposal Facility – South slope and toe, facing east (ATT15_Photo15.jpg)



Photo 88: FOX-2 – Tier II Disposal Facility – VT-1, facing west (ATT2_Photo2.jpg)

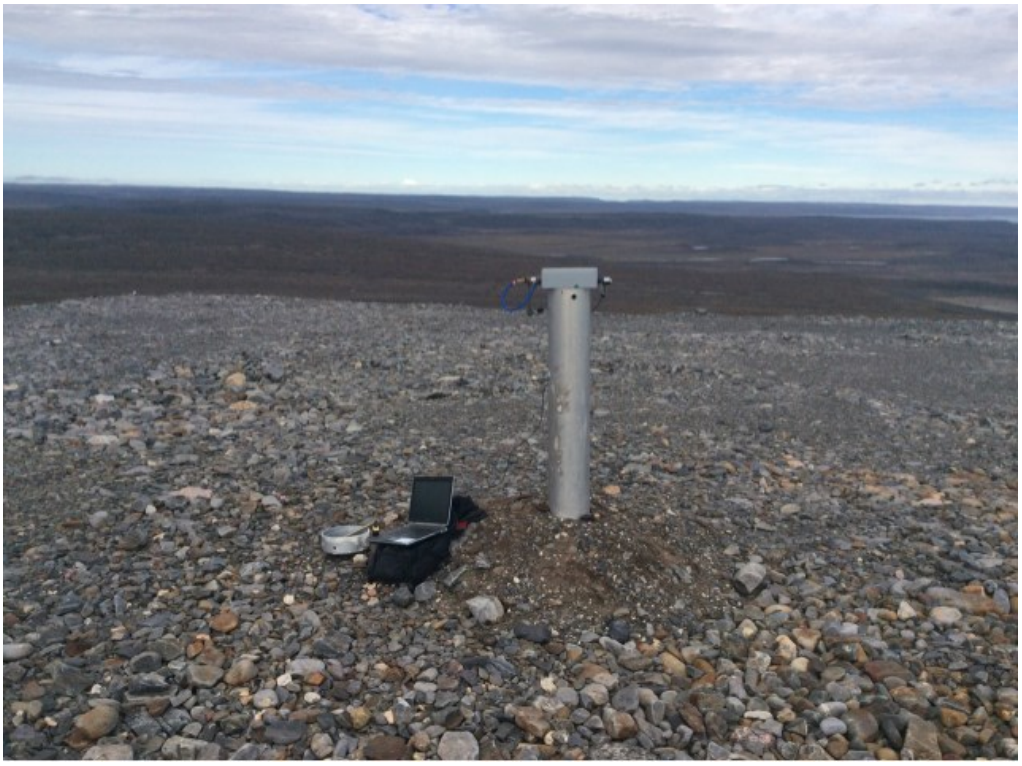


Photo 89: FOX-2 – Tier II Disposal Facility – VT-2, facing north (ATT8_Photo8.jpg)

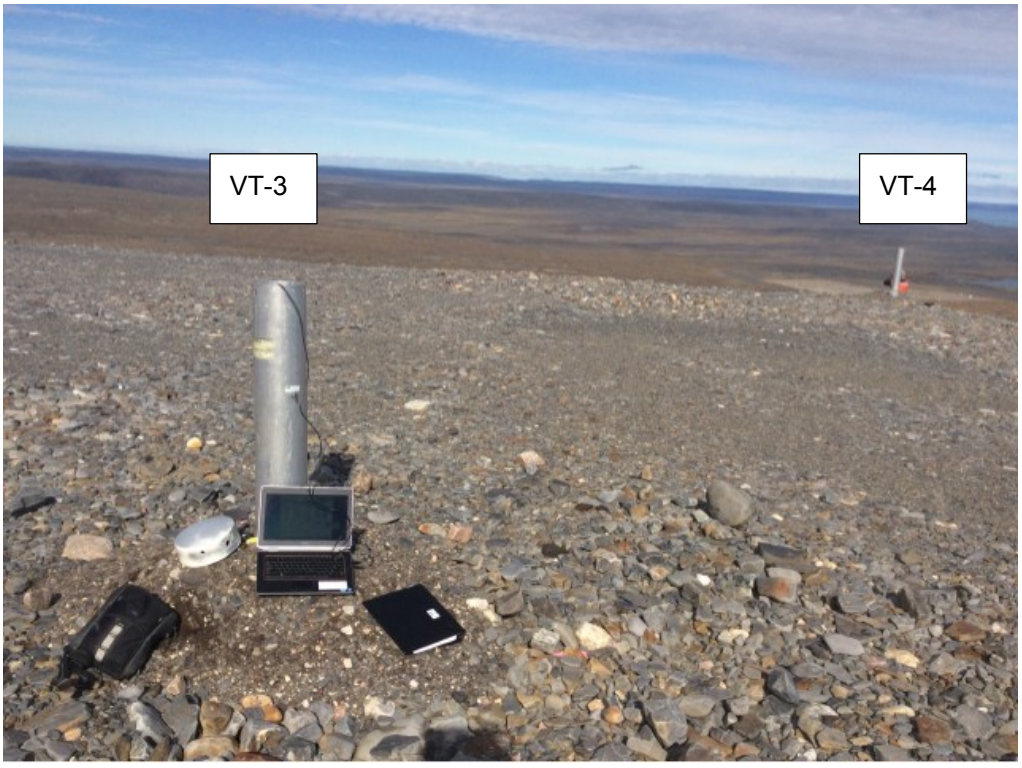


Photo 90: FOX-2 – Tier II Disposal Facility – VT-3, facing north (ATT3_Photo3.jpg)



Photo 91: FOX-2 – Tier II Disposal Facility – VT-4, facing east (ATT5_Photo5.jpg)



Photo 92: FOX-2 – Tier II Disposal Facility – West crest, facing south (ATT10_Photo10.jpg)



Photo 93: FOX-2 – Tier II Disposal Facility – West slope and toe, facing south (ATT12_Photo12.jpg)



Photo 94: FOX-2 – Tier II Disposal Facility – Northeast corner – Feature B – rough grading area (Acceptable), facing east (ATT2_Photo2.jpg)



Photo 95: FOX-2 – Tier II Disposal Facility – West cover surface – Feature B – rough grading area (Acceptable), facing north (ATT3_Photo3.jpg)



Photo 96: FOX-2 – Tier II Disposal Facility – West cover surface – Feature A – minor settlement (Acceptable), facing north (ATT4_Photo4.jpg)



Photo 97: FOX-2 – Tier II Disposal Facility – Southwest corner – Feature B – rough grading area (Acceptable), facing west (ATT5_Photo5.jpg)



Photo 98: FOX-2 – Tier II Disposal Facility – South crest edge – Feature C – minor self-armouring erosion (Acceptable), facing east (ATT6_Photo6.jpg)



Photo 99: FOX-2 – Tier II Disposal Facility – MW-11 – Monitoring Well (ATT85_Photo85.jpg)



Photo 100: FOX-2 – Tier II Disposal Facility – Soil sampling at MW-11 – before excavation (ATT100_Photo100.jpg)



Photo 101: FOX-2 – Tier II Disposal Facility – Soil sampling at MW-11 – after excavation (ATT101_Photo101.jpg)



Photo 102: FOX-2 – Tier II Disposal Facility – Soil sampling at MW-11 – after backfilling (ATT102_Photo102.jpg)



Photo 103: FOX-2 – Tier II Disposal Facility – MW-12 – Monitoring Well (ATT86_Photo86.jpg)



Photo 104: FOX-2 – Tier II Disposal Facility – Soil sampling at MW-12 – before excavation (ATT103_Photo103.jpg)



Photo 105: FOX-2 – Tier II Disposal Facility – Soil sampling at MW-12 – after excavation (ATT104_Photo104.jpg)



Photo 106: FOX-2 – Tier II Disposal Facility – Soil sampling at MW-12 – after backfilling (ATT105_Photo105.jpg)



Photo 107: FOX-2 – Tier II Disposal Facility – MW-09 – Monitoring Well (ATT87_Photo87.jpg)



Photo 108: FOX-2 – Tier II Disposal Facility – Soil sampling at MW-09 – before excavation (ATT106_Photo106.jpg)



Photo 109: FOX-2 – Tier II Disposal Facility – Soil sampling at MW-09 – after excavation (ATT107_Photo107.jpg)



Photo 110: FOX-2 – Tier II Disposal Facility – Soil sampling at MW-09 – after backfilling (ATT108_Photo108.jpg)



Photo 111: FOX-2 – Tier II Disposal Facility – MW-10 – Monitoring Well (ATT84_Photo84.jpg)



Photo 112: FOX-2 – Tier II Disposal Facility – Soil sampling at MW-10 – before excavation (ATT97_Photo97.jpg)



Photo 113: FOX-2 – Tier II Disposal Facility – Soil sampling at MW-10 – after excavation (ATT98_Photo98.jpg)



Photo 114: FOX-2 – Tier II Disposal Facility – Soil sampling at MW-10 – after backfilling (ATT99_Photo99.jpg)



Photo 115: FOX-2 – Upper Site Landfill Lobe A – Cover surface, facing west (ATT24_Photo24.jpg)



Photo 116: FOX-2 – Upper Site Landfill Lobe A – Cover surface, facing northeast (ATT26_Photo26.jpg)

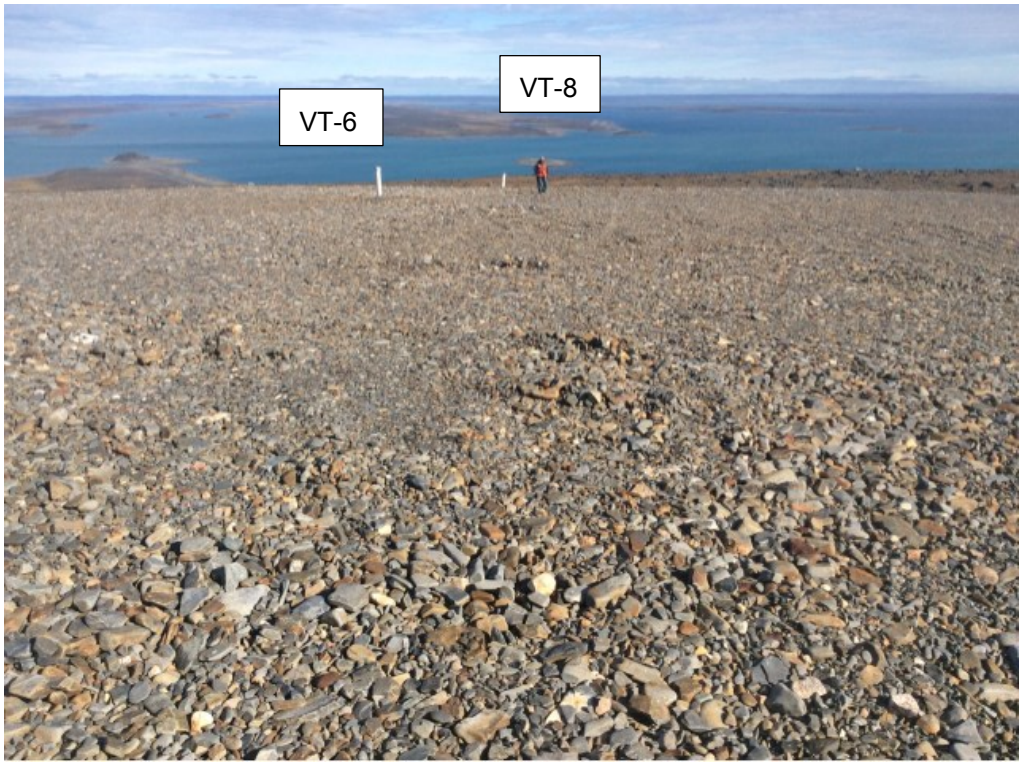


Photo 117: FOX-2 – Upper Site Landfill Lobe A – Cover surface, Feature H – tire tracks and rough area near VT-5, facing east (ATT28_Photo28.jpg)



Photo 118: FOX-2 – Upper Site Landfill Lobe A – East slope and toe, facing northwest (ATT33_Photo33.jpg)



Photo 119: FOX-2 – Upper Site Landfill Lobe A – East slope and toe, facing north (ATT102_Photo102.jpg)



Photo 120: FOX-2 – Upper Site Landfill Lobe A – North crest, facing east (ATT36_Photo36.jpg)



Photo 121: FOX-2 – Upper Site Landfill Lobe A – North slope, facing west (ATT34_Photo34.jpg)



Photo 122: FOX-2 – Upper Site Landfill Lobe A – North slope and toe, facing east (ATT21_Photo21.jpg)



Photo 123: FOX-2 – Upper Site Landfill Lobe A – North slope and toe, facing east (ATT35_Photo35.jpg)



Photo 124: FOX-2 – Upper Site Landfill Lobe A – North slope and toe, facing west (ATT101_Photo101.jpg)



Photo 125: FOX-2 – Upper Site Landfill Lobe A – West slope and toe, Feature C – tire tracks, facing northeast (ATT38_Photo38.jpg)



Photo 126: FOX-2 – Upper Site Landfill Lobe A – South crest, facing northeast (ATT29_Photo29.jpg)



Photo 127: FOX-2 – Upper Site Landfill Lobe A – South slope, facing northeast (ATT30_Photo30.jpg)



Photo 128: FOX-2 – Upper Site Landfill Lobe A – South slope and toe, Feature F – tracks, facing east (ATT31_Photo31.jpg)



Photo 129: FOX-2 – Upper Site Landfill Lobe A – Southeast slope, facing southwest (ATT103_Photo103.jpg)



Photo 130: FOX-2 – Upper Site Landfill Lobe A – Feature F – tracks on south slope, facing southeast (ATT32_Photo32.jpg)



Photo 131: FOX-2 – Upper Site Landfill Lobe A – West crest, facing north (ATT27_Photo27.jpg)



Photo 132: FOX-2 – Upper Site Landfill Lobe A – West crest, facing south (ATT37_Photo37.jpg)



Photo 133: FOX-2 – Upper Site Landfill Lobe A – West toe and slope, facing south (ATT20_Photo20.jpg)

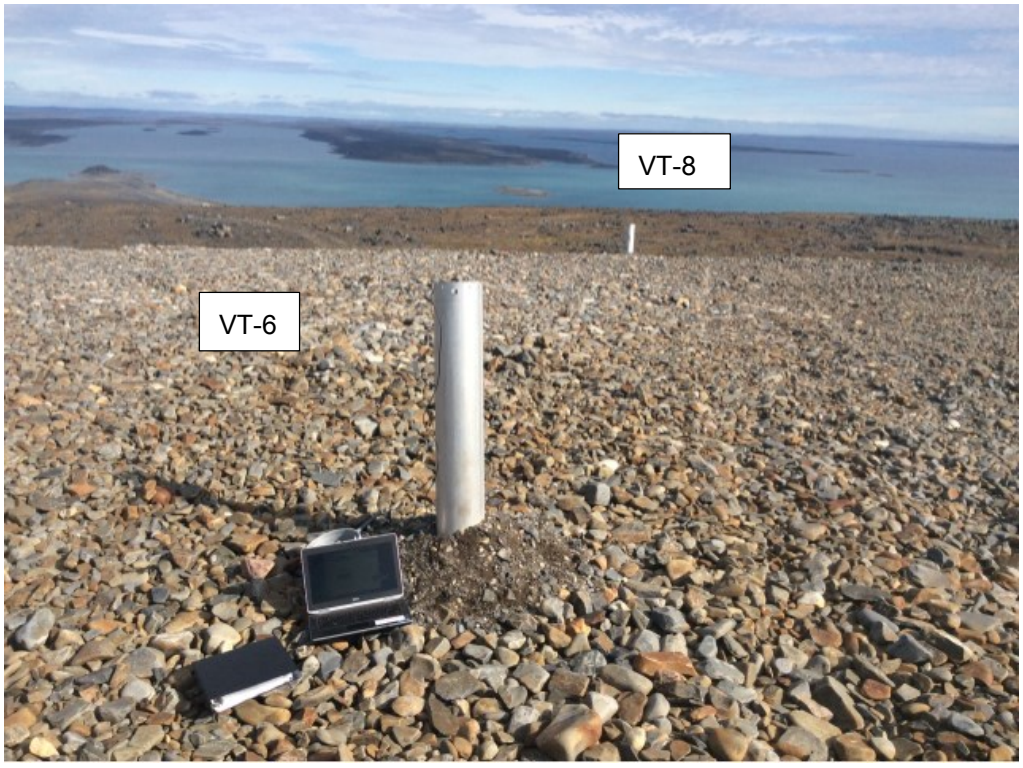


Photo 134: FOX-2 – Upper Site Landfill Lobe A – VT-6, facing east (ATT22_Photo22.jpg)



Photo 135: FOX-2 – Upper Site Landfill Lobe A – VT-7, facing southwest (ATT25_Photo25.jpg)



Photo 136: FOX-2 – Upper Site Landfill Lobe A – VT-8, facing east (ATT23_Photo23.jpg)



Photo 137: FOX-2 – Upper Site Landfill Lobe A – Feature VT-5, facing east –tracks (Feature H) (ATT7_Photo7.jpg)



Photo 138: FOX-2 – Upper Site Landfill Lobe A – West crest – Feature C – Tracks, facing east (ATT44_Photo44.jpg)



Photo 139: FOX-2 – Upper Site Landfill Lobe A – Feature D – minor settlement, facing northeast (ATT45_Photo45.jpg)



Photo 140: FOX-2 – Upper Site Landfill Lobe A – Feature G –settlement on east slope, facing west (ATT46_Photo46.jpg)



Photo 141: FOX-2 – Upper Site Landfill Lobe A – Feature E – self-armouring erosion, facing northeast (ATT47_Photo47.jpg)



Photo 142: FOX-2 – Upper Site Landfill Lobe A – West crest – Feature B – rough area with minor settlement, facing northwest (ATT48_Photo48.jpg)



Photo 143: FOX-2 – Upper Site Landfill Lobe A – Feature B - rough area, facing southwest (ATT8_Photo8.jpg)



Photo 144: FOX-2 – Upper Site Landfill Lobe A – MW-13 – Monitoring Well (ATT77_Photo77.jpg)



Photo 145: FOX-2 – Upper Site Landfill Lobe A – Soil sampling at MW-13 – before excavation (ATT78_Photo78.jpg)



Photo 146: FOX-2 – Upper Site Landfill Lobe A – Soil sampling at MW-13 – after excavation (ATT79_Photo79.jpg)



Photo 147: FOX-2 – Upper Site Landfill Lobe A – Soil sampling at MW-13 – after backfilling (ATT80_Photo80.jpg)



Photo 148: FOX-2 – Upper Site Landfill Lobe A – MW-16 – Monitoring Well (ATT81_Photo81.jpg)



Photo 149: FOX-2 – Upper Site Landfill Lobe A – Soil sampling at MW-16 – before excavation (ATT88_Photo88.jpg)



Photo 150: FOX-2 – Upper Site Landfill Lobe A – Soil sampling at MW-16 – after excavation (ATT89_Photo89.jpg)



Photo 151: FOX-2 – Upper Site Landfill Lobe A – Soil sampling at MW-16 – after backfilling (ATT90_Photo90.jpg)



Photo 152: FOX-2 – Upper Site Landfill Lobe A – MW-15 – Monitoring Well (ATT82_Photo82.jpg)



Photo 153: FOX-2 – Upper Site Landfill Lobe A – Soil sampling at MW-15 – before excavation (ATT91_Photo91.jpg)



Photo 154: FOX-2 – Upper Site Landfill Lobe A – Soil sampling at MW-15 – after excavation (ATT92_Photo92.jpg)



Photo 155: FOX-2 – Upper Site Landfill Lobe A – Soil sampling at MW-15 – after backfilling (ATT93_Photo93.jpg)



Photo 156: FOX-2 – Upper Site Landfill Lobe A – MW-14 – Monitoring Well (ATT83_Photo83.jpg)



Photo 157: FOX-2 – Upper Site Landfill Lobe A – Soil sampling at MW-14 – before excavation (ATT94_Photo94.jpg)



Photo 158: FOX-2 – Upper Site Landfill Lobe A – Soil sampling at MW-14 – after excavation (ATT95_Photo95.jpg)



Photo 159: FOX-2 – Upper Site Landfill Lobe A – Soil sampling at MW-14 – after backfilling (ATT96_Photo96.jpg)



Photo 160: FOX-2 – West Landfill Lobe E – Cover surface – Feature H – bedrock outcrop, facing west (ATT41_Photo41.jpg)



Photo 161: FOX-2 – West Landfill Lobe E – Cover surface, Feature I – bedrock outcrop, facing west (ATT42_Photo42.jpg)



Photo 162: FOX-2 – West Landfill Lobe E – Cover surface, facing southwest (ATT43_Photo43.jpg)



Photo 163: FOX-2 – West Landfill Lobe E – Cover surface, facing northwest (ATT44_Photo44.jpg)



Photo 164: FOX-2 – West Landfill Lobe E – Cover surface, facing north (ATT47_Photo47.jpg)



Photo 165: FOX-2 – West Landfill Lobe E – Cover surface, facing northeast (ATT49_Photo49.jpg)



Photo 166: FOX-2 – West Landfill Lobe E – Cover surface, facing southeast (ATT51_Photo51.jpg)



Photo 167: FOX-2 – West Landfill Lobe E – Cover surface, facing northwest (ATT52_Photo52.jpg)



Photo 168: FOX-2 – West Landfill Lobe E – Cover surface, facing southeast (ATT53_Photo53.jpg)



Photo 169: FOX-2 – West Landfill Lobe E – Northeast crest and toe, facing southeast (ATT40_Photo40.jpg)



Photo 170: FOX-2 – West Landfill Lobe E – Northwest crest, facing southwest (ATT39_Photo39.jpg)



Photo 171: FOX-2 – West Landfill Lobe E – Southeast slope, Feature F – minor erosion channel with no seepage, facing northeast (ATT46_Photo46.jpg)



Photo 172: FOX-2 – West Landfill Lobe E – Southwest slope and toe, facing northwest (ATT50_Photo50.jpg)



Photo 173: FOX-2 – West Landfill Lobe E – Southeast slope, facing southwest (ATT45_Photo45.jpg)



Photo 174: FOX-2 – West Landfill Lobe E – Southwest slope and toe, facing northeast (ATT48_Photo48.jpg)



Photo 175: FOX-2 – West Landfill Lobe E – Cover surface – Feature J – very sparse vegetation (Acceptable), facing northeast (ATT11_Photo11.jpg)



Photo 176: FOX-2 – West Landfill Lobe E – Northwest slope – Feature B – minor self-armouring erosion (Acceptable), facing southeast (ATT12_Photo12.jpg)



Photo 177: FOX-2 – West Landfill Lobe E – Northwest slope – Feature B – minor self-armouring erosion (Acceptable), facing southwest (ATT13_Photo13.jpg)



Photo 178: FOX-2 – West Landfill Lobe E – Cover surface – Feature A – minor settlement (Acceptable) and Feature J – very sparse vegetation, facing west (ATT14_Photo14.jpg)



Photo 179: FOX-2 – West Landfill Lobe E – Southeast slope near toe – Feature M – linear depression (Acceptable), facing south (ATT15_Photo15.jpg)



Photo 180: FOX-2 – West Landfill Lobe E – South slope – Feature F – minor erosion channel on slope with no seepage or running water (Acceptable), facing southwest (ATT16_Photo16.jpg)



Photo 181: FOX-2 – West Landfill Lobe E – Southwest slope and toe – no ponded water observed (previous Feature L), facing southwest (ATT17_Photo17.jpg)



Photo 182: FOX-2 – West Landfill Lobe E – Southwest slope and toe – no seepage observed at toe (previous Feature L), facing southwest (ATT18_Photo18.jpg)



Photo 183: FOX-2 – West Landfill Lobe E – Southwest slope – Feature K – minor settlement (Acceptable), facing southwest (ATT19_Photo19.jpg)



Photo 184: FOX-2 – West Landfill Lobe E – Southwest slope – Feature D – minor self-armouring erosion (Acceptable), facing southwest (ATT20_Photo20.jpg)



Photo 185: FOX-2 – West Landfill Lobe E – Southwest slope – Feature J – sparse vegetation (Acceptable), facing southeast (ATT21_Photo21.jpg)



Photo 186: FOX-2 – West Landfill Lobe E – Feature J – sparse vegetation on surface cover, facing northeast (ATT22_Photo22.jpg)

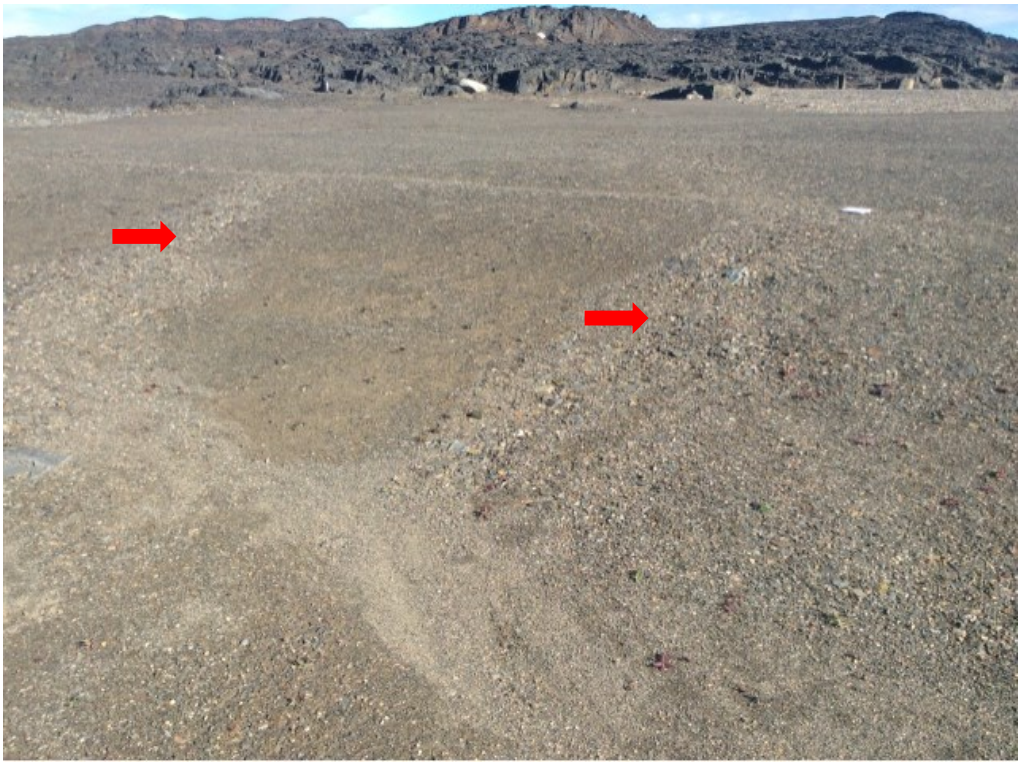


Photo 187: FOX-2 – West Landfill Lobe E – Northwest crest – Feature C – minor self-armouring erosion (Acceptable), facing southeast (ATT10_Photo10.jpg)



Photo 188: FOX-2 – West Landfill Lobe E – Northwest crest – Feature C – minor self-armouring erosion (Acceptable), facing northeast (ATT9_Photo9.jpg)



Photo 189: FOX-2 – West Landfill Lobe E – Soil sampling at F2-1 – before excavation (ATT109_Photo109.jpg)



Photo 190: FOX-2 – West Landfill Lobe E – Soil sampling at F2-1 – after excavation (ATT110_Photo110.jpg)



Photo 191: FOX-2 – West Landfill Lobe E – Soil sampling at F2-1 – after backfilling (ATT111_Photo111.jpg)



Photo 192: FOX-2 – West Landfill Lobe E – Soil sampling at F2-2 – before excavation (ATT112_Photo112.jpg)



Photo 193: FOX-2 – West Landfill Lobe E – Soil sampling at F2-2 – after excavation (ATT113_Photo113.jpg)



Photo 194: FOX-2 – West Landfill Lobe E – Soil sampling at F2-2 – after backfilling (ATT114_Photo114.jpg)



Photo 195: FOX-2 – West Landfill Lobe E – Soil sampling at F2-3 – before excavation (ATT115_Photo115.jpg)



Photo 196: FOX-2 – West Landfill Lobe E – Soil sampling at F2-3 – after excavation (ATT116_Photo116.jpg)



Photo 197: FOX-2 – West Landfill Lobe E – Soil sampling at F2-3 – after backfilling (ATT117_Photo117.jpg)



Photo 198: FOX-2 – West Landfill Lobe E – Soil sampling at F2-4 – before excavation (ATT118_Photo118.jpg)



Photo 199: FOX-2 – West Landfill Lobe E – Soil sampling at F2-4 – after excavation (ATT119_Photo119.jpg)



Photo 200: FOX-2 – West Landfill Lobe E – Soil sampling at F2-4 – after backfilling (ATT120_Photo120.jpg)



Photo 201: FOX-2 – West Landfill Lobe E – Soil sampling at F2-5 – before excavation (ATT121_Photo121.jpg)



Photo 202: FOX-2 – West Landfill Lobe E – Soil sampling at F2-5 – after excavation (ATT122_Photo122.jpg)



Photo 203: FOX-2 – West Landfill Lobe E – Soil sampling at F2-5 – after backfilling (ATT123_Photo123.jpg)

At Golder Associates we strive to be the most respected global company providing consulting, design, and construction services in earth, environment, and related areas of energy. Employee owned since our formation in 1960, our focus, unique culture and operating environment offer opportunities and the freedom to excel, which attracts the leading specialists in our fields. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees who operate from offices located throughout Africa, Asia, Australasia, Europe, North America, and South America.

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