March 2018

QIKIQ15 BAFFIN REGION DEW LINE SITE MONITORING

2017 CAM-5 Monitoring Report

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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 three DEW Line sites that were monitored in 2017 as part of the QIKIQ15 contract are DYE-M, CAM-5 and FOX-M. These sites are all now in the Post-Construction Monitoring Phase of their remedial program.

This Monitoring Report presents the 2017 post-construction inspection and monitoring results for four landfills at CAM-5: Lower Site Landfill South, Non-Hazardous Waste Landfill, USAF & Asbestos Landfill and Tier II Disposal Facility. Remediation of CAM-5 was competed in 2010 and 2017 is the sixth monitoring event at CAM-5. The 2017 monitoring event at CAM-5 was completed on August 11th and 12th.

It is noted that the groundwater samples collected in 2017 were filtered in the lab, and therefore the results represent dissolved metals instead of total metals. An overall trend comparison on the impact of results based on total versus dissolved metals will be prepared in 2018.

Lower Site Landfill South

The Lower Site Landfill South has multiple locations with observed settlement, erosion, cracking, seepage, staining and ponded water features. This landfill was previously assessed to have a “Marginal” overall landfill performance in 2015 because of increased observations of cracking and seepage with staining along the east slope and toe that were considered indicative of deteriorating physical conditions and the potential for future instability. However, this landfill was assessed to have an “Acceptable” overall landfill performance in 2017 because previously observed cracking was generally unchanged since 2015 and the physical condition of the landfill has not deteriorated since the last inspection. There was more ponded water along the west toe, a new wet area on the east slope, a new small tension crack on the east slope and slightly increased erosion with a new crack on the south slope in 2017. Furthermore, previously observed staining and orange ponded water along the east toe may be natural and was less obvious in 2017. All the features observed in 2017 were assessed as “Acceptable”.

Concentrations of metals in soil were highest overall at the deep sample location C5-1, located upgradient of the landfill, however higher concentrations have been historically observed at other locations (C5-4 Deep and C5-5 Deep). At this location, the concentrations of all metals were greater than those reported in previous years and the concentration of arsenic, cadmium, cobalt, lead, nickel and zinc exceeded their respective baseline mean concentration plus 3σ. As noted above, this standard is the same value as the baseline mean for these parameters. In some cases, the 2017 concentrations were slightly lower than in earlier years (e.g., all parameters in shallow sample at C5-1 and downgradient shallow sample locations C5-2, C5-4, C5-5), and in other cases they were higher (e.g., all parameters in deep sample at C5-1 and arsenic, cadmium, cobalt and lead at in the shallow and deep samples at C5-3). At downgradient sample location C5-3, the concentrations of arsenic, cadmium, cobalt, lead, nickel and zinc exceeded their respective baseline mean concentration plus 3σ, however this standard is the same value as the baseline mean for these parameters. The concentration of zinc in the deep sample at C5-2 also exceeded the baseline mean concentrations plus 3σ. No detectable concentrations of PCB or PHC were noted in any of the soil samples in 2017.

Overall, it was noted that the soil sampling locations with the most exceedances of the baseline mean plus 3σ in 2017 were locations C5-1 and C5-3. These elevated parameters and earlier results at C5-4 and C5-5 may be reflective of an ongoing impact from the landfill, however additional data is required to confirm trends and establish if impacts are occurring. There were no exceedances of the PHC or PCB standards in 2017. There are no changes to the monitoring program recommended for this landfill.

Non-Hazardous Waste Landfill

The Non-Hazardous Waste Landfill has been assessed to have an "Acceptable" overall landfill performance. Although ponding of water along the toe has increased in extent since the last inspection it does not appear to be impacting landfill stability to date. Previous inspections reported erosion from the running water along the east and south toe, however the areas with running water leading to the ephemeral stream along the west toe appear to have become self-armoured and no active erosion was observed during the 2017 inspection. Observed minor settlement and stain features were assessed as "Acceptable". No cracks have been observed at this landfill since 2012.

Concentrations of most metals in soil were highest overall at the deep sample location MW-11, located cross-gradient of the landfill. At this location, the concentrations of all detected metals were greater than those reported in previous years and the concentrations of chromium and cobalt exceeded their respective baseline mean concentration plus 3σ. At all other locations, the concentrations of most metals were less than or similar to previous years. For the shallow sample at the cross-gradient sample location MW-09, the concentration of cobalt exceeded the baseline mean concentration plus 3σ. No detectable concentrations of arsenic, cadmium, PCB or PHC were noted in any of the soil samples in 2017.

In 2017, groundwater samples were collected from all three monitoring wells adjacent to the landfill and the only detected parameters in any of three samples were of copper, lead and zinc. At all other locations, the concentrations of all metals were lower than those reported in previous years. No detectable concentrations of arsenic, cadmium, chromium, cobalt, nickel or PHC were noted in any of the groundwater samples in 2017.

Whereas a number of the environmental sampling results are less than or the same as previous sampling sessions, elevated parameters and increases in some cases (e.g., deep soil sample at MW-11) may be reflective of an ongoing impact from the landfill. Based on the results, there does not appear to be significant impact to groundwater quality from the landfill.

There are no changes to the monitoring program recommended for this landfill.

USAF & Asbestos Landfill

Minor settlement, erosion, staining, vehicle rutting and ponded water features were observed at the USAF and Asbestos Landfill. This landfill was assessed to have an "Acceptable" overall landfill performance because all observed features were assessed as "Acceptable". No cracking, sloughing or exposed waste was observed at this landfill. Some establishment of sparse vegetation was observed on the north slope and cover surface.

Some of the features identified at the landfill appear to be a result of anthropogenic activities and are not related to landfill performance (e.g., small hydrocarbon stain, spilled cement or bentonite and rutting caused by vehicles. The extent of previously observed ponded and running water along the west toe has increased towards the north but this area has cobbles and boulders that should provide erosion protection.

The concentrations of copper and zinc in the soil samples were highest at the shallow C5-8 sample location, located downgradient of the landfill, whereas the concentrations of chromium, cobalt and lead were highest at the upgradient shallow C5-6 location, although not significantly so. At the shallow C5-8 location, the concentrations chromium, cobalt, copper and nickel were greater than those reported in previous years, although not significantly so. The only exceedance of the baseline concentration plus 3σ was the concentration of lead in the shallow C5-6 sample. The concentrations of all metals at this location, including lead, were less than or similar to those reported in previous years, which was similarly the case for all remaining sampling locations. No detectable concentrations of arsenic, cadmium, PCB or PHC were noted in any of the samples in 2017.

Overall, the concentrations of metals at most locations were less than or similar to previous years, whereas slight increases in a number of parameters were observed at the shallow C5-8 sample location. These increases are not significant enough to warrant concern, but should continue to be assessed. An overall decreasing trend is noted for a number of these metal concentrations at the cross-gradient C5-7 sample location, which will require collection of additional data to confirm reliability.

There are no changes to the monitoring program recommended for this landfill.

Tier II Disposal Facility

The Tier II Disposal Facility had some minor settlement, erosion, staining, vegetation and wet area features that are not considered to be a concern. This landfill was assessed to have an “Acceptable” overall landfill performance because all observed features were assessed as “Acceptable”. No cracking was observed at this landfill. There is a previously identified small hydrocarbon stain on the crest surface which is unrelated to landfill performance and is considered insignificant. Sparse vegetation was observed on the west slope. The previously observed ponded water in the northwest toe area was smaller compared to the previous inspection in 2015. This is likely related to recent snowmelt rather than seepage from the landfill.

Concentrations of most metals in soil were highest overall at the downgradient deep sample location MW-07, notably copper. At this location, the concentrations of all metals were less than or similar to those reported in previous years and copper exceeded the baseline mean concentrations plus 3σ. The concentrations of most metals at the other sampling locations were less than or similar to those reported in previous years. It is noted that for the cross-gradient deep sample location MW-08, the concentration of cobalt marginally exceeded the baseline mean concentration plus 3σ. No detectable concentrations of arsenic, cadmium, PCB or PHC were noted in any of the soil samples in 2017.

The highest concentrations of most detected metals in groundwater were observed at MW-08. At this location, the concentrations of all metals were less than or similar to those reported in previous years. MW-05, located upgradient of the landfill, was sampled for the first time in 2017 and the concentration of zinc exceeded the baseline mean concentrations plus 3σ. No detectable concentrations of arsenic, cadmium, chromium, cobalt or nickel were noted in any of the groundwater samples in 2017.

Comparison of groundwater elevations based on estimated grade elevation and the measured water depth in the wells indicates that groundwater was highest at MW-05, and lowest towards MW-07. The water levels at MW-05, MW-07 and MW-08 indicate there is generally a southwestern gradient in the area of the landfill. This is consistent with local grades.

Overall, the concentrations of most metals in both soil and groundwater were less than or similar to those reported in recent years. Based on the results, there does not appear to be significant impact to groundwater quality from the landfill.

There are no changes to the monitoring program recommended for this landfill.

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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 conducted in accordance with the project Terms of Reference (TOR) dated April 2015, Golder Proposal P1530908 dated June 16, 2015 ("Golder Proposal") and the May 24, 2017 kick-off meeting minutes.

The three DEW Line sites that were monitored in 2017 as part of the QIKIQ15 contract are DYE-M, CAM-5 and FOX-M. They 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 (LAWP) dated July 7, 2017. Monitoring activities included geotechnical visual inspection, thermal monitoring, soil and groundwater sampling. Deviations from the TOR are noted throughout this report *in italics*, where applicable.

This Monitoring Report presents the 2017 post-construction inspection and monitoring results for CAM-5 (the Site). The remediation of CAM-5 was competed in 2010. Its previous site monitoring was in 2014 and this is the sixth monitoring event since remediation construction was completed. Its next monitoring visits are planned for 2020 and 2025.

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 human health and environmental protection. The monitoring program is designed to monitor landfill integrity and to determine in the event of any evident deterioration, 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 site-specific Health Safety and Environment Plan and procurement of safety equipment and supplies (e.g., personal protective equipment, first aid kits and satellite phones);

3) Development of a Logistics and Work Plan for each field season that outlines the field schedule, travel plans, accommodation, hiring of local Inuit contract workers, ATV and charter aircraft rental;

4) Completion of field work consisting of visual inspection, photographic documentation, thermistor data collection and maintenance 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 Inuit Participation Plan and Report (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, QA/QC and data interpretation.

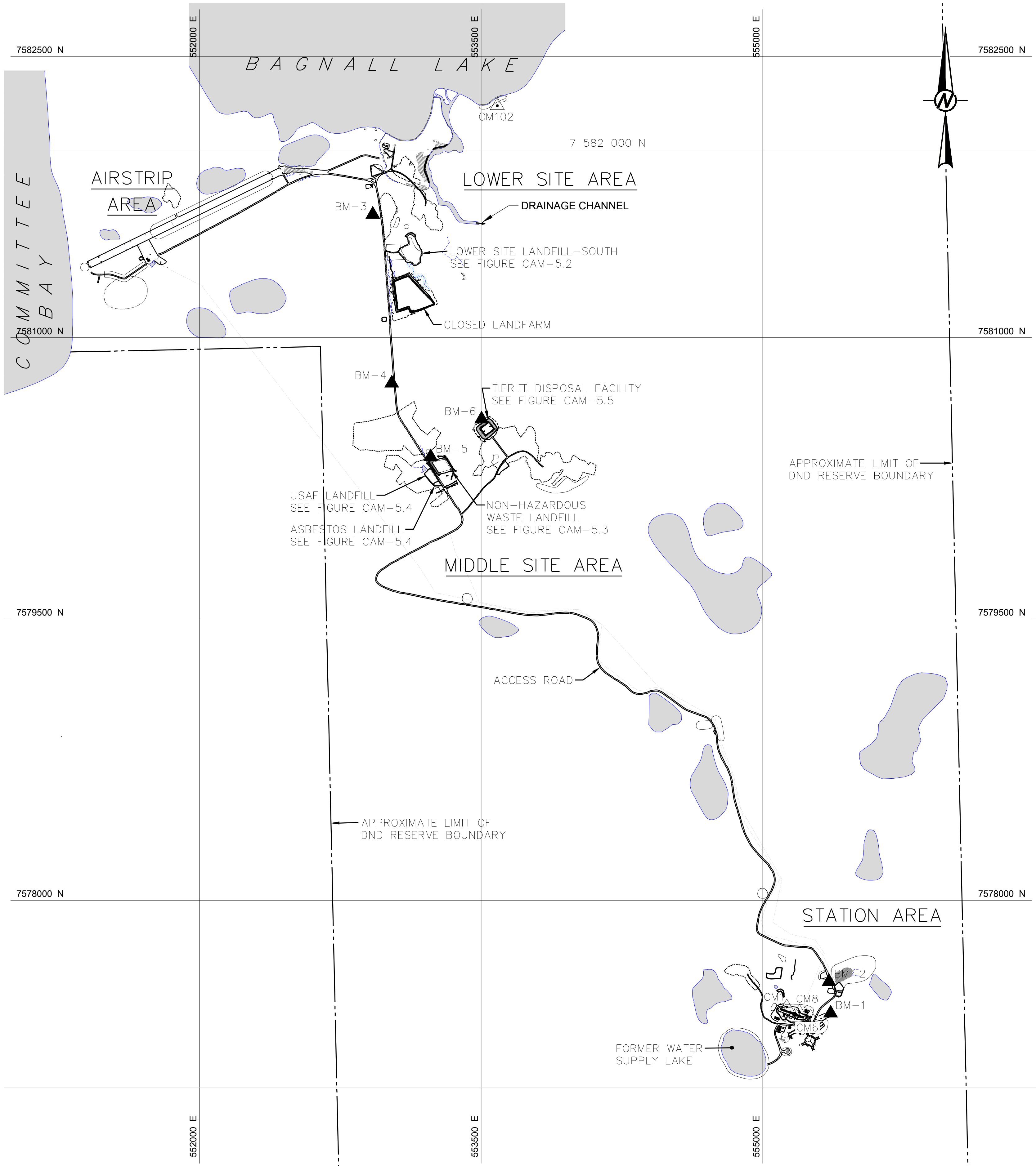
2.0 BACKGROUND

2.1 Site Description

CAM-5 is located at Mackar Inlet, on the western shore of Melville Peninsula in the Committee Bay area of Nunavut, at 68° 20' N, 85° 42' W. The CAM-5 site was decommissioned in 1992 when the CAM-5A (Cape McLoughlin) North Warning System (NWS) short-range radar site was established approximately 35 km north of Mackar Inlet. The CAM-5 station is at an elevation of 400 metres above sea level (masl), about 7 km inland by road from the airstrip. The airstrip is situated close to Bagnall Lake, which is separated from the ocean by a large sandbar.

The site includes four landfills all located at the Lower Site, within 2 km of the airstrip. Figure CAM-5.1 presents a location map and overall site plan of CAM-5 illustrating the landfills that were monitored as well as other site features.

Remediation of the CAM-5 DEW Line Site began in 2008 and was completed in 2010. Two new landfills were constructed during the remediation phase: the Non-hazardous Waste Landfill (NHWL) for debris, and the Tier II Disposal Facility for contaminated soils. The two existing landfills: Lower Site Landfill—South and the United States Air Force (USAF) and Asbestos Landfill, were evaluated to be low risk and were left in place and re-graded.



LOCATION OF MACKAR INLET WITHIN NUNAVUT TERRITORY

SCALE: NTS

LEGEND

- CM1 SURVEY CONTROL MONUMENT
- BM–1 PERMANENT BENCHMARK LOCATION (6)
- APPROXIMATE LIMIT OF DND RESERVE BOUNDARY
- ARCHAEOLOGICAL FEATURE
- BODY OF WATER

NOTES

GRID PROJECTION IS NAD83 ZONE 16N.
ELEVATIONS ARE GEODETIC.

REFERENCE

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

0 500 1,000
1:25,000 METRES

CLIENT
DEPARTMENT OF NATIONAL DEFENCE CANADA

PROJECT
2017 CAM-5 MONITORING REPORT

TITLE
OVERALL SITE PLAN

CONSULTANT
GOLDER

YYYY-MM-DD	2018-03-13
DESIGNED	RM
PREPARED	TDR
REVIEWED	DCJ
APPROVED	DP

PROJECT NO.	PHASE	REV.	FIGURE
1530908	3000	A	CAM-5.1

2.2 Site Geology 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 related deposition of materials 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 with tundra vegetation generally limited to valleys and lower slopes.

The groundwater flow processes at the site are significantly influenced by the presence of continuous permafrost. Annual active thaw layers are typically 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 precipitation from the period after 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.

Rugged topography and the presence of permafrost at the site have created many small, shallow perched lakes and seasonal streams from drainage of melting snow. Smaller, shallow surface water features typically freeze solid during the winter months. Some of the larger, deeper lakes may not freeze solid, potentially allowing them to support fish populations.

The Lower Site Landfill South is located approximately 200 metres from a drainage channel leading to Bagnall Lake and approximately 1,900 metres from Mackar Inlet within the Gulf of Boothia. The remaining landfills are located approximately 2,000 to 2,400 metres from Mackar Inlet; the closest water body to these landfills is an un-named lake, located approximately 200 metres southeast of the Tier II Disposal Facility, which appears to be upgradient of the landfills.

2.3 Land-Use Description

In the 1950's, DEW Line sites were constructed around the North from Alaska to Greenland, between latitudes 65 and 70 degrees to maintain surveillance of the North American Airspace. In 1963, technology upgrades led to the closure of most of these sites and later replacement with the North Warning System (NWS). Since the 1990's, investigations, decommissioning, and clean-up activities have been undertaken. Clean-up and decommissioning activities involved the demolition of surplus buildings and structures, excavation of contaminated soils, and the retrofit 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:

- **Re-graded:** Existing landfills that were re-graded 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 have a saturated granular perimeter berm keyed into the permafrost and sufficient cover of granular material to promote permafrost aggradation into the landfilled materials.

Gravel airstrips are maintained at some of the DEW Line sites for the purpose of ongoing site operations, maintenance and monitoring.

2.4 Field Program Staff and Schedule

Table 2-1 presents a list of field personnel, roles, responsibilities and dates for the CAM-5 2017 monitoring program.

Table 2-1: Field Personnel and Roles

Name (Affiliation)	Role (Responsibility)	Date
Reza Moghaddam (Golder)	Field Geotechnical Lead (Inspections)	August 11-12
Jaime Bonany (Golder)	Field Environmental Lead (Sampling)	August 11-12
Laimiki Irittuq (Inuit Subcontractor)	Wildlife Monitor (Loading / unloading the plane, orientation / safety training, onsite wildlife monitor)	August 11-12
Glen Nagmalik (Inuit Subcontractor)	Wildlife Monitor (Loading / unloading the plane, orientation / safety training, onsite wildlife monitor)	August 11-12
Kenny Kaenerk (Inuit Subcontractor)	Environmental Field Assistant (Loading / unloading the plane, packaging / sorting samples, orientation / safety training)	August 11-12
Moses Nuvviaq (Inuit Subcontractor)	Environmental Field Assistant (Loading / unloading the plane, packaging / sorting samples, orientation / safety training)	August 11-12

2.5 Weather Conditions

Table 2-2 presents a summary of weather conditions during the 2017 CAM-5 monitoring program.

Table 2-2: Summary of Weather Conditions

Date	Weather
August 11-12	Clear to cloudy sky, 5-10 degrees Celsius

2.6 Project References

Biogénie (2013), "The Collection of Landfill Monitoring Data at the Former CAM-5 DEW Line Site, Mackar Inlet, Nunavut, Final Report – 2012", dated March 2013.

Biogénie (2014), "The Collection of Landfill Monitoring Data at the Former CAM-5 DEW Line Site, Mackar Inlet, Nunavut, Final Report – 2013", dated January 2014.

Biogénie (2015), "The Collection of Landfill Monitoring Data at the Former CAM-5 DEW Line Site, Mackar Inlet, Nunavut, Final Report – 2014", dated June 2015.

Canadian Council of Ministers of the Environment (CCME, 2016a), "Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment – Volume I Guidance Manual".

Canadian Council of Ministers of the Environment (CCME, 2016b), "Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment – Volume III Suggested Operating Procedures".

Canadian Council of Ministers of the Environment (CCME, 2016c), "Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment – Volume IV 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.

Environmental Sciences Group, Royal Military College, Kingston, Ontario (ESG, 2011), "CAM-5 Mackar Inlet, Nunavut, First Year Monitoring Report", November 2011.

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

Golder Associates Ltd. (Golder, 2015b), "Baffin Region DEW Line Site Monitoring Health Safety and Environment Plan", Report 1530908-1200-V2, dated July 31, 2015.

Golder Associates Ltd. (Golder, 2015c), "2015 Landfill Monitoring for DEW Line Sites: Logistics and Work Plan", Report 1530908-1300-V2, dated July 31, 2015.

Golder Associates Ltd. (Golder, 2015d), "2015 Baffin Region DEW Line Site Landfill Monitoring Field Work Progress Report", Report 1530908-1400-V2, dated October 5, 2015.

Golder Associates Ltd. (Golder, 2016), "2015 Baffin Region DEW Line Site Landfill Monitoring – 2015 CAM-5 Monitoring Report", Report 1530908-1000-R1-V3, dated March 31, 2016.

Golder Associates Ltd. (Golder, 2017a), "Baffin Region DEW Line Site Monitoring Health Safety and Environment Plan", Report 1530908-3000, dated July 7, 2017.

Golder Associates Ltd. (Golder, 2017b), "2017 Landfill Monitoring for DEW Line Sites: Logistics and Work Plan", Report 1530908-3000-R1, dated July 7, 2017.

Golder Associates Ltd. (Golder, 2017c), "2017 Baffin Region DEW Line Site Landfill Monitoring Field Work Progress Report", Report 1530908-3000-R2-V2, dated October 4, 2017.

2.7 Report Structure

This report describes the monitoring program carried out in August 2017 at CAM-5. Results from visual inspection activities, thermal monitoring, soil sampling and groundwater sampling are presented in accordance with the TOR.

The report is organized with a separate section for each of the landfills (Sections 4.1 to 4.4). Each section contains the following 2017 monitoring information for that landfill:

- 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.

Appendix A provides a Limitation of Responsibilities and forms part of the report. Thermal, soil and groundwater monitoring field record sheets are included in Appendix B. Laboratory Certificates of Analysis, QA/QC Reports and historical landfill monitoring results are included in Appendix C. A photographic log is included in Appendix D. An electronic version of the report, tables, figures, 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 and Safety Environment Plan (Golder, 2017a) for the QIKIQ15 2017 field program, which describes potential hazards, risks and proposed mitigation measures. Unique health and safety risks included the potential for wildlife encounters, travel by air in light planes, long distances to the nearest emergency health care facilities and variable weather conditions. In addition, Golder developed a Logistics and Work Plan (Golder, 2017b) for the field program that contained the detailed schedule and 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. CAM-5 was previously monitored by Golder in 2015 and was monitored in 2017 (Year 7 since 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 and datalogger batteries replacement);
- Soil sampling; and,
- Groundwater sampling (at landfills with monitoring wells).

The field methodology is detailed in the following sections, and any deviations from the TOR are noted in *italics*. Table 3-2 provides a summary of monitoring activities by landfill.

Table 3-1: Summary of QIKIQ15 Project 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		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 (Year 4) – Complete a geotechnical inspection of the thermokarst regrade.

Table 3-2: Summary of Monitoring Requirements for CAM-5

Landfill Designation	Type of Landfill	Visual Inspection ✓ = yes	Soil Sampling(a) Locations x Samples	Groundwater Sampling # of Monitoring Wells	Thermal Monitoring(b) # of Thermistors
CAM-5					
Lower Site Landfill South	Regraded	✓	5 x 2		
Non-Hazardous Waste Landfill	NEW NH	✓	3 x 2	3	
USAF & Asbestos Landfill	Regraded	✓	3 x 2		
Tier II Disposal Facility	New Tier II	✓	4 x 2	4	4
	TOTAL	***4***	***30***	***7***	***4***

Notes:

a) (# x #) Indicates the number of sampling points at each landfill. Samples are collected from two depths at each sampling point; from 0-15 cm and from 40-50 cm (or at refusal).

b) ULB1 and ULB15 batteries replacement for all dataloggers at CAM-5.

3.1.3 Visual Inspection

At each of the CAM-5 landfill locations, 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. Coordinates of all photographs and feature locations were collected using a Garmin GLO GPS (*accurate to 3 m which is less than 0.5 to 1 m accuracy specified in the TOR*) connected by Bluetooth to a field tablet. *The dimensions of all features were measured (e.g., smaller features by measuring tape and larger features by counting 1 m steps) and recorded on the field tablet. Noteworthy features (i.e., relevant to landfill performance) larger than 10 m in length were photographed at 10 m intervals and GPS coordinates were recorded to dimension the feature.* Depths of features were measured with a measuring tape. Areas with the same minor feature (e.g., minor self-armouring erosion, vegetation or vehicle tracks) have generally been assigned a single feature letter where they are located on the same side/section/area of the landfill and/or when previous inspections have reported the area as a single feature. Where extensive minor erosion was observed, the reported feature dimensions refer to the area of minor erosion (i.e., not a single erosion channel). The statement ‘no significant change’ indicates that no significant or noteworthy change in the condition of a feature was observed during the 2017 inspection compared to previously reported observations and photographs of the feature.

In general, for all of the DEW Line sites that form part of this contract, many of the acceptable features observed during the inspections 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”. Where observed, self-armouring erosion, minor water ponding and seepage without staining have also been reported as “not a concern” when they are not indicative of deteriorating landfill performance and/or when they are suspected as being weather related. In addition, when minor cracking appears to be related to slope creep and does not indicate slope instability, it is not considered to be a concern at the present time. Features that are related to landfill performance have been photographed and described in detail.

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 – see definitions below) and Extent (Isolated, Occasional, Numerous or Extensive – see definitions below) and then the landfill was assigned an overall Performance Rating (Acceptable, Marginal, Significant or Unacceptable – see definitions below). 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.

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.
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, impacted 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 have 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 Lakewood Systems Ltd's. Prolog software and a laptop computer. Thermistor inspection and data downloading details were recorded on field record sheets included in Appendix B.

At the CAM-5 site, thermistors and data loggers were only present at the Tier II disposal facility.

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 for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment – Volume I Guidance Manual (CCME, 2016a). 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. Previous consultants left pins and tags in the ground to indicate where they sampled soil. Golder sampled away from those locations and did not leave pins in the ground.
- Coordinates of the 2017 soil sampling locations were recorded using a field tablet equipped with a Garmin GLO 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 deionized 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).*
- Soil samples were not analysed for mercury during the 2017 monitoring program in accordance with Environmental Working Group (EWG) recommendations.
- Field duplicates were collected for at least 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 at each Site.

3.1.6 Groundwater Sampling

Groundwater samples were collected in accordance with the TOR, the Golder Proposal, Logistics and Work Plan and CCME (2016a). 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 deionized 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).*
- *In wells with limited water depth and/or slow recharge, purging was only carried out to obtain a second set of the field parameters* and then sampling was commenced in the priority order outlined in the TOR.
- 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.
- Based on experience gained in the 2015 sampling program, the purging and sampling protocols were changed to maximize sample collection for the wells, which typically have low recovery. For wells with less than 20 cm of standing water, an initial sample for analysis of field parameters was collected, followed by sampling and, where enough water remained, a final sample for analysis of field parameters was collected. For wells with more than 20 cm of standing water, a second sample for field analysis was collected, followed by sampling and a final sample for analysis of field parameters was collected. Where it was evident that the sample recovery was slowing, the second field analysis was not undertaken. The total purging volumes for this technique were 250 ml and 500 ml, equivalent to one or two containers of the Horiba field meter.
- *The potential impact of collecting groundwater samples before the field parameters have stabilized is offset in the case of this project by the requirement to obtain sufficient sample volume for the analyses and thus make interpretations of potential changes in groundwater quality, given the difficulty in accessing the sites and the short period over which active zone water is available for sampling. We consider that the approach taken to well purging for this project is a reasonable balance between prioritizing the objectives of having adequate sample volume and achieving stability of the field parameters to the extent possible.*
- The meter used to analyze field parameters was a Horiba U-52 meter, which monitors temperature, turbidity, pH and electrical conductivity. The instrument was calibrated before the 2017 sampling program by Pine Environmental; the calibration record is provided in Appendix B. In addition, the meter was field calibrated prior to use at each Site, with standard field calibration solutions for pH (4.01), conductivity (4.49 mS/cm) and turbidity (0 NTU). The meter probes were rinsed with deionized water and patted dry between each calibration.
- 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).
- Groundwater samples were not analysed for mercury or PCBs (polychlorinated biphenyls – Total Aroclor analysis) during the 2017 monitoring program in accordance with Environmental Working Group (EWG) recommendations. In addition, petroleum hydrocarbon F1 fraction samples were preserved using sodium bisulphate.

- Field duplicates were collected for 10% of the total groundwater samples collected.
- A travel blank of laboratory prepared water accompanied the sampling containers for each Site, and analyzed for the entire suite of parameters.
- In order to assess the effectiveness of decontamination of the groundwater level / interface probe, and the shovel used to dig the test pits, equipment rinsate (equipment blank) samples of the probe and shovel were completed following a typical decontamination procedure at each Site.
- No equipment blanks were required for the sample collection tubing as new tubing was used at each sampling location.
- *Lab analyses were done as dissolved metals instead of total metals in 2017. This is noted on the trend charts. Golder is conducting an overall trend comparison on the impact of results based on total versus dissolved metals and is preparing a separate Memo.*

3.2 Field Notes and Photographic Documentation

Visual inspection photographs, features, UTM coordinates, dimension measurements and other notes were recorded in the field with a tablet computer equipped with a camera and Global Positioning System (GPS). The tablet's GPS accuracy was enhanced by connecting it to a Garmin GLO, which allows it to also receive information from the GLONASS satellites. *The GPS manufacturer's specified accuracy is 3 m* (typical of handheld GPS units), which is less accurate than the TOR requirement of 0.5 to 1 m (typical of survey quality GPS instruments). Field data, UTM coordinates and photographs from the field 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. Scale items (e.g., people, ATV, glove, handheld radio, etc.) were included in feature photographs. For difficult to identify features, scale items have been placed beside or on the feature and annotation arrows have been drawn in the photo log to help locate features in the visual inspection photographs.

Thermistor inspection and monitoring data were recorded on field record sheets included in Appendix B. Photographs and UTM coordinates of the thermistor locations were recorded with the field tablet.

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 GPS.

Aerial photographs of the four landfills at CAM-5 were taken on August 12, 2017 (Photographs 210 and 211 in Appendix D). Poor weather conditions prevented taking aerial photographs on August 11th.

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 CAM-5 included:

- Using only an ISO 17025 certified environmental lab to perform the soil and groundwater analyses. Golder used Paracel Laboratories Ltd. (Paracel) of Ottawa for all chemical analyses.
- Paracel performed its own internal QA/QC procedures on the analyses performed including testing of matrix spikes, method blanks and lab duplicates. Golder reviewed the quality control reports with each certificate of analysis and has commented on the accuracy of lab results as indicated with these procedures. Golder also reviewed the method detection limits (MDL) achieved by Paracel, and has commented on them in Section 5.
- The field sampling for soil and groundwater was completed by the Golder Environmental Field Lead. The Inuit Environmental Field Assistants assisted with review and verification of sample container identification/labelling, packaging and preparation for shipping;
- 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 sample 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 pits were cleaned manually then rinsed with methyl hydrate, soap and deionized 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 handling the tubing and holding the sample bottles wore nitrile gloves. Equipment blanks were collected by running water over the sterilized shovel and groundwater probe once per site to confirm that the cleaning procedure was not resulting in cross-contamination.
- Groundwater samples were neither filtered nor preserved in the field, with the exception of the petroleum hydrocarbon F1 fraction, which was preserved using a $NaHSO_4$ tablet. 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 under cold storage labelling, 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 at Golder, the samples were dispatched to Paracel 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 lab.

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 trip blank consisting of bottles filled with deionized water and sealed at the laboratory was brought to CAM-5 specifically, and not to the other sites, and then analyzed at the lab. *A field blank (deionized water transferred from supply bottles to sample bottles while on site) was not prepared at CAM-5.*

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 deionized water poured over the water level probe, after it had been sterilized, and for soil sampling the equipment blank was a sample of deionized water that had been poured over the shovel after it had been washed between samples.

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

4.0 2017 MONITORING PROGRAM RESULTS

Photographs 1 through 209 (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:

- **Lower Site Landfill South –** Photographs 1 through 78;
- **Non-Hazardous Waste Landfill** – Photographs 79 through 128;
- **USAF & Asbestos Landfill** – Photographs 129 through 168; and
- **Tier II Disposal Facility** – Photographs 169 through 209.

A complete log of all photographs are included in Appendix D. Copies of all digital photograph files are included on a DVD attached to this report. Visual inspection photographs taken with the field tablet are identified by a "CAM5_Photo Number" in the file name which are noted in brackets in the visual inspection photograph log tables.

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 <u>underlined</u> 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 the landfill areas between 1992 and 2000. 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 2009 and 2010. 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. Discussion of the 2017 data in this report focused on identifying trends, as well as identifying data results for locations where concentrations significantly different (typically greater) than previous years are observed, or locations where concentrations exceeded the baseline concentration plus 3σ.

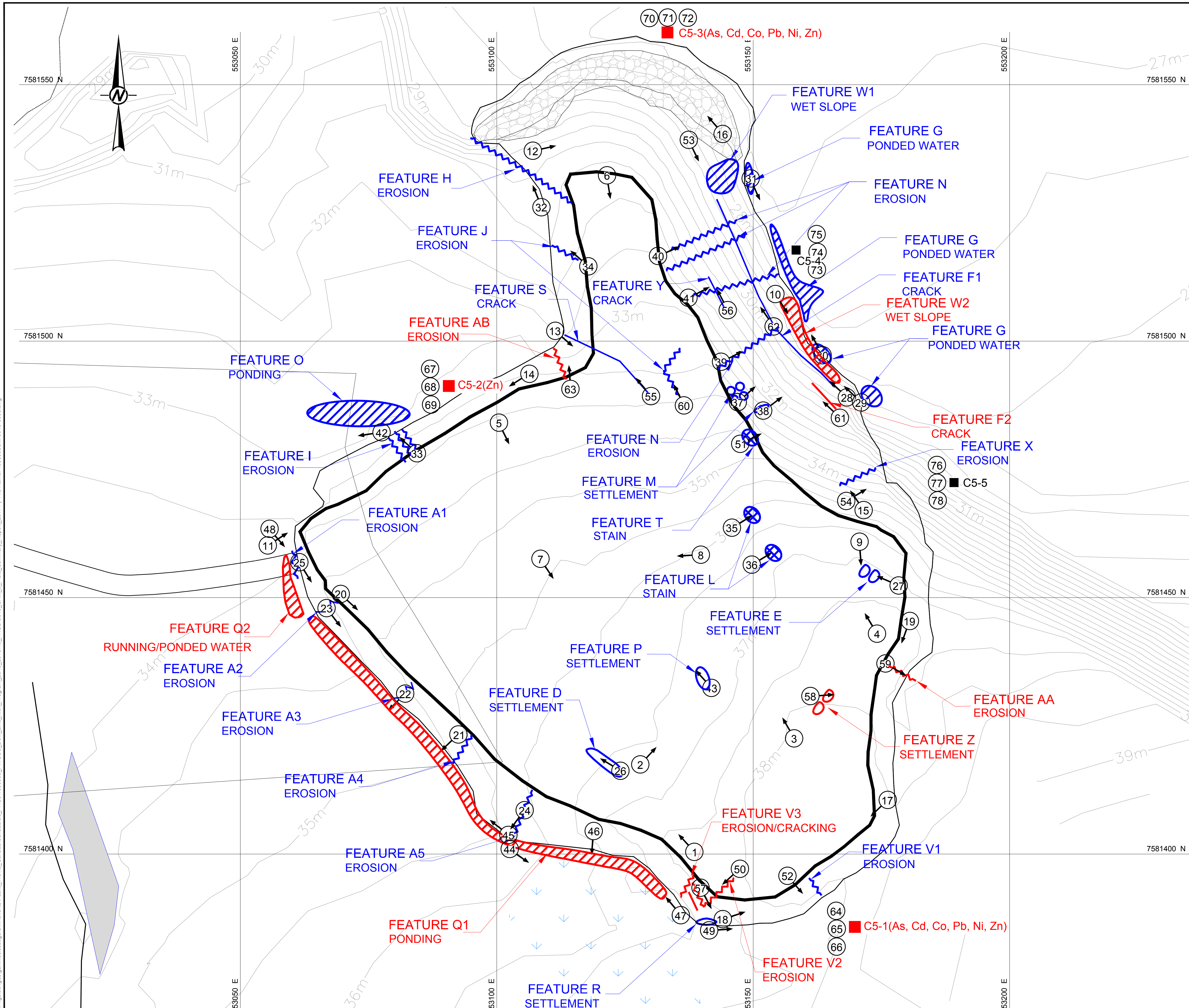
Duplicate soil samples were collected at a total of three locations at CAM-5. This included the deep C5-7 (40-50 cm), shallow MW-08 (0-15 cm) and deep MW-12 (40-50 cm) sample locations. A duplicate groundwater sample was also collected at monitoring well MW-08. For these duplicate sample locations, the averages 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 Lower Site Landfill – South

4.1.1 Landfill Description

The Lower Site Landfill – South is located in the Lower Site Area, north of a closed landfarm (i.e., soil remediation area). The location of the landfill is shown on Figure CAM-5.1. The landfill covers an area approximately 12,700 m^2. The remediation of this landfill consisted of the removal of surface debris and re-grading of the existing cover soil. The layout of the landfill and the soil monitoring locations are shown on Figure CAM-5.2.

The long-term monitoring plan for this landfill consists of visual inspection and the periodic collection of soil samples. The approximate locations for the collection of soil samples are identified on Figure CAM-5.2.



LEGEND

- BODY OF WATER
- SOIL SAMPLE LOCATION
- SOIL SAMPLE LOCATION WITH EXCEEDANCE OF BASELINE MEAN PLUS 3σ
- PHOTOGRAPH LOCATION
- SETTLEMENT
- EROSION
- STAINING
- PONDING
- CRACK
- ELEVATION CONTOUR (0.5m INT)
- SWAMP
- LANDFILL RIP RAP

NOTES

1. GRID PROJECTION IS NAD83 ZONE 16N. ELEVATIONS ARE GEODETIC.
2. *LOCATIONS AND SCALE OF FEATURES ARE APPROXIMATE AND SHOWN FOR ILLUSTRATIVE PURPOSES ONLY.*
3. FEATURES DRAWN IN RED ARE EITHER NEW OR EXPANDED.

REFERENCE

ORIGINAL 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
2017 CAM-5 MONITORING REPORT

TITLE
LOWER SITE LANDFILL SOUTH

CONSULTANT
GOLDER

YYYY-MM-DD	2018-03-13
DESIGNED	RM
PREPARED	TDR
REVIEWED	DCJ
APPROVED	DP

PROJECT NO.	PHASE	REV.	FIGURE
1530908	3000	A	CAM-5.2

4.1.2 Visual Inspection

The Lower Site Landfill South has multiple locations with observed settlement, erosion, cracking, seepage, staining and ponded water features. Table 4-1 presents a summary of observed visual inspection features and Table 4-2 presents the Preliminary Stability Assessment results. This landfill was previously assessed to have a “Marginal” overall landfill performance in 2015 because of increased observations of cracking and seepage with staining along the east slope and toe which were considered indicative of deteriorating physical conditions and the potential for future instability. However, this landfill was assessed to have an “Acceptable” overall landfill performance in 2017 because previously observed cracking was generally unchanged since 2015 and the physical condition of the landfill has not deteriorated since the previous inspection. There was some increased ponded water at the west toe (Feature Q2), a new wet area on the east slope (Feature W2), a small new tension crack on the east slope (Feature F2) and slightly increased erosion with new cracking on the south slope (Features V2 and V3) in 2017. The staining and orange ponded water along the east toe was less obvious in 2017. All of the features observed in 2017 were assessed as “Acceptable.” Table 4-3 is a log of photographs taken during the 2017 visual inspection.

Previously observed cracks (Features B and F) were initially observed in 2012 but not observed in 2013. There is a previously observed 40 m long tension crack running along the lower east slope (Feature F1) with a parallel 4 m long tension crack near the crest (Feature Y) that were unchanged since the 2015 inspection. A new small 1 m long crack (Feature F2) was observed immediately above the existing 40 m long crack on the east slope (Feature F1). Previously observed cracking on the cover surface and northwest slope (Feature S, which was reported as Feature X in 2015) was also unchanged since previous inspections (Photos 13 and 55 in Appendix D). A new infilled crack was observed in 2017 with some self-armouring erosion on the south slope (Feature V3). The previously observed cracks do not appear to be deteriorating (i.e., assessed as “Acceptable”) and the new cracks are also assessed as “Acceptable”.

Previously observed intermittent ponded water along the east slope was observed again in 2017 (Feature G – Photos 29, 30 and 31 in Appendix D) but there was less orange iron staining and coloured water in this area in 2017 compared to the previous inspection in 2015. A previously observed wet area on the north end of the east slope (Feature W1) was unchanged since the previous inspection. A new wet area on the east slope (Feature W2) was observed in 2017 with no related staining (Photo 10 in Appendix D). Both of these wet areas on the east slope do not have associated staining and therefore appear to be caused by precipitation and/or active layer thaw. Previously observed intermittent ponded water along the southwest toe was observed to extend along most of the toe in 2017 (Feature Q1). Some new ponded and running water was observed at the north end of the southwest toe in 2017 (Feature Q2). Previously observed ponded water at the northwest toe (Feature O) was unchanged and a previously observed wet area on the cover surface (Feature K) was not observed in 2017.

The extent of minor self-armouring erosion on the west slope (Features A1-A5) has not increased since the last inspection (Photos 21-25 in Appendix D). Previously observed minor self-armouring erosion channels on the east slope (Features N and X) were unchanged. A previously observed major erosion gulley in the northwest corner (Feature H) does not appear to have deteriorated further and no exposed waste materials were observed during the 2017 inspection. Previously observed erosion on the northwest slope and cover surface (Features I and J) were unchanged. Previously observed self-armouring erosion on the south slope was observed to be unchanged at one location (Feature V1) and expanded slightly at the other locations (Features V2 and V3). New self-armouring erosion channels (Features AA and AB) were observed on the southeast slope and northwest slope, respectively.

In general, observed settlement features were minor and consistent with previous observations (Features D, E, and M). Previously observed settlement features on the cover surface and south slope (Features P and R) were unchanged since previous observations. A new minor settlement area (Feature Z) was also observed in 2017. The previously observed insignificant minor depression (Feature C) was not identified during the 2017 inspection.

The previously observed small hydrocarbon stain areas (Features T and L) were observed during the 2017 inspection. However, one small previously observed hydrocarbon stain (Feature U) was not observed in 2017. These small hydrocarbon stains are unrelated to landfill performance and are considered insignificant in this respect.

Table 4-1: Visual Inspection Checklist – Lower Site Landfill South

SITE NAME: CAM-5 Mackar Inlet
LANDFILL DESIGNATION: Lower Site Landfill South
DATE OF INSPECTION: August 12, 2017
DATE OF PREVIOUS INSPECTION: August 23, 2015
INSPECTED BY: Reza Moghaddam
REPORT PREPARED BY: Reza Moghaddam
MONITORING EVENT NUMBER: 6
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 – Lower Site Landfill South

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	N	C	East crest	-	-	-	-	-	-	Insignificant minor depression (Acceptable)	Previously noted (not identified in 2017)	-
	Y	D	Southwest crest	553124	7581416	5	0.2	0.1	0.008%	Linear depression (Acceptable)	Unchanged since previous observation	26
	Y	E	Cover surface east corner	553178	7581452	1	0.5	0.1	0.005%	Two small minor settlement areas each ~0.5m diameter (Acceptable)	Unchanged since previous observation	27
	Y	M	East crest	553147	7581488	2	2	0.2	0.03%	4 minor settlement depressions (Acceptable)	Unchanged since previous observation	37
	Y	M	East crest	553152	7581486	1	1	0.1	0.01%	Minor settlement and erosion (Acceptable)	Unchanged since previous observation (Feature P in 2015 report)	38
	Y	P	Cover surface	553142	7581432	3	1	0.05	0.02%	Minor settlement (Acceptable)	Unchanged since previous observation	43
	Y	R	South toe	553141	7581385	2	0.5	0.1	0.01%	Minor settlement (Acceptable)	Unchanged since previous observation (Feature Q in 2015 report)	49
	Y	Z	Cover surface	553161	7581431	1	0.3	0.05	0.005%	2 Minor settlement areas (Acceptable)	New observation	58

Table 4-1: Visual Inspection Checklist – Lower Site Landfill South

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	A1	West slope	553,062	7,581,457	5	0.3	0.1	0.01%	Mminor self-armouring erosion channels (Acceptable)	Unchanged since previous observation	25
	Y	A2		553,067	7,581,448	5	0.3	0.1	0.01%			23
	Y	A3		553,082	7,581,431	5	0.3	0.1	0.01%			22
	Y	A4		553,087	7,581,422	5	0.3	0.1	0.01%			21
	Y	A5		553,105	7,581,409	10	0.3	0.1	0.01%			24
	Y	H	Northwest slope	553109	7581526	20	2	0.5	0.3%	Major erosion gulley (Acceptable)	Unchanged since previous observation	32
	Y	I	Northwest slope	553084	7581478	4	3	0.1	0.1%	Area of minor self-armouring erosion (Acceptable)	Unchanged since previous observation	33
	Y	J	Northwest slope and cover	553118	7581515	10	0.3	0.05	0.02%	Minor self-armouring erosion channels (Acceptable)	Unchanged from previous inspections.	34
			Cover Surface	553136	7581487	10	0.5	0.03	0.04%			60
	Y	N	East slope	553144	7581496	15	0.3	0.1	0.03%	Minor erosion channel (Acceptable)	Unchanged since previous observation (Feature J in 2015 report)	39
	Y	N	East slope	553131	7581517	15	5	0.1	0.5%	Area of minor self-armouring erosion (Acceptable)	Unchanged since previous observation	40
	Y	N	East slope	553137	7581508	18	5	0.1	0.7%	Area of minor self-armouring erosion (Acceptable)	Unchanged since previous observation	41

Table 4-1: Visual Inspection Checklist – Lower Site Landfill South

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	V1	South slope	553157	7581396	5	0.3	0.1	0.01%	Minor erosion channels (Acceptable)	Unchanged since previous observation (Feature R in 2015 report)	52
	Y	V2	South crest	553147	7581397	10	2	0.1	0.2%	Minor erosion channels (Acceptable)	Slightly extended area (Feature R in 2015 report)	50
	Y	V3	South slope	553140	7581393	4	0.2	0.05	0.01%	Minor self-armouring erosion with infilled crack (Acceptable)	Extended erosion and new crack observed in 2017	57
	Y	X	East slope	553168	7581469	10	2	0.1	0.2%	Minor self-armouring erosion (Acceptable)	Unchanged since previous observation (Feature S in 2015 report)	54
	Y	AA	Southeast	553176	7581437	5	0.3	0.03	0.01%	Minor self-armouring erosion (Acceptable)	New	59
	Y	AB	Northwest slope	553114	7581491	10	2	0.03	0.2%	Minor self-armouring erosion (Acceptable)	New	63
Lateral Movement	N	-	-	-	-	-	-	-	-	-	-	-
Frost Action	N	-	-	-	-	-	-	-	-	-	-	-
Sloughing	N	-	-	-	-	-	-	-	-	-	-	-

Table 4-1: Visual Inspection Checklist – Lower Site Landfill South

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
Cracking	N	B	-	-	-	-	-	-	-	Tension crack	Not observed in 2017	-
	Y	S	Northwest crest and slope	553130	7581489	20	0.05-0.1	0.01-0.05	0.02%	Crack and erosion channel (Acceptable)	Unchanged since previous observation (Feature X in 2015 report)	13 and 55
	Y	F1	East slope	553170	7581490	40	0.05-0.1	0.05	0.03%	Crack on slope above toe (Acceptable)	This feature was observed in 2012 but not in 2013 or 2014. The dimension of the feature has not changed since 2015.	28 and 62
	Y	F2	East Slope	553167	7581485	1	0.05	0.01	0.01%	Crack on slope above toe and parallel to existing crack (Acceptable)	New	61
	Y	Y	East slope near crest	553145	7581506	4	0.05-0.1	0.05	0.003%	Crack on slope near crest above other cracking (Acceptable)	Unchanged since previous observation	56
	Y	V3	South crest	553140	7581393	4	0.2	0.05	0.01%	Minor self-armouring erosion with infilled cracking (Acceptable)	Extended erosion and new cracking observed in 2017	57

Table 4-1: Visual Inspection Checklist – Lower Site Landfill South

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
Animal Burrows	N	-	-	-	-	-	-	-	-	-	-	-
Vegetation	N	-	-	-	-	-	-	-	-	-	-	-
Staining	Y	G	East toe	553171	7581488	50	3	-	1.2%	Previously observed seepage and ponded water with iron staining (Acceptable)	Less staining and coloured water observed in 2017	29 and 30
	Y	L	Cover Surface	553149	7581466	0.3	0.3	-	0.001%	Small hydrocarbon stain (Acceptable)	Unchanged since previous observation	35
	Y	L	Cover Surface	553153	7581459	0.3	0.3	-	0.001%	Small hydrocarbon stain (Acceptable)	Unchanged since previous observation	36
	Y	T	East crest	553147	7581480	0.5	0.5	-	0.002%	Small hydrocarbon stain (Acceptable)	Unchanged since previous observation	51
	N	U	North slope	553114	7581539	-	-	-	-	Wet area or potential stain	Not Observed in 2017	-
Vegetation Stress	N	-	-	-	-	-	-	-	-	-	-	-

Table 4-1: Visual Inspection Checklist – Lower Site Landfill South

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	Y	G	East toe	553149	7581532	50	3	0.15	1.2%	Intermittent ponded water along toe (Acceptable)	Less staining and coloured water in 2017	29, 30, 31
	Y	O	Northwest toe	553078	7581482	20	3-5	0.15	0.5%	Ponded water at toe (Acceptable)	Unchanged since previous observation	42
	N	K	South crest surface	553155	7581420	-	-	-	-	Wet area on crest	Not observed in 2017	
	Y	W1	East slope (north)	553137	7581539	10	10	-	0.8%	Wet area on slope near toe (Acceptable)	Unchanged since previous observation	53
	Y	W2	East slope (middle)	553154	7581509	20	5	-	1.0%	Wet area on slope near toe (Acceptable)	New	10,28
	Y	Q1	Southwest toe	553103	7581401	90	5	0.3	1.6%	Previously observed intermittent ponded water along toe (Acceptable)	Extended length in 2017 (Feature V in 2015 report)	23,22,21,44-47
	Y	Q2	Southwest toe (north end)	553056	7581463	12	5	0.05	0.5%	Running and ponded water along toe (Acceptable)	New expanded area at north end	48
Debris and/or Liner Exposed	N	-	-	-	-	-	-	-	-	-	-	-

Table 4-1: Visual Inspection Checklist – Lower Site Landfill South

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	N	-	-	-	-	-	-	-	-	-	-	-
Features of Note / Other Observations	N	-	-	-	-	-	-	-	-	-	-	-

Landfill Area = 12,720 m^2.

Table 4-2: Preliminary Stability Assessment – Lower Site Landfill South

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

Table 4-3: Summary Table of Photographic Log – Lower Site Landfill South

Photo	Easting	Northing	Date
Photo 1	553,139	7,581,400	Aug 11, 2017
Photo 2	553,128	7,581,417	Aug 11, 2017
Photo 3	553,158	7,581,423	Aug 11, 2017
Photo 4	553,174	7,581,443	Aug 11, 2017
Photo 5	553,100	7,581,484	Aug 11, 2017
Photo 6	553,121	7,581,532	Aug 11, 2017
Photo 7	553,109	7,581,458	Aug 11, 2017
Photo 8	553,140	7,581,458	Aug 11, 2017
Photo 9	553,171	7,581,461	Aug 11, 2017
Photo 10	553,154	7,581,509	Aug 11, 2017
Photo 11	553,055	7,581,461	Aug 11, 2017
Photo 12	553,107	7,581,537	Aug 11, 2017
Photo 13	553,111	7,581,502	Aug 11, 2017
Photo 14	553,106	7,581,494	Aug 11, 2017
Photo 15	553,172	7,581,467	Aug 11, 2017
Photo 16	553,144	7,581,540	Aug 11, 2017
Photo 17	553,176	7,581,411	Aug 11, 2017
Photo 18	553,144	7,581,387	Aug 11, 2017
Photo 19	553,181	7,581,445	Aug 11, 2017
Photo 20	553,070	7,581,451	Aug 11, 2017
Photo 21	553,087	7,581,422	Aug 11, 2017

Table 4-3: Summary Table of Photographic Log – Lower Site Landfill South

Photo	Easting	Northing	Date
Photo 22	553,082	7,581,431	Aug 11, 2017
Photo 23	553,067	7,581,448	Aug 11, 2017
Photo 24	553,105	7,581,409	Aug 11, 2017
Photo 25	553,062	7,581,457	Aug 11, 2017
Photo 26	553,124	7,581,416	Aug 11, 2017
Photo 27	553,178	7,581,452	Aug 11, 2017
Photo 28	553,170	7,581,490	Aug 11, 2017
Photo 29	553,171	7,581,488	Aug 11, 2017
Photo 30	553,164	7,581,497	Aug 11, 2017
Photo 31	553,149	7,581,532	Aug 11, 2017
Photo 32	553,109	7,581,526	Aug 11, 2017
Photo 33	553,084	7,581,478	Aug 11, 2017
Photo 34	553,118	7,581,515	Aug 11, 2017
Photo 35	553,149	7,581,466	Aug 11, 2017
Photo 36	553,153	7,581,459	Aug 11, 2017
Photo 37	553,147	7,581,488	Aug 11, 2017
Photo 38	553,152	7,581,486	Aug 11, 2017
Photo 39	553,144	7,581,496	Aug 11, 2017
Photo 40	553,131	7,581,517	Aug 11, 2017
Photo 41	553,137	7,581,508	Aug 11, 2017
Photo 42	553,078	7,581,482	Aug 11, 2017
Photo 43	553,142	7,581,432	Aug 11, 2017
Photo 44	553,103	7,581,401	Aug 11, 2017
Photo 45	553,102	7,581,404	Aug 11, 2017
Photo 46	553,119	7,581,401	Aug 11, 2017
Photo 47	553,136	7,581,388	Aug 11, 2017
Photo 48	553,056	7,581,463	Aug 11, 2017
Photo 49	553,141	7,581,385	Aug 11, 2017
Photo 50	553,147	7,581,397	Aug 11, 2017
Photo 51	553,147	7,581,480	Aug 11, 2017
Photo 52	553,157	7,581,396	Aug 11, 2017
Photo 53	553,137	7,581,539	Aug 11, 2017
Photo 54	553,168	7,581,469	Aug 11, 2017
Photo 55	553,130	7,581,489	Aug 11, 2017
Photo 56	553,145	7,581,506	Aug 11, 2017
Photo 57	553,140	7,581,393	Aug 11, 2017
Photo 58	553,161	7,581,431	Aug 11, 2017
Photo 59	553,176	7,581,437	Aug 11, 2017
Photo 60	553,136	7,581,487	Aug 11, 2017

Table 4-3: Summary Table of Photographic Log – Lower Site Landfill South

Photo	Easting	Northing	Date
Photo 61	553,167	7,581,485	Aug 11, 2017
Photo 62	553,154	7,581,503	Aug 11, 2017
Photo 63	553,114	7,581,491	Aug 11, 2017

4.1.3 Summary of Sampling Deviations

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

- The deep soil samples at C5-4 and C5-5 could not be collected due to frozen ground.

4.1.4 Soil Sampling

Table 4-4 presents a summary of analytical results for soil samples collected at the Lower Site Landfill South. C5-1 represents an upgradient sampling location, whereas C5-2, C5-3, C5-4 and C5-5 represent downgradient sampling locations, based on topography.

Table 4-4 also lists the arithmetic mean background and baseline values for the landfill, in addition to the baseline mean plus 3σ limits. At the Lower Site Landfill South, the background arithmetic means for chromium, cobalt, copper, nickel, zinc and PCB are greater than the baseline arithmetic means. Additionally, the arithmetic mean baseline and the baseline concentrations plus 3σ are the same for PCB and all metals with the exception of copper, which reflects the fact that baseline concentrations of these parameters were primarily at or below laboratory detection limits.

C5-1

Sampling location C5-1 is located upgradient of the landfill, approximately 10 m south of the southern toe of the landfill. The estimated elevation of this sampling point is 38.5 masl. Photograph 64 (Appendix D) illustrates the cover and soils off the toe of the cover. The soils in the area consist of yellow-brown sand and gravel with sparse vegetation.

For the shallow sample at C5-1 (0-15 cm), the concentrations of all metals were less than or similar to those reported in previous years. No exceedances of the baseline concentrations plus 3σ were reported in 2017. No arsenic, cadmium, PHC or PCB were detected at this location in 2017.

The deep sample at C5-1 (40-50 cm) exhibited metal concentrations greater than those in the shallow sample. The concentrations of all metals were greater than those reported in previous years. The concentration of arsenic, cadmium, cobalt, lead, nickel and zinc exceeded their respective baseline mean concentration plus 3σ, however as noted above, this standard is the same as the baseline mean for all but copper. No PHC or PCB were detected at this location in 2017.

C5-2

Sampling location C5-2 is located downgradient of the landfill, approximately 6 m north of the northwest toe of the landfill. The estimated elevation of this sampling point is 33 masl. Photograph 67 (Appendix D) illustrates the cover and soils off the toe of the cover. The soils in the area consist of reddish-brown sand with some vegetation.

For the shallow sample at C5-2 (0-15 cm), the concentrations of all metals were less than or similar to those reported in previous years. No exceedances of the baseline concentrations plus 3σ were reported in 2017.

No arsenic, cadmium, PHC or PCB were detected at this location in 2017. It is noted that modified TPH concentrations of 24 mg/kg and 44 mg/kg were noted at this location in 2013 and 2015, respectively.

The deep sample at C5-2 (40-50 cm) exhibited metal concentrations greater than those in the shallow sample. The concentrations of all detected metals were greater than those reported in previous years. The concentration of zinc exceeded the baseline mean concentrations plus 3σ. As noted above, this standard is the same value as the baseline mean for these parameters. No arsenic, cadmium, PHC or PCB were detected at this location in 2017. It is noted that a modified TPH concentrations of 44 mg/kg and 30 mg/kg were noted at this location in 2013 and 2015, respectively.

C5-3

Sampling location C5-3 is located downgradient of the landfill, immediately north of the northern toe of the landfill. The estimated elevation of this sampling point is 27 masl. As shown in Photograph 70 (Appendix D), some ponding of water was observed near the toe of the landfill in this area. The soils in the area consist of grey-brown sand and gravel and are in the area of the edge of the landfill cover.

For the shallow sample at C5-3 (0-15 cm), the concentrations of arsenic, cadmium, cobalt and lead were greater than those reported in previous years, whereas the concentrations of other metals were less than or similar to previous years. The concentration of arsenic, cadmium, cobalt, lead, nickel and zinc exceeded their respective baseline mean concentration plus 3σ, however this standard value is the same as the baseline mean for these parameters. No PHC or PCB were detected at this location in 2017.

The deep sample at C5-3 (40-50 cm) exhibited metal concentrations similar to those in the shallow sample. Similarly to the shallow sample, the concentrations of arsenic, cadmium, cobalt and lead were greater than those reported in previous years, whereas the concentrations of other metals were less than or similar to previous years. The concentration of arsenic, cadmium, cobalt, lead and nickel exceeded their respective baseline mean concentration plus 3σ. As noted above, this standard is the same value as the baseline mean for these parameters. No PHC or PCB were detected at this location in 2017.

C5-4

Sampling location C5-4 is located downgradient of the landfill, approximately 6 m east of the eastern toe of the landfill. The estimated elevation of this sampling point is 27.5 masl. As shown in Photograph 73 (Appendix D), some ponding of water was observed near along the eastern toe of the landfill in this area. The soils in the area consist of wet grey stony sand with some vegetation. Seepage into the excavation commenced shortly after excavation.

For the shallow sample at C5-4 (0-15 cm), the concentrations of all metals were less than or similar to those reported in previous years. No exceedances of the baseline concentrations plus 3σ were reported in 2017. No arsenic, cadmium, PHC or PCB were detected at this location in 2017. It is noted that a modified TPH concentrations of 51 mg/kg and 38 mg/kg were noted at this location in 2013 and 2015, respectively.

C5-5

Sampling location C5-5 is located downgradient of the landfill, approximately 6 m east of the eastern toe of the landfill. The estimated elevation of this sampling point is 30 masl. Photograph 76 (Appendix D) illustrates the cover and soils off the toe of the cover. The soils in the area consist of wet grey silty sand with sparse vegetation.

For the shallow sample at C5-5 (0-15 cm), the concentrations of all metals were less than or similar to those reported in previous years. No exceedances of the baseline concentrations plus 3σ were reported in 2017. No arsenic, cadmium, PHC or PCB were detected at this location in 2017.

Table 4-4: Soil Chemical Analysis Results – Lower Site Landfill South

ID	Depth (cm)	As (mg/kg)	Cd (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Ni (mg/kg	Zn (mg/kg)	Total PCB (mg/kg)	F1 (mg/kg)	F2 (mg/kg)	F3 (mg/kg)	F4 (mg/kg)
Background Mean		0.83	1.0	21.8	9.5	10.5	10.0	14.0	31.0	0.100	NA	NA	NA	NA
Baseline Mean		**1.0**	**1.0**	**20.0**	**5.0**	**5.7**	**10.0**	**6.8**	**15.3**	**0.003**	**NA**	**NA**	**NA**	**NA**
Baseline + 3σ		1.0	1.0	20.0	5.0	20.7	10.0	6.8	15.3	0.003	NA	NA	NA	NA
Upgradient														
C5-1 Shallow	0-15	<1.0	<0.5	6.0	1.5	2.7	2.2	3.2	9.0	<0.05	<7	<4	<8	<6
C5-1 Deep	40-50	**11.3**	**10.5**	19.6	**14.3**	**19.8**	**15.7**	**17.3**	**35.2**	<0.05	<7	<4	<8	<6
Downgradient														
C5-2 Shallow	0-15	<1.0	<0.5	3.3	1.3	2.6	1.8	3.0	7.9	<0.05	<7	<4	<8	<6
C5-2 Deep	40-50	<1.0	<0.5	9.7	4.1	**9.0**	4.5	6.6	**25.2**	<0.05	<7	<4	<8	<6
C5-3 Shallow	0-15	**11.8**	**11.2**	14.5	**12.5**	**14.2**	**12.6**	**14.2**	**18.2**	<0.05	<7	<4	<8	<6
C5-3 Deep	40-50	**12.0**	**11.8**	12.0	**12.0**	**12.4**	**12.1**	**12.2**	11.2	<0.05	<7	<4	<8	<6
C5-4 Shallow	0-15	<1.0	<0.5	3.9	1.4	2.7	1.4	2.8	8.2	<0.05	<7	<4	<8	<6
C5-4 Deep [1]														
C5-5 Deep	0-15	<1.0	<0.5	9.7	2.2	4.7	2.4	5.0	11.1	<0.05	<7	<4	<8	<6
C5-5 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.

Shaded Values: Results exceed the Baseline arithmetic mean plus 3σ.

1: The deep soil samples at C5-4 and C5-5 could not be collected due to frozen ground.

4.1.5 Conclusions and Overall Performance of the Lower Site Landfill South

The Lower Site Landfill South has multiple locations with observed settlement, erosion, cracking, seepage, staining and ponded water features. This landfill was previously assessed to have a “Marginal” overall landfill performance in 2015 because of increased observations of cracking and seepage with staining along the east slope and toe that were considered indicative of deteriorating physical conditions and the potential for future instability. However, this landfill was assessed to have an “Acceptable” overall landfill performance in 2017 because previously observed cracking was generally unchanged since 2015 and the general physical condition of the landfill has not deteriorated since the last inspection. There was more ponded water along the west toe, a new wet area on the east slope, a new small tension crack on the east slope and slightly increased erosion with a new crack on the south slope in 2017. Furthermore, previously observed staining and orange ponded water along the east toe may be natural and was less obvious in 2017. All the features observed in 2017 were assessed as “Acceptable.”

Concentrations of metals in soil were highest overall at the deep sample location C5-1, located upgradient of the landfill, however higher concentrations have been historically observed at other locations (C5-4 Deep and C5-5 Deep). At this location, the concentrations of all metals were greater than those reported in previous years and the concentration of arsenic, cadmium, cobalt, lead, nickel and zinc exceeded their respective baseline mean concentration plus 3σ. As noted above, this standard is the same value as the baseline mean for these parameters. In some cases, the 2017 concentrations were slightly lower than in earlier years (e.g., all parameters in shallow sample at C5-1, C5-2, C5-4, C5-5), and in other cases they were higher (e.g., all parameters in deep sample at C5-1 and arsenic, cadmium, cobalt and lead at in the shallow and deep samples at C5-3). At C5-3, the concentrations of arsenic, cadmium, cobalt, lead, nickel and zinc exceeded their respective baseline mean concentration plus 3σ, however this standard is the same value as the baseline mean for these parameters. The concentration of zinc in the deep sample at C5-2 also exceeded the baseline mean concentrations plus 3σ. No detectable concentrations of PCB or PHC were noted in any of the soil samples in 2017.

Overall, it was noted that the soil sampling locations with the most exceedances of the baseline mean plus 3σ in 2017 were locations C5-1 and C5-3. These elevated parameters and earlier results at C5-4 and C5-5 may be reflective of an ongoing impact from the landfill, however additional data is required to confirm trends and establish if impacts are occurring. There were no exceedances of the PHC or PCB standards in 2017.

4.1.6 Recommendations for Lower Site Landfill South

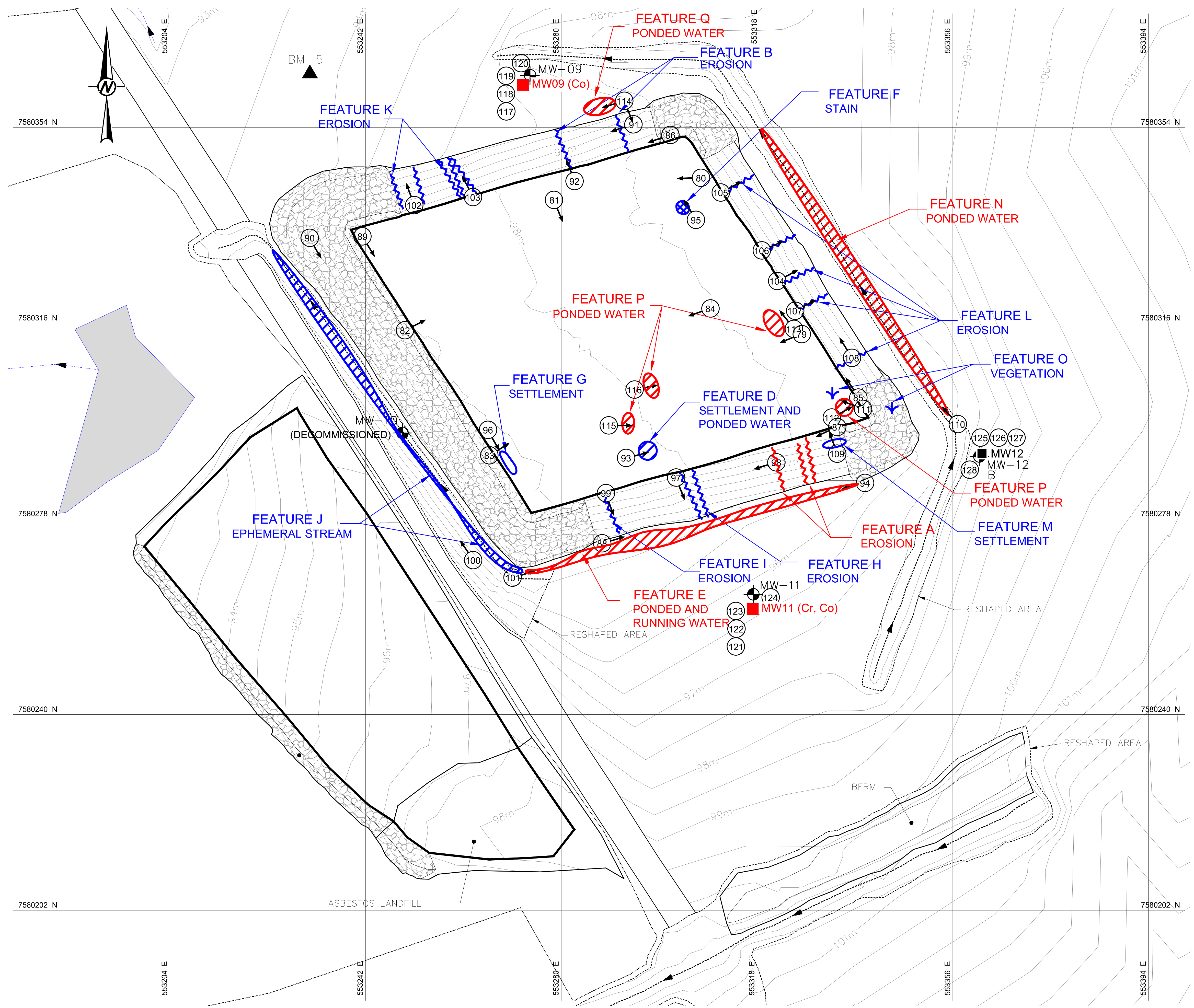
No modifications to the ongoing monitoring program at this landfill are recommended.

4.2 Non-Hazardous Waste Landfill

4.2.1 Landfill Description

The Non-Hazardous Waste Landfill is located in the Middle Site Area, on the east side of the main road (Figure CAM-5.1). This landfill was constructed for the disposal of non-hazardous waste and debris generated and collected during site clean-up. The landfill covers an area approximately 7,000 m^2. The design of this landfill includes perimeter berms and the placement of a cover of compacted granular fill over the landfilled material.

Four groundwater monitoring wells were originally installed around the landfill perimeter. The long-term monitoring plan consists of periodic visual inspection as well as collection of soil and groundwater samples at three locations (MW-09, MW-11 and MW-12) around the landfill perimeter. It is reported that MW-10 was removed when a drainage swale was constructed around the landfill. Approximate locations for the collection of soil and groundwater samples are identified in Figure CAM-5.3.



LEGEND

- BODY OF WATER
- BM-6 PERMANENT BENCHMARK LOCATION
- MONITORING WELL LOCATION
- BACKGROUND MONITORING WELL LOCATION
- SOIL SAMPLE LOCATION
- SOIL SAMPLE LOCATION WITH EXCEEDANCE OF BASELINE MEAN PLUS 3σ
- 86 PHOTOGRAPH LOCATION
- EROSION
- PONDING
- STAINING
- SETTLEMENT
- VEGETATION
- 97m ELEVATION CONTOUR (0.5m INT.)
- DRAINAGE
- LANDFILL RIP RAP

NOTES

1. GRID PROJECTION IS NAD83 ZONE 16N. ELEVATIONS ARE GEODETIC.
2. *LOCATIONS AND SCALE OF FEATURES ARE APPROXIMATE AND SHOWN FOR ILLUSTRATIVE PURPOSES ONLY.*
3. FEATURES DRAWN IN RED ARE EITHER NEW OR EXPANDED.

REFERENCE

ORIGINAL 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
2017 CAM-5 MONITORING REPORT

TITLE
NON-HAZARDOUS WASTE LANDFILL

CONSULTANT
GOLDER

YYYY-MM-DD	2018-03-13
DESIGNED	RM
PREPARED	TDR
REVIEWED	DCJ
APPROVED	DP

PROJECT NO.	PHASE	REV.	FIGURE
1530908	3000	A	CAM-5.3

4.2.2 Visual Inspection

The Non-Hazardous Waste Landfill has observed ponded water, settlement, erosion, vegetation and staining features. Table 4-5 presents a summary of observed visual inspection features and Table 4-6 presents the Preliminary Stability Assessment results. This landfill was assessed to have an "Acceptable" overall landfill performance. Although some erosion and ponding of water have increased in extent since the last inspection they do not appear to be having an impact on landfill stability. All observed features were assessed as "Acceptable". No cracks or exposed waste have been observed at this landfill. Table 4-7 is a log of photographs taken during the 2017 visual inspection.

Previously reported ponded water around the east and south toe (Features E and N) was observed to extend or to expand slightly during the 2017 visual inspection (Photos 94, 101 and 110 in Appendix D). The extent of ponded and the running ephemeral stream along the west toe (Feature J) had not increased compared to the previous inspection and there was no evidence of erosion from the running water. Previous inspections reported erosion from the running water along the east and south toe, however the areas with running water along the toe appear to have become self-armoured and no active erosion was observed during the 2017 inspection. New areas of ponded water were observed along the north toe (Feature Q) and on the cover surface (Feature P). A small depression with ponded water on the cover (Feature D) was previously observed in 2013. The shallow ponding on the cover surface are likely related to recent snow melt and are considered insignificant. The increased water ponding compared to previous inspections may be due to recent snow melt prior to the 2017 inspection. Short-term or seasonal ponding of water due to snow melt is not a concern.

The extent of minor self-armouring erosion on the side slopes has not increased significantly on the north (Features K and B) and east (Feature L) slopes (Photos 91, 92, 102-108 in Appendix D). Most of the previously observed self-armouring erosion on the south slope (Features H and I) was unchanged; however, previously observed self-armouring erosion at the east end of the south slope (Feature A) had expanded slightly.

Previously observed settlement on the crest surface (Feature D) was filled with water during the 2017 inspection. Other previously observed minor settlement areas (Features G and M) were isolated and are considered insignificant.

There is one previously identified small hydrocarbon stain on the crest surface (Feature F) which appears to be unrelated to landfill performance. There is a small area of sparse vegetation becoming established on the southeast slope and crest (Feature O). A minor tension crack on the north slope (Feature C) has not been observed since 2012 and was not observed during the 2017 inspection.

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

SITE NAME: CAM-5 Mackar Inlet
LANDFILL DESIGNATION: Non Hazardous Waste Landfill
DATE OF INSPECTION: August 11, 2017
DATE OF PREVIOUS INSPECTION: August 23, 2015
INSPECTED BY: Reza Moghaddam
REPORT PREPARED BY: Reza Moghaddam
MONITORING EVENT NUMBER: 6
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	G	Southwest corner along crest	553,266	7,580,290	1.25	0.15	0.1	0.001%	Minor linear settlement near crest (Acceptable)	Unchanged since previous observation	96
	Y	D	South crest surface	553,293	7,580,290	3	2	0.1	0.09%	Minor settlement (Acceptable)	Unchanged since previous observation with ponded water	93
	Y	M	South slope	553,334	7,580,291	1	0.5	0.1	0.01%	Minor settlement (Acceptable)	Unchanged since previous observation	109
Erosion	Y	L	East slope	553,322	7,580,324	40	5	0.1	2.9%	Are of self-armouring erosion (Acceptable)	Unchanged since previous observation	104-108
	Y	B	North slope	553,294	7,580,355	10	8	0.1	1.1%	Area of self-armouring erosion (Acceptable)	Unchanged since previous observation	91
			North slope	553,283	7,580,344						Unchanged since previous observation	92
	Y	K	North slope	553,251	7,580,339	15	8	0.1	1.7%	Area of self-armouring erosion (Acceptable)	Unchanged since previous observation	102
			North slope	553,263	7,580,340						Unchanged since previous observation	103
	Y	H	South central slope	553,302	7,580,286	10	5	0.1	0.7%	Area of self-armouring erosion (Acceptable)	Unchanged since previous observation	97

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	A	South slope	553,322	7,580,289	10	6	0.1	0.9%	Area of self-armouring erosion (Acceptable)	Expanded area (this feature was noted as Feature H in 2014 while originally named Feature A in 2012.)	98
	Y	I	Southwest slope	553,289	7,580,283	5	2	0.1	0.14%	Self-armouring erosion (Acceptable)	Unchanged since previous observation	99
Lateral Movement	N	-	-	-	-	-	-	-	-	-	-	-
Frost Action	N	-	-	-	-	-	-	-	-	-	-	-
Sloughing	N	-	-	-	-	-	-	-	-	-	-	-
Cracking	N	C	North slope	-	-	-	-	-	-	Minor tension crack	First noted in 2011. Not observed in 2013,2014, 2015 or 2017.	-
Animal Burrows	N	-	-	-	-	-	-	-	-	-	-	-
Vegetation	Y	O	Southeast corner	553,339	7,580,299	10	5	-	0.7%	Sparse vegetation (Acceptable)	Unchanged since previous observation (Feature M in 2015 report)	111
Staining	Y	F	NE corner crest	553,306	7,580,336	0.3	0.3	-	0.0007%	Small hydrocarbon stain (Acceptable)	Unchanged since previous observation	95

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
Vegetation Stress	N	-	-	-	-	-	-	-	-	-	-	-
Seepage	N	-	-	-	-	-	-	-	-	-	-	-
Ponded/ Running Water	Y	J	West toe	553,263	7,580,270	80	1	0.2	1.1%	Ephemeral stream along toe (Acceptable)	Slightly narrower	90,100
	Y	E	South toe	553,271	7,580,267	70	3	0.2	3%	Ponded/Running water along toe (Acceptable)	Slightly wider	101
			South toe	553,339	7,580,285							94
	Y	N	East toe	553,355	7,580,293	60	2	0.2	1.7%	Wet area and ponded water (Acceptable)	Extended length	110
	Y	P	Cover Surface	553,333	7,580,298	1	0.5	0.1	0.01%	Ponded water (Acceptable)	New	112
				553,325	7,580,315	4	4	0.1	0.2%	Ponded water (Acceptable)	New	113
				553,289	7,580,296	5	4	0.1	0.3%	Ponded water (Acceptable)	New	115
				553,294	7,580,303	1	1	0.1	0.01%	Ponded water (Acceptable)	New	116
	Y	Q	North toe	553,292	7,580,359	6	2	0.2	0.2%	Ponded water (Acceptable)	New	114
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-09, 11,12	-	-	-	-	-	-	-	Monitoring wells intact	MW-10 previously decommissioned	-
Features of Note / Other Observations	N	-	-	-	-	-	-	-	-	-	-	-

Landfill Area = 7,020 m^2.

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

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	Isolated
Staining	Acceptable	Isolated
Vegetation Stress	Not observed	-
Seepage/Ponded/Running Water	Acceptable	Occasional
Debris and/or liner exposure	Not observed	-
Other	Not observed	-
Overall Landfill Performance	**Acceptable**	

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

Photo	Easting	Northing	Date
Photo 79	553,327	7,580,314	Aug 11, 2017
Photo 80	553,307	7,580,344	Aug 11, 2017
Photo 81	553,279	7,580,340	Aug 11, 2017
Photo 82	553,250	7,580,315	Aug 11, 2017
Photo 83	553,266	7,580,290	Aug 11, 2017
Photo 84	553,309	7,580,319	Aug 11, 2017
Photo 85	553,338	7,580,302	Aug 11, 2017
Photo 86	553,301	7,580,353	Aug 11, 2017
Photo 87	553,334	7,580,296	Aug 11, 2017
Photo 88	553,288	7,580,273	Aug 11, 2017
Photo 89	553,241	7,580,333	Aug 11, 2017
Photo 90	553,231	7,580,333	Aug 11, 2017
Photo 91	553,294	7,580,355	Aug 11, 2017
Photo 92	553,283	7,580,344	Aug 11, 2017
Photo 93	553,293	7,580,290	Aug 11, 2017
Photo 94	553,339	7,580,285	Aug 11, 2017
Photo 95	553,306	7,580,336	Aug 11, 2017
Photo 96	553,266	7,580,290	Aug 11, 2017

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

Photo	Easting	Northing	Date
Photo 97	553,302	7,580,286	Aug 11, 2017
Photo 98	553,322	7,580,289	Aug 11, 2017
Photo 99	553,289	7,580,283	Aug 11, 2017
Photo 100	553,263	7,580,270	Aug 11, 2017
Photo 101	553,271	7,580,267	Aug 11, 2017
Photo 102	553,251	7,580,339	Aug 11, 2017
Photo 103	553,263	7,580,340	Aug 11, 2017
Photo 104	553,322	7,580,324	Aug 11, 2017
Photo 105	553,311	7,580,341	Aug 11, 2017
Photo 106	553,319	7,580,330	Aug 11, 2017
Photo 107	553,325	7,580,318	Aug 11, 2017
Photo 108	553,336	7,580,309	Aug 11, 2017
Photo 109	553,334	7,580,291	Aug 11, 2017
Photo 110	553,357	7,580,296	Aug 11, 2017
Photo 111	553,339	7,580,299	Aug 11, 2017
Photo 112	553,333	7,580,298	Aug 11, 2017
Photo 113	553,325	7,580,315	Aug 11, 2017
Photo 114	553,292	7,580,359	Aug 11, 2017
Photo 115	553,289	7,580,296	Aug 11, 2017
Photo 116	553,294	7,580,303	Aug 11, 2017

4.2.3 Summary of Scope Deviations

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

- The deep soil sample at MW-09 could not be collected due to refusal on rock.

4.2.4 Soil Sampling

Table 4-8 presents a summary of analytical results for soil samples collected at the Non-Hazardous Waste Landfill. MW-12 represents an upgradient sampling location whereas MW-11 and MW-09 represent cross-gradient sampling locations.

Table 4-8 also lists the arithmetic mean background and baseline values for the landfill, in addition to the baseline mean plus 3σ limits. At the Non-Hazardous Waste Landfill, the background arithmetic means for chromium, cobalt, nickel, zinc and PCB are greater than the baseline arithmetic means. Additionally, the arithmetic mean baseline and the baseline concentrations plus 3σ are the same for PCB and all metals with the exception of copper, nickel and zinc, which reflects the fact that baseline concentrations of these parameters were primarily at or below laboratory detection limits.

MW-12

Sampling location MW-12 is located upgradient of the landfill, approximately 14 m southeast of the southern toe of the landfill. The estimated elevation of this sampling point is 98 masl. As shown in Photograph 125 (Appendix D), the area is covered with loose coarse sand, gravel and stones and is not vegetated. The soil in the area of the sample location consisted of brown sand matrix with pink and grey igneous gravel, pebbles and stone.

For the shallow sample at MW-12 (0-15 cm), the concentrations of all metals were less than or similar to those reported in previous years. No exceedances of the baseline concentrations plus 3σ were reported in 2017. No arsenic, cadmium, PHC or PCB were detected at this location in 2017.

The deep sample at MW-12 (40-50 cm, duplicate location) exhibited similar metals concentrations to the shallow sample. The concentrations of metals were similar to or less than those reported in previous years. No exceedances of the baseline concentrations plus 3σ were reported in 2017. No arsenic, cadmium, PHC or PCB were detected at this location in 2017.

MW-09

Sampling location MW-09 is located cross-gradient of the landfill, approximately 12 m north of the northern toe of the landfill. The estimated elevation of this sampling point is 95.5 masl. As shown in Photograph 117 (Appendix D), some ponding of water was observed near the toe of the landfill in this area. The area is generally covered with coarse sand, gravel and boulders with sparse vegetation. The soil in the area of the sample location consisted of wet brown sand matrix with pink and grey igneous gravel, pebbles and stone. Water entered the hole shortly after excavation.

For the shallow sample at MW-09 (0-15 cm), the concentration of chromium was greater than those reported in previous years, whereas the concentrations of the other metals were similar. The concentration of cobalt exceeded the baseline mean concentration plus 3σ, although as noted above, this standard is the same as the baseline mean value. No arsenic, cadmium, PCB or PHC were detected at this location in 2017.

MW-11

Sampling location MW-11 is located cross-gradient of the landfill, approximately 19 m south of the southern toe of the landfill. The estimated elevation of this sampling point is 96 masl. As shown in Photograph 121 (Appendix D), there was surface water in the area of MW-11 likely from precipitation and snow melt south of the landfill. The area generally consists of sand and gravel, with cobbles and stone and is sparsely vegetated. The soil in the area of the sample location consisted of grey sand matrix with predominantly pink and grey igneous gravel, pebbles and stone. Seepage entered the hole shortly after excavation.

For the shallow sample at MW-11 (0-15 cm), the concentrations of all metals were less than or similar to those reported in previous years. No exceedances of the baseline concentrations plus 3σ were reported in 2017. No arsenic, cadmium, PHC or PCB were detected at this location in 2017.

The deep sample at MW-11 (40-50 cm) exhibited metals concentrations greater than those in the shallow sample. The concentrations of all detected metals were greater than those reported in previous years. The concentrations of chromium and cobalt exceeded their respective baseline mean concentration plus 3σ, although as noted above, the standard for these parameters is the same as the baseline mean value. No arsenic, cadmium, PHC or PCB were detected at this location in 2017.

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

ID	Depth (cm)	As (mg/kg)	Cd (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Ni (mg/kg	Zn (mg/kg)	Total PCB (mg/kg)	F1 (mg/kg)	F2 (mg/kg)	F3 (mg/kg)	F4 (mg/kg)
Background Mean		0.83	1.0	21.8	9.5	10.5	10.0	14.0	31.0	0.100	NA	NA	NA	NA
Baseline Mean		**1.0**	**1.0**	**20.0**	**5.0**	**12.0**	**10.0**	**7.1**	**25.9**	**0.003**	**NA**	**NA**	**NA**	**NA**
Baseline + 3σ		1.0	1.0	20.0	5.0	39.1	10.0	15.5	44.5	0.003	NA	NA	NA	NA
Upgradient														
MW-12 Shallow	0-15	<1.0	<0.5	9.1	4.3	9.0	5.2	6.6	**26.1**	<0.05	<7	<4	<8	<6
MW-12 Deep	40-50	<1.0	<0.5	10.2	4.6	10.5	5.4	7.0	25.3	<0.05	<7	<4	<8	<6
MW-912 Deep (Duplicate)	40-50	<1.0	<0.5	10.3	4.2	9.7	4.8	6.5	23.4	<0.05	<7	<4	<8	<6
MW-12 Deep (Dup Avg)	40-50	<1.0	<0.5	10.3	4.4	10.1	5.1	6.8	24.4	<0.05	<7	<4	<8	<6
Cross-gradient														
MW-09 Shallow	0-15	<1.0	<0.5	18.5	**6.1**	7.7	6.5	**9.9**	**43.0**	<0.05	<7	<4	<8	<6
MW-09 Deep [1]														
MW-11 Shallow	0-15	<1.0	<0.5	13.8	3.6	7.4	3.8	**7.7**	18.1	<0.05	<7	<4	<8	<6
MW-11 Deep	40-50	<1.0	<0.5	**23.7**	**6.3**	**13.0**	6.2	**14.2**	**30.0**	<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: The deep soil sample at MW-09 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.

MW-12

The depth to groundwater measured at MW-12 in 2017 was 0.65 m below grade. The concentration of zinc, the only parameter detected at this location, was less than the concentration reported in 2013 (0.038 mg/L) but greater than 2015 (less than 0.005 mg/L). The concentration of zinc remained well below the baseline mean concentration plus 3σ. No arsenic, cadmium, chromium, cobalt, copper, lead, nickel or PHC were detected at this location in 2017.

MW-09

The depth to groundwater measured at MW-09 in 2017 was 0.22 m below grade. The concentrations of copper and lead, the only parameters detected at this location, were less than the concentrations reported in 2013 and 2015. The concentrations of copper and lead remained well below their baseline mean concentration plus 3σ. No arsenic, cadmium, chromium, cobalt, nickel, zinc or PHC were detected at this location in 2017.

MW-11

The depth to groundwater measured at MW-11 in 2017 was 0.21 m below grade. The concentrations of copper, lead and zinc, the only parameters detected at this location, were less than the concentrations reported in previous years. The concentrations of copper, lead and zinc remained well below their baseline mean concentration plus 3σ. No arsenic, cadmium, chromium, cobalt, nickel or PHC were detected at this location in 2017.

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

ID	GW Depth BGS (m)	As (mg/L)	Cd (mg/L)	Cr (mg/L)	Co (mg/L)	Cu (mg/L)	Pb (mg/L)	Ni (mg/L)	Zn (mg/L)	F1 (mg/L)	F2 (mg/L)	F3 (mg/L)	F4 (mg/L)
Baseline Mean		**0.003**	**0.001**	**0.039**	**0.003**	**0.050**	**0.010**	**0.021**	**0.051**	**NA**	**NA**	**NA**	**NA**
Baseline + 3σ		0.003	0.001	0.147	0.003	0.218	0.010	0.082	0.209	NA	NA	NA	NA
Upgradient													
MW-12	0.65	<0.001	<0.0001	<0.001	<0.0005	<0.0005	<0.0001	<0.001	0.007	<0.025	<0.1	<0.1	<0.1
Cross-gradient													
MW-09	0.22	<0.001	<0.0001	<0.001	<0.0005	0.0008	0.0004	<0.001	<0.005	<0.025	<0.1	<0.1	<0.1
MW-11	0.21	<0.001	<0.0001	<0.001	<0.0005	0.0005	0.0001	<0.001	0.01	<0.025	<0.1	<0.1	<0.1

Notes:

ID: Monitoring well location ID.

GW: Groundwater.

BGS: Below ground surface.

NA: Not available

Bold Values: Results exceed Baseline arithmetic mean.

Groundwater metals analyses were for dissolved metals.

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

The Non-Hazardous Waste Landfill has been assessed to have an “Acceptable” overall landfill performance. Although ponding of water along the toe has increased in extent since the last inspection it does not appear to be impacting landfill stability to date. Previous inspections reported erosion from the running water along the east and south toe, however the areas with running water leading to the ephemeral stream along the west toe appear to have become self-armoured and no active erosion was observed during the 2017 inspection. Observed minor settlement and stain features were assessed as “Acceptable”. No cracks have been observed at this landfill since 2012.

Concentrations of most metals in soil were highest overall at the deep sample location MW-11. At this location, the concentrations of all detected metals were greater than those reported in previous years and the concentrations of chromium and cobalt exceeded their respective baseline mean concentration plus 3σ. At all other locations, the concentrations of most metals were less than or similar to previous years. For the shallow sample at MW-09, the concentration of cobalt exceeded the baseline mean concentration plus 3σ, although as noted above, the standard for these parameters is the same as the baseline mean value. No detectable concentrations of arsenic, cadmium, PCB or PHC were noted in any of the soil samples in 2017.

In 2017, groundwater samples were collected from all three monitoring wells adjacent to the landfill and the only detected parameters in any of three samples were of copper, lead and zinc. The concentrations of all metals were lower than those reported in previous years. No detectable concentrations of arsenic, cadmium, chromium, cobalt, nickel or PHC were noted in any of the groundwater samples in 2017. It is noted that the groundwater samples collected in 2017 were filtered in the lab, and therefore the results represent dissolved metals instead of total metals. An overall trend comparison on the impact of results based on total versus dissolved metals will be prepared in 2018.

Comparison of groundwater elevations based on estimated grade elevation and the measured water depth in the wells indicates that groundwater was highest at MW-12 and lowest towards MW-09. It is noted that the swale in the south part of the landfill contained water. Given that this area is approximately 1 metre or more lower in elevation compared to the wells to the south, this indicates that the water in the swale likely represents an expression of the local water table.

Whereas a number of the environmental sampling results are less than or the same as previous sampling sessions, elevated parameters and increases in some cases (e.g., deep soil sample at MW-11) may be reflective of an ongoing impact from the landfill. However, there is currently insufficient data (i.e., 3 data points for deep soil sample at MW-11) to establish a reliable trend that indicates soil quality impact from the landfill. Based on the results, there does not appear to be significant impact to groundwater quality from the landfill.

4.2.7 Recommendations for Non-Hazardous Waste Landfill

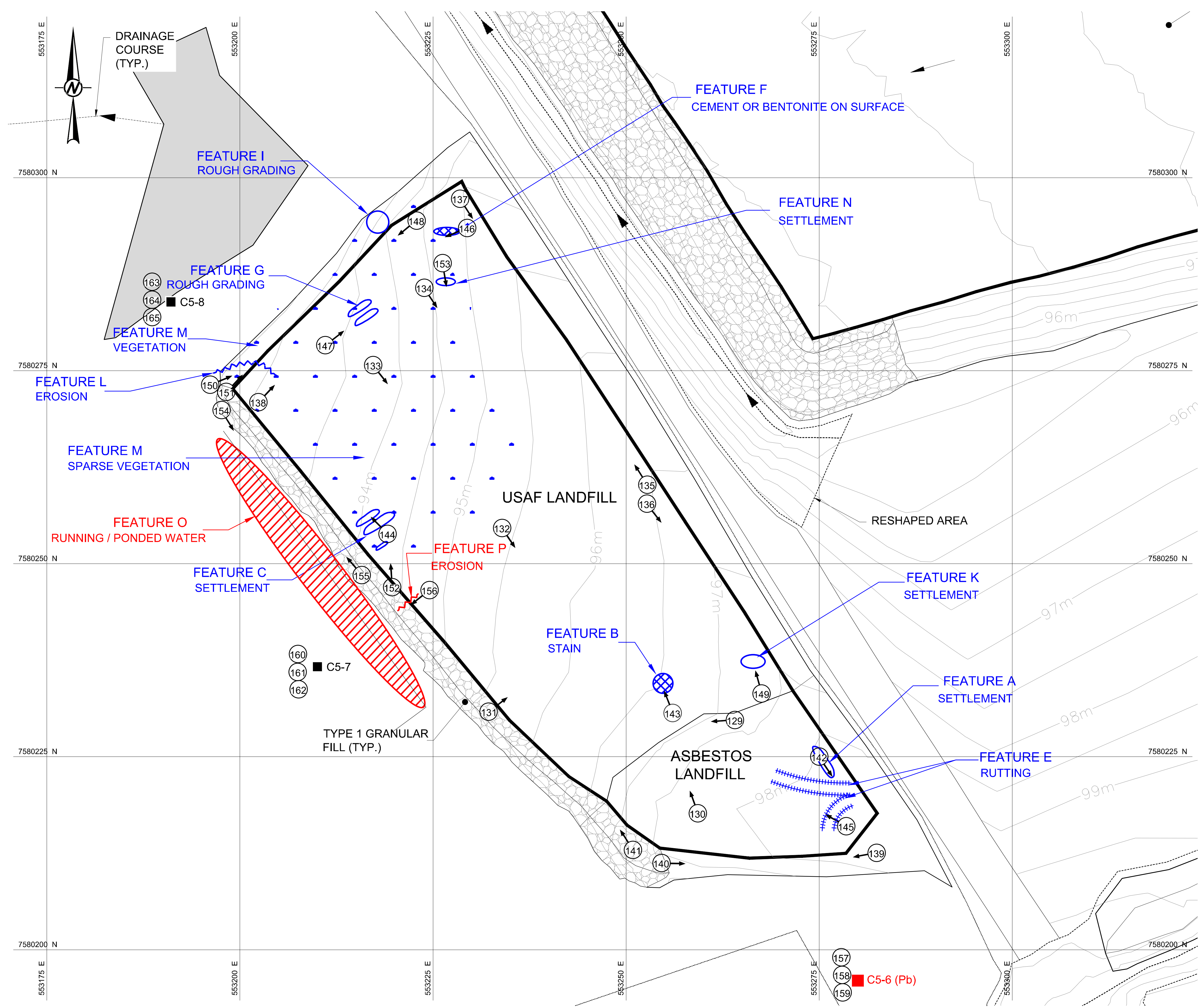
No modifications to the ongoing monitoring program at this landfill are recommended.

4.3 USAF & Asbestos Landfill

4.3.1 Landfill Description

The USAF & Asbestos Landfill is located in the Middle Site Area, west of the main road. This landfill was constructed during the closure of the site in 1992. The remediation of these landfills consisted of regrading. The USAF & Asbestos landfill, including the regraded sideslopes, covers an area approximately 4,100 m^2.

The long-term monitoring plan consists of visual inspection and collection of soil samples. Approximate locations for the collection of soil samples are identified in Figure CAM-5.4.



LEGEND

- BODY OF WATER
- SOIL SAMPLE
- SOIL SAMPLE LOCATION WITH EXCEEDANCE OF BASELINE MEAN PLUS 3σ
- PHOTOGRAPH LOCATION (139)
- SETTLEMENT / ROUGH GRADING
- RUTTING
- VEGETATION
- PONDING
- STAINING
- EROSION
- ELEVATION CONTOUR (0.5m INT.) (96m)
- DRAINAGE
- LANDFILL RIP RAP

NOTES

1. GRID PROJECTION IS NAD83 ZONE 16N. ELEVATIONS ARE GEODETIC.
2. *LOCATIONS AND SCALE OF FEATURES ARE APPROXIMATE AND SHOWN FOR ILLUSTRATIVE PURPOSES ONLY.*
3. FEATURES DRAWN IN RED ARE EITHER NEW OR EXPANDED.

REFERENCE

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

0 10 20
1:500 METRES

CLIENT
DEPARTMENT OF NATIONAL DEFENCE CANADA

PROJECT
2017 CAM-5 MONITORING REPORT

TITLE
USAF AND ASBESTOS LANDFILL

CONSULTANT
GOLDER

YYYY-MM-DD	2018-03-13
DESIGNED	RM
PREPARED	TDR
REVIEWED	DCJ
APPROVED	DP

PROJECT NO.	PHASE	REV.	FIGURE
1530908	3000	A	CAM-5.4

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

4.3.2 Visual Inspection

The USAF and Asbestos Landfill exhibits settlement, erosion, staining, vegetation and ponded water features. 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 landfill performance because all observed features were assessed as “Acceptable”. No cracking, sloughing or exposed waste was observed at this landfill. Some of the features identified at the landfill appear to be a result of anthropogenic activities and are not related to landfill performance (e.g., small hydrocarbon stain (Feature B), spilled cement or bentonite (Feature F) and rutting caused by vehicles (Feature E)). Table 4-12 is a log of photographs taken during the 2017 visual inspection.

The extent of sparse vegetation (Feature M) has increased on the north slope and cover surface since previous observations. The extent of previously observed ponded and running water along the west toe (Feature O) has increased towards the north but this area has cobbles and boulders that should provide erosion protection. Previously observed self-armouring erosion (Feature L) does not appear to be deteriorating (i.e., experiencing increased erosion) with time. The previously observed rough area with minor erosion (Feature I) and rough area with minor settlement (Feature G) were unchanged since the last inspection. A new area of minor self-armouring erosion (Feature P) was observed on the west slope but it is considered insignificant. Previously observed minor settlement depressions (Features A, C, K and N) are considered insignificant. There is one previously identified small hydrocarbon stain (Feature B) on the crest surface which appears to be unrelated to landfill performance and is considered insignificant.

Table 4-10: Visual Inspection Checklist – USAF & Asbestos Landfill

SITE NAME: CAM-5 Mackar Inlet
LANDFILL DESIGNATION: USAF & Asbestos Landfill
DATE OF INSPECTION: August 11, 2017
DATE OF PREVIOUS INSPECTION: August 23, 2015
INSPECTED BY: Reza Moghaddam
REPORT PREPARED BY: Reza Moghaddam
MONITORING EVENT NUMBER: 6
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 – USAF & Asbestos 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	Comparison to Historical Observations	Photos
Settlement	Y	A	Southeast crest surface	553,275	7,580,225	2	0.6	0.2	0.03%	Linear depression (Acceptable)	Unchanged since previous observation	142
	Y	C	West crest surface	553,219	7,580,254	0.3	0.3	0.1	0.002%	Minor settlement (Acceptable)	Unchanged since previous observation	144
	Y	G	North crest surface	553,211	7,580,278	5	0.3	0.2	0.04%	Rough area with minor settlement (Acceptable)	Unchanged since previous observation with some vegetation	147
	Y	K	Southeast crest surface	553,268	7,580,233	1	0.3	0.1	0.007%	Linear depression (Acceptable)	Unchanged since previous observation	149
	Y	N	Northeast crest surface	553,226	7,580,289	0.3	0.3	0.1	0.002%	Minor settlement (Acceptable)	Unchanged since previous observation (Feature J in 2015 report)	153
Erosion	Y	E	Southeast crest surface	553,278	7,580,216	5	5	0.1	0.6%	Vehicle rutting with minor erosion (Acceptable)	Previously noted as rutting. Unchanged since previous observation	145
	Y	L	Northwest slope	553,197	7,580,272	3	2	0.1	0.1%	Minor erosion channel (Acceptable)	Previously noted as rutting. Combined width for the area.	150

Table 4-10: Visual Inspection Checklist – USAF & Asbestos 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	Comparison to Historical Observations	Photos
Erosion	Y	I	Northwest slope	553,223	7,580,294	5	5	-	0.6%	Rough area with minor erosion (Acceptable)	Unchanged since previous observation (Feature M in 2015 report)	148
	Y	P	West slope	553,225	7,580,247	6	0.3	0.03	0.04%	Self-armouring erosion (Acceptable)	New	156
	N	H	Beyond east slope	-	-	-	-	-	-	Erosion	Reported in 2014 but outside the landfill.	-
Lateral Movement	N	-	-	-	-	-	-	-	-	-	-	-
Frost Action	N	-	-	-	-	-	-	-	-	-	-	-
Sloughing	N	-	-	-	-	-	-	-	-	-	-	-
Cracking	N	-	-	-	-	-	-	-	-	-	-	-
Animal Burrows	N	-	-	-	-	-	-	-	-	-	-	-
Vegetation	Y	M	North slope	553,198	7,580,272	40	3	-	3%	Sparse vegetation (Acceptable)	Expanded Area (Feature H in 2015 report)	151
			Northwest end of crest surface	553,220	7,580,247	40	40	-	38%	Sparse vegetation (Acceptable)	Unchanged since previous observation (Feature H in 2015 report)	152

Table 4-10: Visual Inspection Checklist – USAF & Asbestos 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	Comparison to Historical Observations	Photos
Staining	Y	B	South central crest	553,256	7,580,231	0.4	0.2	-	0.002%	Small hydrocarbon stain (Acceptable)	Unchanged since previous observation	143
Vegetation Stress	N	-	-	-	-	-	-	-	-	-	-	-
Seepage or Ponded Water	Y	O	West toe	553,198	7,580,270	45	5	0.2	5.4%	Ponded and running water along toe (Acceptable)	Expanded Area (Feature I in 2015 report)	154 and 155
Debris and/or Liner Exposed	N	J	Cover surface	-	-	-	-	-	-	Landfill plaque	Reported in 2014 but not observed in 2015 or 2017.	-
Presence / Condition of Monitoring Instruments	N	-	-	-	-	-	-	-	-	-	-	-
Features of Note / Other Observations	N	D	Southeast crest	-	-	-	-	-	-	Wooden survey stake	Not observed in 2017.	-
	Y	F	Northeast crest surface	553,229	7,580,293	3	3	-	0.2%	Bentonite or cement on surface (Acceptable)	Previously identified as fertilizer. Unchanged since previous observation.	146

Landfill Area = 4,150 m^2.

Table 4-11: Preliminary Stability Assessment – USAF & Asbestos Landfill

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	Acceptable	Isolated
Vegetation Stress	Not observed	-
Seepage/Ponded Water	Acceptable	Isolated
Debris and/or liner exposure	Not observed	-
Other	Acceptable	Isolated
Overall Landfill Performance	**Acceptable**	

Table 4-12: Summary Table of Photographic Log – USAF & Asbestos Landfill

Photo	Easting	Northing	Date
Photo 129	553,264	7,580,230	Aug 11, 2017
Photo 130	553,259	7,580,218	Aug 11, 2017
Photo 131	553,232	7,580,231	Aug 11, 2017
Photo 132	553,234	7,580,255	Aug 11, 2017
Photo 133	553,217	7,580,276	Aug 11, 2017
Photo 134	553,224	7,580,286	Aug 11, 2017
Photo 135	553,253	7,580,258	Aug 11, 2017
Photo 136	553,253	7,580,258	Aug 11, 2017
Photo 137	553,229	7,580,297	Aug 11, 2017
Photo 138	553,202	7,580,271	Aug 11, 2017
Photo 139	553,282	7,580,213	Aug 11, 2017
Photo 140	553,255	7,580,211	Aug 11, 2017
Photo 141	553,251	7,580,213	Aug 11, 2017
Photo 142	553,275	7,580,225	Aug 11, 2017
Photo 143	553,256	7,580,231	Aug 11, 2017
Photo 144	553,219	7,580,254	Aug 11, 2017
Photo 145	553,278	7,580,216	Aug 11, 2017
Photo 146	553,229	7,580,293	Aug 11, 2017
Photo 147	553,211	7,580,278	Aug 11, 2017

Table 4-12: Summary Table of Photographic Log – USAF & Asbestos Landfill

Photo	Easting	Northing	Date
Photo 148	553,223	7,580,294	Aug 11, 2017
Photo 149	553,268	7,580,233	Aug 11, 2017
Photo 150	553,197	7,580,272	Aug 11, 2017
Photo 151	553,198	7,580,272	Aug 11, 2017
Photo 152	553,220	7,580,247	Aug 11, 2017
Photo 153	553,226	7,580,289	Aug 11, 2017
Photo 154	553,198	7,580,270	Aug 11, 2017
Photo 155	553,216	7,580,249	Aug 11, 2017
Photo 156	553,225	7,580,247	Aug 11, 2017

4.3.3 Summary of Sampling Deviations

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

- The deep soil sample at C5-6 could not be collected due to refusal on rock.

4.3.4 Soil Sampling

Table 4-13 presents a summary of analytical results for soil samples collected at the USAF & Asbestos Landfill. C5-6 represents an upgradient sampling location, C5-7 represents a cross-gradient sampling location and C5-8 represents a downgradient sampling location.

Table 4-13 also lists the arithmetic mean background and baseline values for the landfill, in addition to the baseline mean plus 3σ limits. At the USAF & Asbestos Landfill, the background arithmetic means for chromium, cobalt, copper, nickel, zinc and PCB are greater than the baseline arithmetic means. Additionally, the arithmetic mean baseline and the baseline concentrations plus 3σ are the same for PCB, arsenic, cadmium, chromium and lead, which reflects the fact that baseline concentrations of these parameters were primarily at or below laboratory detection limits.

C5-6

Sampling location C5-6 is located upgradient of the landfill, approximately 20 m south of the southern toe of the landfill. The estimated elevation of this sampling point is 98 masl. As shown in Photograph 157 (Appendix D), the area consists of sand and stones with some vegetation. The soil in the area of the sample location consisted of brown sand matrix with igneous gravel, pebbles and stone.

For the shallow sample at C5-6 (0-15 cm), the concentrations of all metals were less than or similar to those reported in previous years. The concentration of lead exceeded the baseline concentration plus 3σ; however, as noted above, this standard is the same as the baseline mean for this parameter. No arsenic, cadmium, PHC or PCB were detected at this location in 2017.

C5-7

Sampling location C5-7 is located cross-gradient of the landfill, approximately 28 m west of the western toe of the landfill. The estimated elevation of this sampling point is 94.5 masl. As shown in Photograph 160 (Appendix D), the area consists of a boulder pavement with a soil matrix of and loose coarse sand gravel and stones with sparse vegetation. The soil in the area of the sample location consisted of a wet, brown sand matrix with pink and grey igneous gravel, pebbles and stone. Seepage filled the excavated hole soon after it was dug.

For the shallow sample at C5-7 (0-15 cm), the concentrations of all metals were less than or similar to those reported in previous years, however an overall decreasing trend is noted for a number of these parameters that will require additional data points to confirm reliability (only four data points at present). No exceedances of the baseline concentrations plus 3σ were reported in 2017. No arsenic, cadmium, PHC or PCB were detected at this location in 2017.

For the deep sample at C5-7 (40-50 cm, duplicate location), metals concentrations were less than those in the shallow sample, however as noted for the shallow sample, an overall decreasing trend is noted for a number of these parameters that will require additional data points to confirm reliability. The concentrations of all metals were less than or similar to those reported in previous years. No exceedances of the baseline concentrations plus 3σ were reported in 2017. No arsenic, cadmium, PHC or PCB were detected at this location in 2017.

C5-8

Sampling location C5-8 is located downgradient of the landfill, approximately 13 m northwest of the northern toe of the landfill. The estimated elevation of this sampling point is 92 masl. As shown in Photograph 163 (Appendix D), the area consists of a boulder pavement with a soil matrix of coarse sand and gravel with sparse vegetation. The soil in the area of the sample location consisted of brown sand matrix with gravel and stone. The excavation filled with groundwater soon after it was dug.

For the shallow sample at C5-8 (0-15 cm), the concentrations chromium, cobalt, copper and nickel were greater than those reported in previous years whereas the concentrations of all other metals were less than or similar. No exceedances of the baseline concentrations plus 3σ were reported in 2017. No arsenic, cadmium, PHC or PCB were detected at this location in 2017.

The deep sample at C5-8 (40-50 cm) exhibited similar metals concentrations to those in the shallow sample. The concentrations of all metals were less than or similar to those reported in previous years. No exceedances of the baseline concentrations plus 3σ were reported in 2017. No arsenic, cadmium, PHC or PCB were detected at this location in 2017.

Table 4-13: Soil Chemical Analysis Results – USAF & Asbestos Landfill

ID	Depth (cm)	As (mg/kg)	Cd (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Ni (mg/kg	Zn (mg/kg)	Total PCB (mg/kg)	F1 (mg/kg)	F2 (mg/kg)	F3 (mg/kg)	F4 (mg/kg)
Background Mean		0.83	1.0	21.8	9.5	10.5	10.0	14.0	31.0	0.100	NA	NA	NA	NA
Baseline Mean		**1.0**	**1.0**	**20.0**	**6.4**	**9.5**	**10.0**	**7.5**	**27.3**	**0.003**	**NA**	**NA**	**NA**	**NA**
Baseline + 3σ		1.0	1.0	20.0	13.6	22.4	10.0	13.8	48.1	0.003	NA	NA	NA	NA
Upgradient														
C5-6 Shallow	0-15	<1.0	<0.5	16.4	**7.6**	**9.6**	**10.2**	**8.6**	**30.3**	<0.05	<7	<4	<8	<6
C5-6 Deep [1]														
Cross-gradient														
C5-7 Shallow	0-15	<1.0	<0.5	10.8	4.8	**12.7**	6.2	**8.8**	25.7	<0.05	<7	<4	<8	<6
C5-7 Deep	40-50	<1.0	<0.5	10.0	4.1	9.3	3.5	6.6	21.4	<0.05	<7	<4	<8	<6
C5-97 Deep (Duplicate)	40-50	<1.0	<0.5	10.7	4.4	**10.6**	4.8	7.5	24.5	<0.05	<7	<4	<8	<6
C5-7 Deep (Dup avg)	40-50	<1.0	<0.5	10.4	4.3	**10.0**	4.2	7.1	23.0	<0.05	<7	<4	<8	<6
Downgradient														
C5-8 Shallow	0-15	<1.0	<0.5	15.5	5.9	**18.4**	5.3	**11.0**	**32.3**	<0.05	<7	<4	<8	<6
C5-8 Deep	40-50	<1.0	<0.5	15.6	5.7	**17.5**	5.9	**11.4**	**32.2**	<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: The deep soil sample at C5-6 could not be collected due to refusal on rock.

4.3.5 Conclusions and Overall Performance of the USAF & Asbestos Landfill

Minor settlement, erosion, staining, vehicle rutting and ponded water features were observed at the USAF and Asbestos Landfill. This landfill was assessed to have an “Acceptable” overall landfill performance because all observed features were assessed as “Acceptable.” No cracking, sloughing or exposed waste was observed at this landfill. Some establishment of sparse vegetation was observed on the north slope and cover surface.

The concentrations of copper and zinc in the soil samples were highest at the shallow C5-8 sample location whereas the concentrations of chromium, cobalt and lead were highest at the shallow C5-6 location, although not significantly so. At the shallow C5-8 location, the concentrations chromium, cobalt, copper and nickel were greater than those reported in previous years, although not significantly so. The only exceedance of the baseline concentration plus 3σ was the concentration of lead in the shallow C5-6 sample. The concentrations of all metals at this location, including lead, were less than or similar to those reported in previous years, which was similarly the case for all remaining sampling locations. No detectable concentrations of arsenic, cadmium, PCB or PHC were noted in any of the samples in 2017.

Overall, the concentrations of metals at most locations were less than or similar to previous years, whereas slight increases in a number of parameters were observed at the shallow C5-8 sample location. These increases are not significant enough to warrant concern, but should continue to be assessed. An overall decreasing trend is noted for a number of these metal concentrations at C5-7, which will require collection of additional data to confirm reliability.

4.3.6 Recommendations for USAF & Asbestos Landfill

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

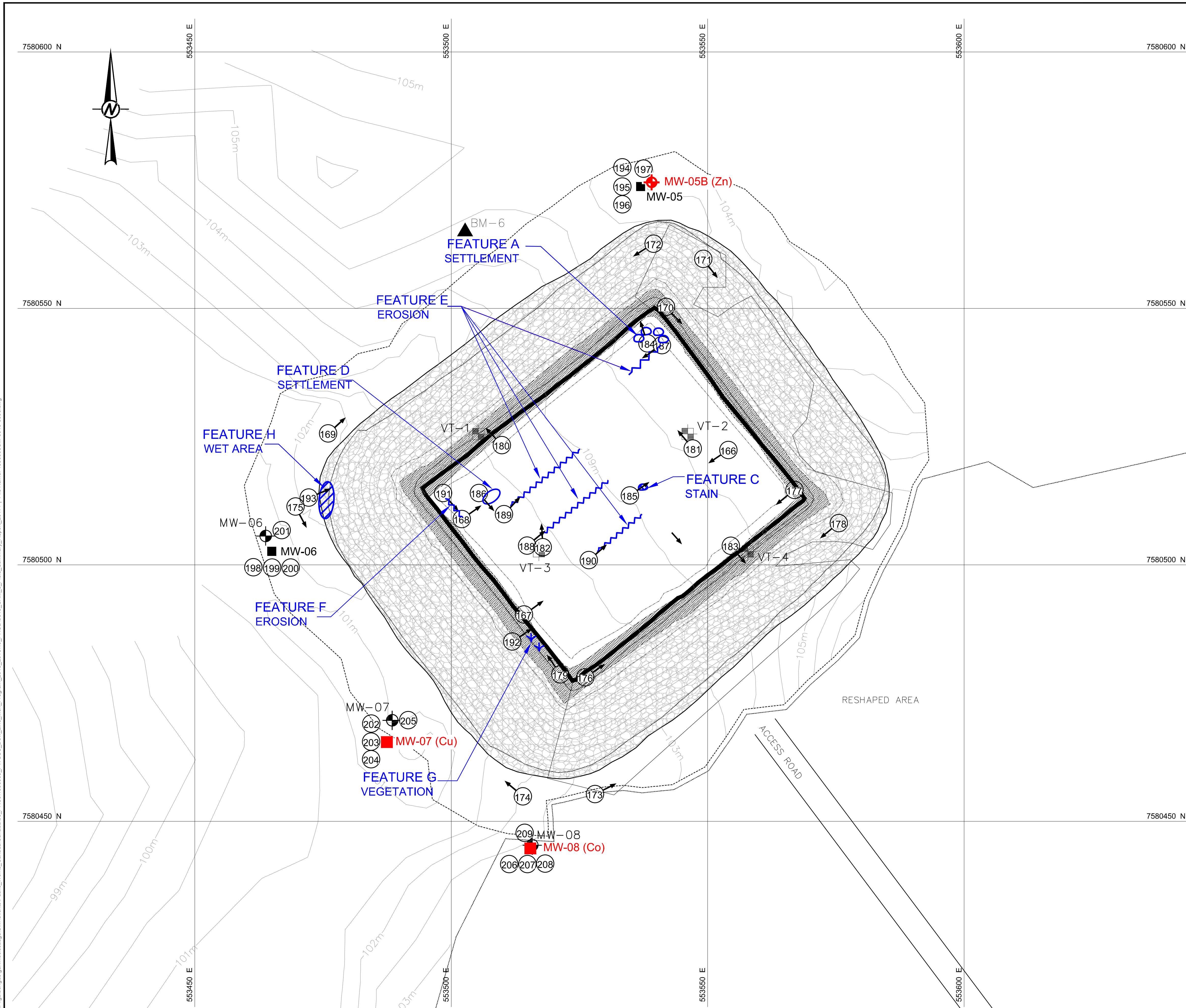
4.4 Tier II Disposal Facility

4.4.1 Landfill Description

A Tier II Disposal Facility was constructed at the CAM-5 site for disposal of Tier II soil excavated during the clean-up. The Facility is located in the Middle Site Area, northeast of the Non-Hazardous Waste Landfill. The landfill covers an area approximately 7,200 m^2.

The design of this landfill included a double containment system consisting of a geosynthetic base liner and cover and the placement of sufficient granular cover fill to promote freezing of landfill contents. The liner was placed along the bottom of the landfill, along the berms, and over the top of the landfill contents.

Four thermistor strings were installed within the landfill. Four groundwater monitoring wells were installed near the landfill perimeter. The long-term monitoring plan consists of periodic visual inspection, collection of soil and groundwater samples (at wells MW-05 through MW-08), and monitoring of subsurface ground temperatures in the berms and in the main body of the disposal facility. Approximate locations for the collection of soil and groundwater samples, and thermistor installation locations are identified in Figure CAM-5.5.



LEGEND

- BM-6 PERMANENT BENCHMARK LOCATION
- MONITORING WELL LOCATION
- MONITORING WELL LOCATION WITH EXCEEDANCE OF BASELINE MEAN PLUS 3σ
- BACKGROUND MONITORING WELL LOCATION
- GROUND TEMPERATURE CABLE LOCATION
- SOIL SAMPLE LOCATION
- SOIL SAMPLE LOCATION WITH EXCEEDANCE OF BASELINE MEAN PLUS 3σ
- 192 PHOTOGRAPH LOCATION
- SETTLEMENT
- STAINING
- EROSION
- PONDNG
- VEGETATION
- 103m ELEVATION CONTOUR (0.5m INT.)
- LANDFILL RIP RAP

NOTES

1. GRID PROJECTION IS NAD83 ZONE 16N. ELEVATIONS ARE GEODETIC.
2. *LOCATIONS AND SCALE OF FEATURES ARE APPROXIMATE AND SHOWN FOR ILLUSTRATIVE PURPOSES ONLY.*
3. FEATURES DRAWN IN RED ARE EITHER NEW OR EXPANDED.

REFERENCE

ORIGINAL 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
2017 CAM-5 MONITORING REPORT

TITLE
TIER II DISPOSAL FACILITY

CONSULTANT
GOLDER

YYYY-MM-DD	2018-03-13
DESIGNED	RM
PREPARED	TDR
REVIEWED	DCJ
APPROVED	DP

PROJECT NO.	PHASE	REV.	FIGURE
1530908	3000	A	CAM-5.5

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

4.4.2 Visual Inspection

The Tier II Disposal Facility had some minor settlement, erosion, staining, vegetation and wet area features. 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 landfill performance because all observed features were assessed as “Acceptable”. No cracking was observed at this landfill. Table 4-16 is a log of photographs taken during the 2017 visual inspection.

Two previously observed areas of minor settlement depressions (Features A and D) are considered insignificant. Seepage on the southeast slope and toe (Feature B) previously reported in 2012 was not reported in 2013 and 2015 and not observed in 2017. There is a previously identified small hydrocarbon stain (Feature C) on the crest surface which is unrelated to landfill performance and is considered insignificant. Sparse vegetation (Feature G) was observed on the west slope. Previously observed minor self-armouring erosion on the cover surface (Feature E) have not changed significantly (Photos 187-190 in Appendix D). The previously observed ponded water in the northwest toe area (Feature H) was smaller compared to the previous inspection in 2015. This is likely related to recent snowmelt rather than seepage from the landfill. Overall this landfill appeared to be stable and performing well.

The four thermistors were intact and in good condition.

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

SITE NAME: CAM-5 Mackar Inlet
LANDFILL DESIGNATION: Tier II Disposal Facility
DATE OF INSPECTION: August 11, 2017
DATE OF PREVIOUS INSPECTION: August 23, 2015
INSPECTED BY: Reza Moghaddam
REPORT PREPARED BY: Reza Moghaddam
MONITORING EVENT NUMBER: 6
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	Comparison to Historical Observations	Photos
Settlement	Y	A	Northeast crest surface	553,536	7,580,546	0.5	0.3	0.15	0.002%	Minor depressions (Acceptable)	Unchanged since previous observation	184
	Y	D	Cover surface	553,505	7,580,514	0.5	0.3	0.05	0.002%	Settlement (Acceptable)	Unchanged since previous observation	186
Erosion	Y	E	North crest surface	553,541	7,580,543	10	0.2	0.1	0.03%	Minor erosion channel (Acceptable)	Unchanged since previous observation	187
		E	Cover surface	553,516	7,580,504	20	0.2	0.05	0.06%	Minor erosion channel (Acceptable)	No significant change since 2014	188
		E	Cover surface	553,510	7,580,510	20	0.2	0.05	0.06%	Minor erosion channel (Acceptable)	No significant change since 2014	189
		E	Cover surface	553,527	7,580,501	15	0.2	0.05	0.04%	Minor erosion channel (Acceptable)	No significant change since 2014	190
	Y	F	West crest corner	553,498	7,580,514	5.0	0.3	0.05	0.02%	Erosion channel (Acceptable)	Unchanged since previous observation	191

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	Comparison to Historical Observations	Photos
Lateral Movement	N	-	-	-	-	-	-	-	-	-	-	-
Frost Action	N	-	-	-	-	-	-	-	-	-	-	-
Sloughing	N	-	-	-	-	-	-	-	-	-	-	-
Cracking	N	-	-	-	-	-	-	-	-	-	-	-
Animal Burrows	N	-	-	-	-	-	-	-	-	-	-	-
Vegetation	Y	G	West slope	553,512	7,580,485	5	5	-	0.4%	Sparse vegetation (Acceptable)	Unchanged since previous observation (Feature D in 2015 report)	192
Staining	Y	C	Central crest surface	553,535	7,580,514	0.3	0.3	-	0.001%	Possible hydrocarbon stain (Acceptable)	Unchanged since previous observation	185
Vegetation Stress	N	-	-	-	-	-	-	-	-	-	-	-
Seepage or Ponded Water	N	B	Southeast slope	-	-	-	-	-	-	Wet area	Not reported in 2013, 2014, 2015 or observed in 2017.	-
	Y	H	Northwest toe	553,472	7,580,513	1	1	0.1	0.01%	Ponded water and wet area (Acceptable)	Smaller area (Feature F in 2015 report)	193

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	Comparison to Historical Observations	Photos
Debris and/or Liner Exposed	N	-	-	-	-	-	-	-	-	-	-	-
Presence / Condition of Monitoring Instruments	Y	VT-1,2, 3,4 and MW-05, 06,07,08	-	-	-	-	-	-	-	Thermistors and monitoring wells intact	-	180-183, 197,201,205,209
Features of Note / Other Observations	N	-	-	-	-	-	-	-	-	-	-	-

Landfill Area = 7,200 m^2.

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

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	Isolated
Staining	Acceptable	Isolated
Vegetation Stress	Not observed	-
Seepage/Ponded Water	Acceptable	Isolated
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

Photo	Easting	Northing	Date
Photo 166	553,554	7,580,522	Aug 11, 2017
Photo 167	553,514	7,580,490	Aug 11, 2017
Photo 168	553,502	7,580,509	Aug 11, 2017
Photo 169	553,476	7,580,526	Aug 11, 2017
Photo 170	553,542	7,580,550	Aug 11, 2017
Photo 171	553,549	7,580,560	Aug 11, 2017
Photo 172	553,539	7,580,563	Aug 11, 2017
Photo 173	553,528	7,580,455	Aug 11, 2017
Photo 174	553,514	7,580,455	Aug 11, 2017
Photo 175	553,471	7,580,512	Aug 11, 2017
Photo 176	553,526	7,580,478	Aug 11, 2017
Photo 177	553,567	7,580,515	Aug 11, 2017
Photo 178	553,576	7,580,508	Aug 11, 2017
Photo 179	553,521	7,580,479	Aug 11, 2017
Photo 180	553,510	7,580,523	Aug 11, 2017
Photo 181	553,547	7,580,523	Aug 11, 2017
Photo 182	553,518	7,580,503	Aug 11, 2017
Photo 183	553,554	7,580,504	Aug 11, 2017
Photo 184	553,536	7,580,546	Aug 11, 2017

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

Photo	Easting	Northing	Date
Photo 185	553,535	7,580,514	Aug 11, 2017
Photo 186	553,505	7,580,514	Aug 11, 2017
Photo 187	553,541	7,580,543	Aug 11, 2017
Photo 188	553,516	7,580,504	Aug 11, 2017
Photo 189	553,510	7,580,510	Aug 11, 2017
Photo 190	553,527	7,580,501	Aug 11, 2017
Photo 191	553,498	7,580,514	Aug 11, 2017
Photo 192	553,512	7,580,485	Aug 11, 2017
Photo 193	553,472	7,580,513	Aug 11, 2017

4.4.3 Thermal Monitoring

All four dataloggers and thermistors were observed to be functioning properly. Thermistor dataloggers VT-1, 2, 3 and 4 located at the Tier II Disposal Facility were downloaded using Lakewoods Systems Ltd. Prolog software and a laptop computer. Thermistor inspection and data downloading details were recorded on field record sheets included in Appendix B.

Both the ULB1 and ULB15 lithium batteries were replaced in all dataloggers (VT-1, 2, 3 and 4) after completion of data downloading. The batteries should last approximately 7 to 8 years and therefore the next battery replacement should be scheduled prior to 2024 (i.e., during the Year 10 monitoring event in 2020).

4.4.4 Summary of Sampling Deviations

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

- The deep soil sample at MW-06 could not be collected due to refusal on rock; and,
- The groundwater sample at MW-07 could not be collected because the groundwater in the well was frozen.

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-05 represents an upgradient sampling location whereas MW-06, MW-07 represent downgradient sampling locations and MW-08 represents a cross-gradient monitoring location.

Table 4-17 also lists the arithmetic mean background and baseline values for the landfill, in addition to the baseline mean plus 3σ limits. At the Tier II Disposal Facility, the background arithmetic means for chromium, cobalt, copper, nickel, zinc and PCB are greater than the baseline arithmetic means. Additionally, the arithmetic mean baseline and the baseline concentrations plus 3σ are the same for PCB, arsenic, cadmium, chromium, cobalt and lead, which reflects the fact that baseline concentrations of these parameters were primarily at or below laboratory detection limits.

MW-05

Sampling location MW-05 is located upgradient of the landfill, approximately 12 m north of the northern toe of the landfill. The estimated elevation of this sampling point is 105 masl. As shown in Photograph 194 (Appendix D), the area is a covered with loose coarse sand, gravel and stones with sparse vegetation. The soil in the area of the sample location consisted of brown sand matrix with pink and grey gravel, pebbles and stone.

For the shallow sample at MW-05 (0-15 cm), the concentrations of all metals were less than or similar to those reported in previous years. No exceedances of the baseline concentrations plus 3σ were reported in 2017. No arsenic, cadmium, PHC or PCB were detected at this location in 2017.

For the deep sample at MW-05 (20-30 cm), metals concentrations were similar to those in the shallow sample. The concentrations of lead and zinc were slightly greater than those reported in previous years, whereas the concentrations of all other metals were less than or similar. No exceedances of the baseline concentrations plus 3σ were reported in 2017. No arsenic, cadmium, PHC or PCB were detected at this location in 2017.

MW-08

Sampling location MW-08 is located cross-gradient of the landfill, approximately 19 m southwest of the western toe of the landfill. The estimated elevation of this sampling point is 103 masl. As shown in Photograph 206 (Appendix D), the area is covered with loose coarse sand, gravel and stones and is not vegetated. The soil in the area of the sample location consisted of brown matrix with pink and grey gravel, pebbles and stone.

For the shallow sample at MW-08 (0-15 cm, duplicate location), the concentrations of all metals were less than or similar to those reported in previous years. No exceedances of the baseline concentrations plus 3σ were reported in 2017. No arsenic, cadmium, PHC or PCB were detected at this location in 2017.

For the deep sample at MW-08 (40-50 cm), metals concentrations were similar those in the shallow sample. The concentrations of most metals were similar those reported in previous years. The concentration of cobalt marginally exceeded the baseline mean concentration plus 3σ, although as noted above, this standard is the same as the baseline mean. No arsenic, cadmium, PHC or PCB were detected at this location in 2017.

MW-06

Sampling location MW-06 is located downgradient of the landfill, approximately 17 m west of the western toe of the landfill. The estimated elevation of this sampling point is 101.5 masl. As shown in Photograph 198 (Appendix D), the area is covered with loose coarse sand, gravel and stones with sparse vegetation. The soil in the area of the sample location consisted of brown sand matrix with pink and grey gravel, pebbles and stone.

For the shallow sample at MW-06 (0-15 cm), the concentrations of all metals were less than or similar to those reported in previous years. No exceedances of the baseline concentrations plus 3σ were reported in 2017. No arsenic, cadmium, PHC or PCB were detected at this location in 2017.

MW-07

Sampling location MW-07 is located downgradient of the landfill, approximately 16 m west of the western toe of the landfill. The estimated elevation of this sampling point is 101 masl. As shown in Photograph 202 (Appendix D), the area is covered with loose coarse sand and is not vegetated. The soil in the area of the sample location consisted of brown sand matrix with pink and grey gravel.

For the shallow sample at MW-07 (0-15 cm), the concentrations of all metals were less than or similar to those reported in previous years. No exceedances of the baseline concentrations plus 3σ were reported in 2017. No arsenic, cadmium, PHC or PCB were detected at this location in 2017

For the deep sample at MW-07 (40-50 cm), most metals concentrations were similar to those in the shallow sample. The concentrations of all metals were less than or similar to those reported in previous years. The concentration of copper exceeded the baseline concentration plus 3σ. No arsenic, cadmium, PHC or PCB were detected at this location in 2017

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

ID	Depth (cm)	As (mg/kg)	Cd (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Ni (mg/kg	Zn (mg/kg)	Total PCB (mg/kg)	F1 (mg/kg)	F2 (mg/kg)	F3 (mg/kg)	F4 (mg/kg)
Background Mean		0.83	1.0	21.8	9.5	10.5	10.0	14.0	31.0	0.100	NA	NA	NA	NA
Baseline Mean		**1.0**	**1.0**	**20.0**	**5.0**	**6.1**	**10.0**	**5.5**	**22.3**	**0.003**	**NA**	**NA**	**NA**	**NA**
Baseline + 3σ		1.0	1.0	20.0	5.0	12.0	10.0	16.1	37.8	0.003	NA	NA	NA	NA
Upgradient														
MW-05 Shallow	0-15	<1.0	<0.5	6.2	3.5	**8.9**	3.6	**6.4**	21.3	<0.05	<7	<4	<8	<6
MW-05 Deep	20-30	<1.0	<0.5	8.4	3.9	**6.9**	5.9	**6.3**	**24.5**	<0.05	<7	<4	<8	<6
Cross-gradient														
MW-08 Shallow	0-15	<1.0	<0.5	12	4.9	**12.2**	5.2	**8.2**	**25.5**	<0.05	<7	<4	<8	<6
MW-908 Shallow (Duplicate)	0-15	<1.0	<0.5	9.7	4.5	**10.9**	4.4	**6.7**	**24.5**	<0.05	<7	<4	<8	<6
MW-08 Shallow (Dup Avg)	0-15	<1.0	<0.5	10.9	4.7	**11.6**	4.8	**7.5**	**25.0**	<0.05	<7	<4	<8	<6
MW-08 Deep	40-50	<1.0	<0.5	11	**5.1**	**11.6**	5.5	**7.2**	**26.5**	<0.05	<7	<4	<8	<6

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

ID	Depth (cm)	As (mg/kg)	Cd (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Ni (mg/kg	Zn (mg/kg)	Total PCB (mg/kg)	F1 (mg/kg)	F2 (mg/kg)	F3 (mg/kg)	F4 (mg/kg)
Downgradient														
MW-06 Shallow	0-15	<1.0	<0.5	5.7	2.7	2.7	4.1	3.7	20.9	<0.05	<7	<4	<8	<6
MW-06 Deep [1]														
MW-07 Shallow	0-15	<1.0	<0.5	13.7	4.8	**<u>11.9</u>**	5.8	**9.2**	**28.5**	<0.05	<7	<4	<8	<6
MW-07 Deep	40-50	<1.0	<0.5	14.4	4.0	**<u>30.9</u>**	5.2	**10.0**	**27.9**	<0.05	<7	<4	<8	<6

Notes:

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

<u>Underlined values</u>: 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 sample at MW-06 could not be collected 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-07 could not be sampled because the water was frozen.

MW-05

The depth to groundwater measured at MW-05 in 2017 was 1.2 m below grade. MW-05 was sampled in 2017 for the first time. Copper, lead and zinc were detected at this location and the concentration of zinc marginally exceeded the baseline mean concentration plus 3σ. No arsenic, cadmium, chromium, cobalt, nickel, or PHC were detected at this location in 2017.

MW-08

The depth to groundwater measured at MW-08 (duplicate location) in 2017 was 0.87 m below grade. The concentrations of all metals were less than or similar to those reported in recent years. No arsenic, cadmium, chromium, cobalt, nickel or PHC were detected at this location in 2017. None of the reported values exceeded their respective baseline mean concentration plus 3σ.

MW-06

The depth to groundwater measured at MW-06 in 2017 was 0.95 m below grade. The concentrations of all metals were less than or similar to those reported in recent years. No arsenic, cadmium, chromium, cobalt, nickel or PHC were detected at this location in 2017. None of the reported values exceeded their respective baseline mean concentration plus 3σ.

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

ID	GW Depth BGS (m)	As (mg/L)	Cd (mg/L)	Cr (mg/L)	Co (mg/L)	Cu (mg/L)	Pb (mg/L)	Ni (mg/L)	Zn (mg/L)	F1 (mg/L)	F2 (mg/L)	F3 (mg/L)	F4 (mg/L)
Baseline Mean		**0.003**	**0.001**	**0.021**	**0.003**	**0.015**	**0.010**	**0.014**	**0.010**	**NA**	**NA**	**NA**	**NA**
Baseline + 3σ		0.003	0.001	0.062	0.003	0.085	0.010	0.068	0.010	NA	NA	NA	NA
Upgradient													
MW-05	1.20	<0.001	<0.0001	<0.001	<0.0005	0.0023	0.0006	<0.001	**0.012**	<0.025	<0.1	<0.1	<0.1
Cross-gradient													
MW-08	0.87	<0.001	<0.0001	<0.001	<0.0005	0.0064	0.0012	<0.001	0.007	<0.025	<0.1	<0.1	<0.1
MW-908 (Duplicate)	0.87	<0.001	<0.0001	<0.001	<0.0005	0.0058	0.0010	<0.001	**0.013**	<0.025	<0.1	<0.1	<0.1
MW-08 (Dup Avg)	0.87	<0.001	<0.0001	<0.001	<0.0005	0.0061	0.0011	<0.001	0.01	<0.025	<0.1	<0.1	<0.1
Downgradient													
MW-06	0.95	<0.001	<0.0001	<0.001	<0.0005	0.0017	0.0006	<0.001	0.007	<0.025	<0.1	<0.1	<0.1
MW-07 [1]													

Notes:

ID: Monitoring well location ID.

GW: Groundwater.

BGS: Below ground surface.

NA: Not available

Bold Values: Results exceed Baseline arithmetic mean.

Groundwater metals analyses were for dissolved metals.

1: The groundwater sample at MW-07 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

The Tier II Disposal Facility exhibited some minor erosion and settlement features that are not considered to be a concern. This landfill was assessed to have an “Acceptable” overall landfill performance because all observed features were assessed as “Acceptable”. The visual inspection did not observe any significant erosion, settlement, cracking, sloughing, exposed waste or indications of instability at the Tier II Disposal Facility. A wet area was observed in the northwest toe area that is likely related to recent snowmelt rather than seepage from the landfill.

Concentrations of most metals in soil were highest overall at the deep sample location MW-07, notably copper. At this location, the concentrations of all metals were less than or similar to those reported in previous years and copper exceeded the baseline mean concentrations plus 3σ. The concentrations of most metals at the other sampling locations were less than or similar to those reported in previous years. It is noted that for the deep sample at MW-08, the concentration of cobalt marginally exceeded the baseline mean concentration plus 3σ. No detectable concentrations of arsenic, cadmium, PCB or PHC were noted in any of the soil samples in 2017.

The highest concentrations of most detected metals in groundwater were observed at MW-08. At this location, the concentrations of all metals were less than or similar to those reported in previous years. MW-05 was sampled for the first time in 2017 and the concentration of zinc exceeded the baseline mean concentrations plus 3σ. No detectable concentrations of arsenic, cadmium, chromium, cobalt or nickel were noted in any of the groundwater samples in 2017. It is noted that the groundwater samples collected in 2017 were filtered in the lab, and therefore the results represent dissolved metals instead of total metals. An overall trend comparison on the impact of results based on total versus dissolved metals will be prepared in 2018.

Comparison of groundwater elevations based on estimated grade elevation and the measured water depth in the wells indicates that groundwater was highest at MW-05, and lowest towards MW-07. The water levels at MW-05, MW-07 and MW-08 indicate there is generally a southwestern gradient in the area of the landfill. This is consistent with local grades.

Overall, the concentrations of most metals in both soil and groundwater were less than or similar to those reported in recent years. Based on the results, there does not appear to be significant impact to groundwater quality from the landfill.

4.4.8 Recommendations for Tier II Disposal Facility

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

5.0 QA/QC RESULTS

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

The three DEW Line sites monitored in 2017 were performed as a single deployment of people and equipment in which the standard operating procedures didn't change from site to site. Therefore, the QA/QC analysis below contains both program-level and site-level discussions where appropriate. The lab reports related to the site-level discussion for CAM-5 are contained in Appendix C.

5.1 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
- PCB in soil: 365 days
- PHC-F1 in soil: 48 hours (unpreserved), PHC-F1 in water (preserved): 14 days
- PHC F2-F4 in soil: 14 days, PHC F2-F4 in water (preserved): 14 days

At CAM-5, the soil and groundwater sampling was carried out on August 11 and 12, 2017 and the samples were received at Paracel six to seven days later, on August 18, 2017, thus all of the field samples with the exception of PHC-F1 in soil met their respective hold times. The samples were packed in coolers with ice and sent with instructions "Keep Cold" on First Air. They were placed in a walk-in refrigerator at First Air cargo upon arrival in Ottawa. The sample date on the CAM-5 trip blank corresponds to date it was prepared at the lab (July 13, 2017), thus it is shown as over its hold time, however this was intended, because it had to be carried over the duration of the entire travel from the lab to CAM-5 and back.

As of 2017, groundwater samples for PHC analysis are being preserved, resulting in a 14-day hold time. None of the groundwater samples collected at CAM-5 exceeded their hold times in 2017.

Maximum hold times were exceeded for PHC-F1 (soil) 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 and because PHC-F1 preservation would require methanol, which might cause the sample shipment to be delayed (i.e., related to transportation of dangerous goods). Given that indications of petroleum hydrocarbon are usually spread across more than one fraction and no PHC was detected in any fraction in any soil or groundwater sample at CAM-5, an impact on the data quality of exceeding the hold time for PHC-F1 is not anticipated.

The samples were packed in coolers with ice prior to shipping and sent with instructions "Keep Cold" on First Air. They were stored in a walk-in refrigerator at First Air cargo upon arrival in Ottawa until Golder picked them up. The temperature recorded by Paracel upon reception of the batch of CAM-5 samples was 19°C, however we have confirmed with Paracel that the temperature is measured once per shipment received with a handheld infrared temperature reader pointed into a single cooler. The samples were only unrefrigerated during the two or three hours that they were being checked at Golder's lab in Ottawa just prior to same-day delivery to Paracel, then repacked in coolers with cold gel packs. The sample jars or bottles comprising each soil or groundwater sample were packed together in plastic Ziploc® bags. Based on our review of procedures, we expect that the exterior temperature of the Ziploc® bag which had warmed up during sample inspection in our lab is what was read by the IR temperature reader and was not representative of the interior temperature of the soil or water contained within.

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 lab blanks, spikes and surrogate recoveries. For the CAM-5 samples, Paracel performed blank and spike analyses on water and soil, and a surrogate recovery for soil. The analyses of blanks were all non-detect. The spike recovery percentages and the surrogate recovery were within the acceptable data quality objectives, in every case. The accuracy of the results is therefore not considered to be an issue. Paracel was able to achieve the project's minimum MDLs for soil and groundwater.

5.3 Reliability

Reliability is a measure of certainty that the concentrations reported by the lab are reliable indicators of field conditions and have not been affected other sources of contamination. The analysis of blanks provides a measure of reliability. A set of bottles of deionized water for Trip Blanks accompanied the team to CAM-5, and only to CAM-5. These bottles were not opened at the site. The analytical reports indicate that zinc was detected in the Trip Blank at 0.014 mg/L at the end of the trip compared to the detection limit for zinc was 0.005 mg/L. No other parameter was detected.

Two Equipment Blanks were prepared at CAM-5: one to test the decontamination of the groundwater probe, and the other to test the decontamination of the shovel used to dig the test holes. There were no metals or PHC parameters in any of the blanks, with the exception of zinc, which was detected in the Trip Blank and both Equipment Blanks at about twice the detection limit. Given that zinc was systematically detected at similar concentrations in all blanks prepared from the same deionized water, it is concluded that this parameter was likely present in the deionized water and not introduced in the field. Also given the minute concentrations of zinc detected in the equipment blanks and the minimal contact between the equipment and the sampled material it is concluded that the sampling probe and shovel are not influencing the results of the collected samples.

Given the high similarity in results between the Shovel Blank, Probe Blank and Trip blank, the lack of a field blank at CAM-5 does not affect our confidence in the data quality. If there had been spurious contaminants which would have affected a field blank, they would also have affected the equipment blanks which are prepared in the field; however, no additional parameter concentrations appear to have been picked up by the equipment blanks.

The Trip Blank and two Equipment Blank sample results for CAM-5 are summarized in the table below.

Field, Trip and Equipment Blank Samples (mg/L)

ID	As*	Cd*	Cr*	Co*	Cu	Pb*	Ni	Zn	F1	F2	F3	F4
MDL	<0.001	<0.0001	<0.001	<0.0005	<0.0005	<0.0001	<0.001	<0.005	<0.025	<0.1	<0.1	<0.1
Shovel Blank	<0.001	<0.0001	<0.001	<0.0005	<0.0005	<0.0001	<0.001	0.011	<0.025	<0.1	<0.1	<0.1
Probe Blank	<0.001	<0.0001	<0.001	<0.0005	<0.0005	<0.0001	<0.001	0.013	<0.025	<0.1	<0.1	<0.1
Trip Blank	<0.001	<0.0001	<0.001	<0.0005	<0.0005	<0.0001	<0.001	0.014	<0.025	<0.1	<0.1	<0.1

5.4 Reproducibility (Duplicate Analysis)

The reproducibility of lab results was measured through the comparative analysis of field duplicate samples. Duplicate soil samples were prepared in the field, in the test pit being sampled, by taking portions of soil and alternately filling the sample jars for the original and duplicate samples. Duplicate groundwater samples were prepared by alternately filling bottles for each lab for each parameter type. Unlike previous years, the duplicate samples were analyzed at the same lab as the rest of the samples: Paracel Labs in Ottawa.

Paracel Labs also performed their own internal duplicate analysis of soil, which indicated all parameter pairs met their RPD limit of 30.0%. Their internal duplicate analysis for groundwater indicated that all parameter pairs met their RPD limit of 20%.

The total number of original soil samples collected for the 2017 QIKIQ program was 254, for which 26 duplicate soil samples were prepared and analyzed, providing a duplicate ratio of over 10%. A total of 24 groundwater samples were collected and three duplicates were analyzed, which is a duplicate ratio of over 10% for each site and for the program. The distribution of duplicate soil and groundwater samples over the three sites is provided in the table below.

Soil Samples and Duplicates

	DEW Line Site			Totals
	CAM-5	DYE-M	FOX-M	
Soil Samples Collected	25	145	84	254
Duplicate Soil Samples	3	15	8	26
Percent	12%	10%	10%	10%

Groundwater Samples and Duplicates

	DEW Line Site			Totals
	CAM-5	DYE-M	FOX-M	
Monitoring Well Sampled	6	8	10	24
Duplicate Groundwater Samples	1	1	1	3
Percent	17%	13%	10%	13%

To determine the precision 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. RPDs can only be calculated if concentrations of given parameter are greater than the analytical method detection limits (MDL) in both the duplicate and original samples of the pair. Additionally, lower precision in the RPD calculation occurs when the reported concentrations are less than five (5) times the MDL. RPDs 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-level RPDs were calculated by taking the average of the parameter RPDs for a given sample-duplicate pair, and a program-level RPD was calculated by taking the average of all sample RPDs 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 duplicate of 30%. A discussion or the RPDs for the program and at CAM-5 is provided below.

5.4.1 Soil Samples

Organics and PCB

Program Level Interpretation

At the 2017 program level, there were only two duplicated samples where PCB was detected and, in both cases, the original and duplicate PCB results were below five times the MDL which is internally consistent; RPDs were not calculated due to the low concentrations.

From the 26 soil duplicates there were only three samples in the 2017 program where one or more PHC fraction was detected. From those three samples there were six PHC parameter pairs with concentrations over five times the MDL and three of them had RPDs over 30%, but the concentrations were still on the same order of magnitude. The PHC parameter appears to have variability in results when it is present.

Site Level Interpretation

All of the duplicate pairs of soil samples at CAM-5 had PHC F1-F3 results which were below the detection limit and all PCB concentrations were also below the detection limit; therefore, the precision of these results is not a concern in the CAM-5 data set.

Metals

Program Level Interpretation

Cadmium was below detection limits for all 26 pairs of duplicate soil samples in the program. Mercury in soil has been removed from the analytical program as of the 2017 monitoring year. RPD calculations were undertaken on the seven remaining metals (arsenic, chromium, cobalt, copper, lead nickel and zinc) for the 26 duplicate soil samples, where both sample results were over five times the MDL.

Twenty-five parameter pairs had RPDs exceeding 20% (individual DQO). Seven of the 26 soil duplicates had a sample average RPDs of over 15% (DQO for sample average), four at DYE-M and three at FOX-M. The most frequent metals to have a parameter pair RPD over 20% were: chromium (seven instances), nickel and lead (five instances). The program-level average RPD for the soil sample duplicate analysis was 14% which meets the overall DQO for inorganic analyses (15%).

Site Level Interpretation

From the three soil sample duplicates taken at CAM-5 there were 21 potential parameter pairs for RPD analysis (7 metals times 3 samples). Of those 21 parameter pairs, only 12 had concentrations over five times the MDL for both parameters in the pair, thus 12 parameter RPDs were calculated. The RPDs ranged from 1% to 21%. Chromium had the highest and lowest RPDs of 21% and 1%. Only chromium exceeded the individual parameter pair RPD DQO of 20%. The CAM-5 average RPD for the soil sample duplicate analysis was 11% which meets the overall DQO for inorganic analyses of 15%. The table below shows the metals results and RPD calculations for CAM-5.

In conclusion, the reproducibility of the soil sample results at CAM-5 was acceptable and better than the overall program.

Relative Percent Difference Analysis of Metals in Soil Data at CAM-5

Sample ID	Parameter Concentrations (mg/kg)							Sample Average RPD	Any Over 20%?
	Arsenic	Chromium	Cobalt	Copper	Lead	Nickel	Zinc		
MDL	<1	<1	<1	<1	<1	<1	<1		
MW 08 Shallow	<1.0	**12**	4.9	**12.2**	**5.2**	**8.2**	**25.5**	14%	Yes, Cr
MW 908 Shallow	<1.0	**9.7**	4.5	**10.9**	4.4	**6.7**	**24.5**		
RPD		21%		11%		20%	4%		
MW 12 Deep	<1.0	**10.2**	4.6	**10.5**	**5.4**	**7**	**25.3**	6%	no
MW 912 Deep	<1.0	**10.3**	4.2	**9.7**	4.8	**6.5**	**23.4**		
RPD		1%		8%		7%	8%		
C5-7 Deep	<1.0	**10**	4.1	**9.3**	3.5	**6.6**	**21.4**	12%	no
C597 Deep	<1.0	**10.7**	4.4	**10.6**	4.8	**7.5**	**24.5**		
RPD		7%		13%		13%	14%		
CAM-5 Site Average RPD								11%	no

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

5.4.2 Groundwater Samples

Organics

All three of the groundwater duplicate analyses in the 2017 program had PHC F1-F3 results which were below the detection limit in the original and duplicate samples, therefore the precision of these results is not a concern. PCB testing in groundwater has been removed from the analytical program as of the 2017 monitoring year.

Metals

Program Level Interpretation

Given the three groundwater duplicate pairs and eight metals analyzed, there were 24 potential parameters pairs for duplicate analysis of metals via RPD calculation (8 metals times 3 samples). Mercury in groundwater has been removed from the analytical program as of the 2017 monitoring year. The metals concentrations were very low; in fact, only 10 of these parameter pairs had both parameters detected above the MDL, and only four had both parameters greater than five times the MDL and were therefore eligible for RPD analysis. In addition to analyzing the QC by RPD analysis the following points are made regarding repeatability. Of the 24 parameter pairs, there were:

- 14 parameter pairs where both concentrations were non-detect in the parameter pair (good repeatability);
- 6 parameter pairs where both concentrations were detected and less than five times the MDL (good repeatability);
- 4 parameter pairs where concentrations were greater than five times the MDL, so an RPD could be calculated. Of those:
  - All 4 were under 20% (very good repeatability)
- No parameter pairs where the results were greater than five times the MDL and the RPD was over 20% (good result).

The program-level average RPD for water analysis of metals (where both parameters were over five times the MDL) was 8%, which meets the program DQO for metals in groundwater of 15%.

Site Level Interpretation

The duplicate groundwater sample at CAM-5 was taken at MW08 at the Tier II Waste Facility. As shown in the table below, there were two groundwater parameter pairs for which the concentrations in the original and duplicate were over 5 times the MDL (copper and lead) thus two RPDs were calculated for the groundwater duplicate at CAM-5. The parameter pair RPDs were 10% and 18%, which were both under the individual DQO of 20%. The average RPD was 14% which met the average DQO for inorganics of 15%. Therefore, the groundwater quality reproducibility at CAM-5 met the data quality objectives.

Relative Percent Difference Analysis of Groundwater Data at CAM-5

Sample ID	Parameter Concentrations (mg/L)								Average RPD	Any Over 20%?
	As	Cd	Cr	Co	Cu	Pb	Ni	Zn		
MDL	<0.001	<0.0001	<0.001	<0.0005	<0.0005	<0.0001	<0.001	<0.005		
MW08	<0.001	<0.0001	<0.001	<0.0005	**0.0064**	**0.0012**	<0.001	0.007	14%	no
MW08 (Duplicate)	<0.001	<0.0001	<0.001	<0.0005	**0.0058**	**0.001**	<0.001	0.013		
RPD					10%	18%			Average 14%	

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

5.4.3 Overall Lab Data Reproducibility

The lab reproducibility for organics in soil was not a concern at CAM-5 since all soil duplicates were non-detect in PHC (all fractions) and PCB. Organics in groundwater were similarly not detected at CAM-5, thus there are no concerns about their reproducibility. All individual DQOs and average DQOs were met.

Regarding the lab reproducibility for inorganics in soil, chromium was the only parameter that exceeded the individual parameter pair RPD DQO of 20%. The average RPD for inorganics in soil at CAM-5 was 11%, which met the overall DQO for inorganic analyses of 15%. For inorganics in groundwater only two RPDs were calculable: 10% and 18%, which were both under the individual DQO of 20%. The average RPD for inorganics in groundwater was 14% which met the average DQO for inorganics of 15%.

5.5 QA/QC Conclusions

The QA/QC analysis has shown that:

- Achieving maximum hold times of PHC-F1 in soil is often not possible if the sample is not preserved, given the logistics of transport from the remote site location;
- Preserving the PHC water samples enabled meeting the maximum hold time for PHC-F1;
- The trip blank analysis and equipment blank analysis indicated that a low concentration of zinc was systematically present in all of the blank samples, however; given the minute concentrations of zinc detected in the equipment blanks and the minimal contact between the equipment and the sampled material it is concluded that the sampling probe and shovel are not influencing the results of the collected samples.
- The site duplicate analyses for soil at CAM-5 met the program field data quality objectives; and,
- The site duplicate analyses for water at CAM-5 met the program field data quality objectives.

Report Signature Page

We trust that this Monitoring Report meets the Project requirements of DND. 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

Monitoring Well Sampling Record Sheets

Soil Sampling Record Sheets

Thermistor Inspection Record Sheets

Annex J: Monitoring Wells Sampling Log

Site Name: CAM-5 Landfill Name: Tier II Disposal Facility
Monitoring Well ID: MW-05
Sample Number(s) include dups.: 1
Bottles filled (by parameter type) 4 (all)
Date of Sampling Event: 11 August 2017 Time: 2:00pm
Weather Sun and could, 8°C, slight wind
Names of Samplers JEB
Description of well condition and surrounding ground conditions (note ponding of water):
Casing in great condition, no ponding, dry ground
Lock (condition, presence, model, manufacturer): Cut & replaced

Pre-Measured Data (from water well record log)
Depth of well installation (cm): Diameter of well (cm): 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): 50
Static water level (cm) from top of pipe: 170
Static water level (cm) (below ground surface) calculated: 120
Measured well refusal depth (cm) (measured after sampling): 175
Thickness of water column (cm): 5 Static Volume of water in well (mL): 63
Free product thickness (mm): N/A Evidence of Sludge or siltation: none

Purge Information Summary
Purging/sampling equipment, sampling technique and equipment calibration information:
Low flow peristaltic pump

Well purged (Y/N): Y Recharge Rate: <100 mL/min
Volume Purged (L) (note multiple purging events): ~ 250 mL Purge Rate: ~ 100 mL/min

Parameter	Initial	Stablized	Final	Notes
pH	8.23			went dry after bottles filled
Conductivity (mS/cm)	0.094			
Turbidity (NTU)	20.8			
Temperature (degC)	4.59			

Visual/olfactory observations:
No sheen, no odour, slightly silty

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

Other relevant comments: PHC F1 preserved using sodium bisulphate

Annex J: Monitoring Wells Sampling Log

Site Name: CAM-5
Landfill Name: Tier II Disposal Facility
Monitoring Well ID: MW-06
Sample Number(s) include dups.: 1
Bottles filled (by parameter type) 4 (all)
Date of Sampling Event: 11 August 2017 Time: 1:00pm
Weather Sun and could, 8°C, slight wind
Names of Samplers JEB
Description of well condition and surrounding ground conditions (note ponding of water):
Casing in great condition, no ponding, dry ground
Lock (condition, presence, model, manufacturer): Cut & replaced

Pre-Measured Data (from water well record log)

Depth of well installation (cm):
Diameter of well (cm): 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): 64
Static water level (cm) from top of pipe: 159
Static water level (cm) (below ground surface) calculated: 95
Measured well refusal depth (cm) (measured after sampling): 217
Thickness of water column (cm): 58
Static Volume of water in well (mL): 729
Free product thickness (mm): N/A
Evidence of Sludge or siltation: N/A

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
Low flow peristaltic pump

Well purged (Y/N): Y
Recharge Rate: ~ 100 mL/min
Volume Purged (L) (note multiple purging events): ~ 500 mL
Purge Rate: ~ 100 mL/min

Parameter	Initial	Stablized	Final	Notes
pH	8.41	7.98	7.78	
Conductivity (mS/cm)	0.209	0.207	0.217	
Turbidity (NTU)	15.9	15.3	14.3	
Temperature (degC)	4.44	4.41	4.28	

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: PHC F1 preserved using sodium bisulphate

Annex J: Monitoring Wells Sampling Log

Site Name: CAM-5
Landfill Name: Tier II Disposal Facility
Monitoring Well ID: MW-07
Sample Number(s) include dups.: -
Bottles filled (by parameter type) -
Date of Sampling Event: 11 August 2017 Time: 12:00pm
Weather Sun and could, 8°C, slight wind
Names of Samplers JEB
Description of well condition and surrounding ground conditions (note ponding of water):
Casing in great condition, no ponding, dry ground
Lock (condition, presence, model, manufacturer): Cut & replaced

Pre-Measured Data (from water well record log)

Depth of well installation (cm):
Diameter of well (cm): 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): 39
Static water level (cm) from top of pipe: 160
Static water level (cm) (below ground surface) calculated: 121
Measured well refusal depth (cm) (measured after sampling): 160
Thickness of water column (cm): -
Static Volume of water in well (mL): N/A
Free product thickness (mm): N/A
Evidence of Sludge or siltation: N/A

Purge Information Summary

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

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

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

Visual/olfactory observations:
ice on tip of probe

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: CAM-5

Landfill Name: Tier II Disposal Facility

Monitoring Well ID: MW-08

Sample Number(s) include dups.: 2 (duplicate MW-908)

Bottles filled (by parameter type) 4 (all)

Date of Sampling Event: 11 August 2017 Time: 11:00am

Weather Sun and could, 8°C, slight wind

Names of Samplers JEB

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

Lock (condition, presence, model, manufacturer): Cut & replaced

Pre-Measured Data (from water well record log)

Depth of well installation (cm):

Diameter of well (cm): 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): 71

Static water level (cm) from top of pipe: 158

Static water level (cm) (below ground surface) calculated: 87

Measured well refusal depth (cm) (measured after sampling): 242

Thickness of water column (cm): 84

Static Volume of water in well (mL): 1056

Free product thickness (mm): N/A

Evidence of Sludge or siltation: none

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
Low flow peristaltic pump

Well purged (Y/N): Y

Recharge Rate: ~ 100 mL/min

Volume Purged (L) (note multiple purging events): ~ 500 mL

Purge Rate: ~ 100 mL/min

Parameter	Initial	Stablized	Final	Notes
pH	8.11	8.37	8.32	
Conductivity (mS/cm)	0.656	0.216	0.124	
Turbidity (NTU)	208	198	161	
Temperature (degC)	5.21	4.93	4.41	

Visual/olfactory observations:
Slightly silty, 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: PHC F1 preserved using sodium bisulphate

Annex J: Monitoring Wells Sampling Log

Site Name: CAM-5
Landfill Name: Non-Hazardous Waste Landfill
Monitoring Well ID: MW-09
Sample Number(s) include dups.: 1
Bottles filled (by parameter type) 4 (all)
Date of Sampling Event: 11 August 2017 Time: 4:45pm
Weather Sun and could, 8°C, slight wind
Names of Samplers JEB
Description of well condition and surrounding ground conditions (note ponding of water):
Casing is loose, no ponding, dry ground
Lock (condition, presence, model, manufacturer): Cut & replaced

Pre-Measured Data (from water well record log)
Depth of well installation (cm):
Diameter of well (cm): 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: 53
Static water level (cm) (below ground surface) calculated: 22
Measured well refusal depth (cm) (measured after sampling): 206
Thickness of water column (cm): 153
Static Volume of water in well (mL): 1923
Free product thickness (mm): N/A
Evidence of Sludge or siltation: none

Purge Information Summary
Purging/sampling equipment, sampling technique and equipment calibration information:
Low flow peristaltic pump

Well purged (Y/N): Y
Recharge Rate: ~ 100 mL/min
Volume Purged (L) (note multiple purging events): ~ 500 mL
Purge Rate: ~ 100 mL/min

Parameter	Initial	Stablized	Final	Notes
pH	8.68	8.84	8.44	
Conductivity (mS/cm)	0.079	0.041	0.035	
Turbidity (NTU)	163	61.8	58.9	
Temperature (degC)	5.61	4.87	4.94	

Visual/olfactory observations:
Slightly silty, 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: PHC F1 preserved using sodium bisulphate

Annex J: Monitoring Wells Sampling Log

Site Name: CAM-5
Landfill Name: Non-Hazardous Waste Landfill
Monitoring Well ID: MW-11
Sample Number(s) include dups.: 1
Bottles filled (by parameter type) 4 (all)
Date of Sampling Event: 11 August 2017 Time: 3:00pm
Weather Sun and could, 8°C, slight wind
Names of Samplers JEB
Description of well condition and surrounding ground conditions (note ponding of water):
Casing in great condition, no ponding, dry ground
Lock (condition, presence, model, manufacturer): Cut & replaced

Pre-Measured Data (from water well record log)

Depth of well installation (cm):
Diameter of well (cm): 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): 69
Static water level (cm) from top of pipe: 90
Static water level (cm) (below ground surface) calculated: 21
Measured well refusal depth (cm) (measured after sampling): 269
Thickness of water column (cm): 179
Static Volume of water in well (mL): 2249
Free product thickness (mm): N/A
Evidence of Sludge or siltation: none

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
Low flow peristaltic pump

Well purged (Y/N): Y
Recharge Rate: ~ 100 mL/min
Volume Purged (L) (note multiple purging events): ~ 500 mL
Purge Rate: ~ 100 mL/min

Parameter	Initial	Stablized	Final	Notes
pH	7.33	8.49	8.32	
Conductivity (mS/cm)	0.253	0.066	0.027	
Turbidity (NTU)	69.1	69.4	7.3	
Temperature (degC)	5.16	5.66	5.64	

Visual/olfactory observations:
Slightly silty, 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: PHC F1 preserved using sodium bisulphate

Annex J: Monitoring Wells Sampling Log

Site Name: CAM-5
Landfill Name: Non-Hazardous Waste Landfill
Monitoring Well ID: MW-12
Sample Number(s) include dups.: 1
Bottles filled (by parameter type) 4 (all)
Date of Sampling Event: 11 August 2017 Time: 3:45pm
Weather Sun and could, 8°C, slight wind
Names of Samplers JEB
Description of well condition and surrounding ground conditions (note ponding of water):
Casing in great condition, no ponding, dry ground
Lock (condition, presence, model, manufacturer): Cut & replaced

Pre-Measured Data (from water well record log)

Depth of well installation (cm):
Diameter of well (cm): 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: 114
Static water level (cm) (below ground surface) calculated: 65
Measured well refusal depth (cm) (measured after sampling): 174
Thickness of water column (cm): 60
Static Volume of water in well (mL): 754
Free product thickness (mm): N/A
Evidence of Sludge or siltation: none

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
Low flow peristaltic pump

Well purged (Y/N): Y
Recharge Rate: ~ 100 mL/min
Volume Purged (L) (note multiple purging events): ~ 500 mL
Purge Rate: ~ 100 mL/min

Parameter	Initial	Stablized	Final	Notes
pH	8.13	8.18	7.98	
Conductivity (mS/cm)	0.02	0.017	0.016	
Turbidity (NTU)	14.3	5.3	4.1	
Temperature (degC)	5.72	4.51	4.25	

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: PHC F1 preserved using sodium bisulphate

Thermistor Inspection Field Record Sheet

Inspector Name: Reza Moghaddam	Inspection Date: August 11 , 2017
Inspector Signature / Prepared By:	

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

Site Name:	**CAM-5**	Landfill:	**Tier II Disposal Facility**
Thermistor Number:	**VT-1**	Inclination:	**Vertical**
Datalogger model no:	**RX-16**	Datalogger cable download model:	USB
*Install Date:	**2010-09-07**	First Date Event **15-Aug-11**	Last Date Event **23-Aug-15**
*Coordinates and Elevation	N **7580526**	E **553505.3**	Elev **109.1 m**
Length of Cable (m)	**10.5**	Cable Lead Above Ground (m)	**3.47**
Datalogger Serial #	**7110050**	Nodal Points	**16**

Thermistor Inspection

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

Battery Installation Date: **11-Aug-2017**

Battery Levels: Main 11.34 Aux 13.38

Manual Ground Temperature Readings

Bead	Volts	Degrees C
1	1.0305	7.89
2	0.9548	0.40
3	0.9592	0.54
4	0.8998	-1.43
5	0.8487	-3.15
6	0.8151	-4.31
7	0.7840	-5.39
8	0.7608	-6.21

Bead	Volts	Degrees C
9	0.4100	-6.92
10	0.7186	-7.72
11	0.7035	-8.27
12	0.6942	-8.61
13	0.6825	-9.05
14	0.6728	-9.41
15	0.6680	-9.59
16	0.6639	-9.74

Battery Information

Batteries changed ? Yes [x] No [ ] Monitoring Year: 7

Battery model number installed: ULB1 and ULB15 Batteries (9 V)

Expected battery life (years): 2024

Datalogger Programming (Describe programming completed; beads and frequency)

Memory wrap around enabled

Observations and Proposed Maintenance

Both batteries changed.

Thermistor Inspection Field Record Sheet

Inspector Name:	Reza Moghaddam	Inspection Date:	August 11 , 2017
Inspector Signature / Prepared By:			

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

Site Name:	**CAM-5**	Landfill:	**Tier II Disposal Facility**		
Thermistor Number:	**VT-2**	Inclination:	**Vertical**		
Datalogger model no:	**RX-16**	Datalogger cable download model:	USB		
*Install Date:	**2010-09-07**	First Date Event	**15-Aug-11**	Last Date Event	**23-Aug-15**
*Coordinates and Elevation		N **7580525.5**	E **553546.1**	Elev	**109.1 m**
Length of Cable (m)	**8.25**	Cable Lead Above Ground (m)	3		
Datalogger Serial #	**7110073**	Nodal Points	**12**		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Lock condition	X	☐	New lock
Battery Installation Date	**11-Aug-2017**		
Battery Levels	Main 11.34	Aux 13.26	

Manual Ground Temperature Readings

Bead	Volts	Degrees C
1	1.0822	4.58
2	1.0959	5.03
3	1.0779	4.44
4	1.0072	2.13
5	0.9379	-0.15
6	0.9041	-1.28
7	0.8425	-3.37
8	0.8108	-4.46

Bead	Volts	Degrees C
9	0.7883	-5.24
10	0.7691	-5.91
11	0.7508	-6.56
12	0.7375	-7.04

Battery Information

Batteries changed ? Yes [x] No [ ] Monitoring Year: 7

Battery model number installed: ULB1 and ULB15 Batteries (9 V)

Expected battery life (years): 2024

Datalogger Programming (Describe programming completed; beads and frequency)

Memory wrap around enabled

Observations and Proposed Maintenance

Both batteries changed.

Thermistor Inspection Field Record Sheet

Inspector Name: Reza Moghaddam	Inspection Date: August 11 , 2017
Inspector Signature / Prepared By:	

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

Site Name:	**CAM-5**	Landfill:	**Tier II Disposal Facility**		
Thermistor Number:	**VT-3**	Inclination:	**Vertical**		
Datalogger model no:	**RX-16**	Datalogger cable download model:	USB		
*Install Date:	**2010-09-07**	First Date Event	**15-Aug-11**	Last Date Event	**23-Aug-15**
*Coordinates and Elevation		N **7580502.6**	E **553517.1**	Elev	**108.3 m**
Length of Cable (m)	**9.25**	Cable Lead Above Ground (m)	**3.53**		
Datalogger Serial #	**7110076**	Nodal Points	**14**		

Thermistor Inspection

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

Battery Installation Date **11-Aug-2017**

Battery Levels Main 11.34 Aux 13.26

Manual Ground Temperature Readings

Bead	Volts	Degrees C
1	1.1417	6.53
2	1.1219	5.88
3	1.1049	5.33
4	1.1076	5.41
5	1.0537	3.65
6	0.9671	0.80
7	0.9205	-0.73
8	-0.8473	-3.20

Bead	Volts	Degrees C
9	0.8156	-4.29
10	0.7894	-5.20
11	0.7691	-5.91
12	0.7522	-6.51
13	0.7365	-7.08
14	0.7236	-7.54

Battery Information

Batteries changed ? Yes [x] No [ ] Monitoring Year: 7

Battery model number installed: ULB1 and ULB15 Batteries (9 V)

Expected battery life (years): 2024

Datalogger Programming (Describe programming completed; beads and frequency)

Memory was full. Restarted memory on Aug 11, 2017. No reprograming was planned.

Observations and Proposed Maintenance

Both batteries changed.

Thermistor Inspection Field Record Sheet

Inspector Name:	Reza Moghaddam	Inspection Date:	August 11 , 2017
Inspector Signature / Prepared By:			

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

Site Name:	**CAM-5**	Landfill:	**Tier II Disposal Facility**
Thermistor Number:	**VT-4**	Inclination:	**Vertical**
Datalogger model no:	**RX-16**	Datalogger cable download model:	USB
*Install Date:	**2010-09-07**	First Date Event **15-Aug-11**	Last Date Event **23-Aug-15**
*Coordinates and Elevation	N **7580502.6**	E **553557.8**	Elev **108.48 m**
Length of Cable (m)	**10.5**	Cable Lead Above Ground (m)	**3.9**
Datalogger Serial #	**7110071**	Nodal Points	**16**

Thermistor Inspection

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

Battery Installation Date **11-Aug-2017**

Battery Levels Main 11.34 Aux 13.87

Manual Ground Temperature Readings

Bead	Volts	Degrees C
1	1.1927	8.20
2	1.0718	4.34
3	1.0561	3.73
4	1.0195	2.53
5	0.9514	0.28
6	0.9030	-1.32
7	0.8675	-2.52
8	0.8381	-3.52

Bead	Volts	Degrees C
9	0.8156	-4.29
10	0.7949	-5.01
11	0.7759	-5.67
12	0.7608	-6.21
13	0.7460	-6.74
14	0.7386	-7.20
15	0.7316	-7.26
16	0.7291	-7.52

Battery Information

Batteries changed ? Yes [x] No [ ] Monitoring Year: 7

Battery model number installed: ULB1 and ULB15 Batteries (9 V)

Expected battery life (years): 2024

Datalogger Programming (Describe programming completed; beads and frequency)

Memory wrap around enabled.

Observations and Proposed Maintenance

Both batteries changed.

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

Site Name: CAM-5 Landfill Name: Tier II Disposal Facility

Monitoring Well ID: MW-05

Sample Number(s) include dups.: 1

Bottles filled (by parameter type): 4 (all)

Date of Sampling Event: 11 Aug 2017 Time: 2:00pm

Weather: Sun & cloud 8°C, slight wind

Names of Samplers: JEB

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

Lock (condition, presence, model, manufacturer): cut & replaced

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= Diameter of well (cm)= 4

*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)= 50

Static water level (cm) from top of pipe = 170

Static water level (cm) (below ground surface) calculated = 120

Measured well refusal depth (cm) (measure after sampling)= 175

Thickness of water column (cm)= 5 Static volume of water in well (mL)= 63

Free product thickness (mm)= ∅ Evidence of sludge or siltation: none

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information: Low flow peristaltic pump

Well purged (Y/N): Y Recharge Rate: <100mL/min.

Volume Purged (L) (note multiple purging events if applicable): ~250mL

Parameter	Initial	Stabilized	Final	*Notes (if not stabilized)*
pH	8.23			dry after
Conductivity (uS/cm)	0.094			bottles
Turbidity (NTU)	20.8			filled
Temperature (degC)	4.59			

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

Decontamination of sampling equipment

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

Number washes: 1 Number rinses: 1

Other Relevant Comments: PHC F1 preserved with sodium bisulphate

* 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: CAM-5 Landfill Name: Tier II Disposal Facility

Monitoring Well ID: MW-06

Sample Number(s) include dups.: 1

Bottles filled (by parameter type): all

Date of Sampling Event: 11 Aug 2017 Time: 1:00pm

Weather: sun & cloud, 8°C, slight wind

Names of Samplers: JEB

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

casing in great condition, no ponding, dry ground

Lock (condition, presence, model, manufacturer): cut & replaced

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= Diameter of well (cm)= 4

*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)= 64

Static water level (cm) from top of pipe = 159

Static water level (cm) (below ground surface) calculated = 95

Measured well refusal depth (cm) (measure after sampling)= 217

Thickness of water column (cm)= 58 Static volume of water in well (mL)= 729

Free product thickness (mm)= Ø Evidence of sludge or siltation: none

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information: Low flow peristaltic pump

Well purged (Y/N): N Recharge Rate: ~100mL/min

Volume Purged (L) (note multiple purging events if applicable): ~500mL

Parameter	Initial	Stabilized	Final	*Notes (if not stabilized)*
pH	8.41	7.98	7.78	
Conductivity (uS/cm)	0.209	0.207	0.217	
Turbidity (NTU)	15.9	15.3	14.3	
Temperature (degC)	4.44	4.41	4.28	

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: PHC F1 preserved with sodium bisulphate

* 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: CAM-S Landfill Name: Tier II Disposal Facility

Monitoring Well ID: MW-07

Sample Number(s) include dups.: Ø

Bottles filled (by parameter type): Ø

Date of Sampling Event: 11-Aug-2017 Time: 12:00

Weather: Sun & cloud, 8°C, slight wind

Names of Samplers: JEB

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

casing in great condition, no ponding, dry ground

Lock (condition, presence, model, manufacturer): cut & replaced

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= Diameter of well (cm)= 4

*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 = 160

Static water level (cm) (below ground surface) calculated = 121

Measured well refusal depth (cm) (measure after sampling)= 160

Thickness of water column (cm)= Ø Static volume of water in well (mL)= N/A

Free product thickness (mm)= Ø Evidence of sludge or siltation: N/A

Purging Information Summary*

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

Well purged (Y/N): N/A Recharge Rate: N/A

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

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 on tip of probe

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: CAM-5 Landfill Name: Tier II Disposal Facility

Monitoring Well ID: MW-08

Sample Number(s) include dups.: 2 (MW-908)

Bottles filled (by parameter type): all

Date of Sampling Event: 11-Aug-2017 Time: 11:00

Weather: sun and cloud, 8°C, slight wind

Names of Samplers: JEB

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

casing in great condition, no ponding, dry ground

Lock (condition, presence, model, manufacturer): cut & replaced

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= Diameter of well (cm)= 4cm

*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)= 71

Static water level (cm) from top of pipe = 158

Static water level (cm) (below ground surface) calculated = 87

Measured well refusal depth (cm) (measure after sampling)= 242

Thickness of water column (cm)= 84 Static volume of water in well (mL)= 1056

Free product thickness (mm)= Ø Evidence of sludge or siltation: none

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information: low flow peristaltic pump

Well purged (Y/N): Y Recharge Rate: ~100mL/min

Volume Purged (L) (note multiple purging events if applicable): ~500mL

Parameter	Initial	Stabilized	Final	*Notes (if not stabilized)*
pH	8.11	8.37	8.32	
Conductivity (uS/cm)	0.656	0.216	0.124	
Turbidity (NTU)	208	198	161	
Temperature (degC)	5.21	4.93	4.41	

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation…): slightly silty, 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: PHC F1 preserved using sodium bisulphate

* 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: CAM-5 Landfill Name: NHWL
Monitoring Well ID: MW-09
Sample Number(s) include dups.: 1
Bottles filled (by parameter type): all
Date of Sampling Event: 11-Aug-2017 Time: 4:45pm
Weather: Sun & cloud, 8°C, slight wind
Names of Samplers: JEB
Description of Well Condition and Surrounding ground conditions (note ponding of water):
casing in loose, no ponding, dry ground
Lock (condition, presence, model, manufacturer): cut & replaced

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= Diameter of well (cm)= 4
*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
Static water level (cm) from top of pipe = 53
Static water level (cm) (below ground surface) calculated = 22
Measured well refusal depth (cm) (measure after sampling)= 206
Thickness of water column (cm)= 153 Static volume of water in well (mL)= 1923
Free product thickness (mm)= Ø Evidence of sludge or siltation: none

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information: low flow peristaltic pump
Well purged (Y/N): Y Recharge Rate: ~100mL/min
Volume Purged (L) (note multiple purging events if applicable): ~500mL

Parameter	Initial	Stabilized	Final	*Notes (if not stabilized)*
pH	8.68	8.84	8.44	
Conductivity (uS/cm)	0.079	0.041	0.035	
Turbidity (NTU)	163	61.8	58.9	
Temperature (degC)	5.61	4.87	4.94	

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation…): Slightly silty, 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: PHC F1 preserved using sodium bisulphate

* 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: CAM-5 Landfill Name: NHWL

Monitoring Well ID: MW-11

Sample Number(s) include dups.: 1

Bottles filled (by parameter type): all

Date of Sampling Event: 11-Aug-2017 Time: 3:00pm

Weather: Sun & cloud, 8°C, slight wind

Names of Samplers: JEB

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

casing in great condition, no ponding, dry ground

Lock (condition, presence, model, manufacturer): cut & replaced

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= Diameter of well (cm)= 4

*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)= 69

Static water level (cm) from top of pipe = 90

Static water level (cm) (below ground surface) calculated = 21

Measured well refusal depth (cm) (measure after sampling)= 269

Thickness of water column (cm)= 179 Static volume of water in well (mL)= 2249

Free product thickness (mm)= Ø Evidence of sludge or siltation: none

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information: low flow peristaltic pump

Well purged (Y/N): Y Recharge Rate: ~100mL/min

Volume Purged (L) (note multiple purging events if applicable): ~500mL

Parameter	Initial	Stabilized	Final	*Notes (if not stabilized)*
pH	7.33	8.49	8.32	
Conductivity (uS/cm)	0.253	0.066	0.027	
Turbidity (NTU)	69.1	69.4	7.3	
Temperature (degC)	5.16	5.66	5.64	

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation…): slightly silty, 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: PHC F1 preserved using sodium bisulphate

* 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: CAM-5 Landfill Name: NHWL
Monitoring Well ID: MW-12
Sample Number(s) include dups.: 1
Bottles filled (by parameter type): all
Date of Sampling Event: 11 Aug 2017 Time: 3:45pm
Weather: sun & cloud, 8°C, slight wind
Names of Samplers: JEB
Description of Well Condition and Surrounding ground conditions (note ponding of water):
casing in great condition, no ponding, dry ground
Lock (condition, presence, model, manufacturer): cut & replaced

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= Diameter of well (cm)= 4
*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 = 114
Static water level (cm) (below ground surface) calculated = 65
Measured well refusal depth (cm) (measure after sampling)= 174
Thickness of water column (cm)= 60 Static volume of water in well (mL)= 754
Free product thickness (mm)= Ø Evidence of sludge or siltation: none

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information: low flow peristaltic pump
Well purged (Y/N): Y Recharge Rate: ~100mL/min
Volume Purged (L) (note multiple purging events if applicable): ~500mL

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH	8.13	8.18	7.98	
Conductivity (uS/cm)	0.020	0.017	0.016	
Turbidity (NTU)	14.3	5.3	4.1	
Temperature (degC)	5.72	4.51	4.25	

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: /
Other Relevant Comments: PHC F1 preserved using sodium bisulphate

* 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.

SITE NAME: CAM-5

RECORD OF SOIL SAMPLING

DATE: Aug 11, 2017
SAMPLER NAME: 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-08 Shallow	0-15	moist redish brown sand with some gravel, trace stone				3	Y
Tier II Disposal Facility	MW-08 shallow	0-15	moist redish brown sand with some gravel, trace stone				3	Y
Tier II Disposal Facility	MW-08 Deep	40-50	moist redish brown sand with some gravel, trace stone				3	Y
Tier II Disposal Facility	MW-07 Shallow	0-15	moist -redish brown coarse sand and gravel, trace stone				3	Y
Tier II Disposal Facility	MW-07 Deep	40-50	moist -redish brown coarse sand and gravel, trace stone				3	Y
Tier II Disposal Facility	MW-06 Shallow	0-15	moist black brown sand with gravel and stone, organics (black)	-refusal @ 15cm on rock			3	Y
Tier II Disposal Facility	MW-05 Shallow	0-15	moist brown sand with gravel and stone.				3	Y
Tier II Disposal Facility	MW-05 Deep	20-30	moist brown sand with gravel and stone	-refusal @30 on rock			3	Y
Non-Hazardous Waste Landfill	MW-11 Shallow	0-15	- wet grey sand with some gravel and stone				3	Y
Non-Hazardous Waste Landfill	MW-11 Deep	40-50	-wet grey sand with some gravel and stone -	water entered hole			3	Y

SITE NAME: CAM-5

RECORD OF SOIL SAMPLING

DATE: Aug 11, 2017
SAMPLER NAME: J.F.B

LANDFILL NAME	SOIL SAMPLE ID	DEPTH (m)	SOIL DESCRIPTION	GPS Northing	GPS Easting	GPS Elevation	Photographs	Backfilled (Y/N)
Non-Hazardous Waste Landfill	MW-12 shallow	0-15	redish brown coarse sand with some gravel, trace stone				3	Y
Non-Hazardous Waste Landfill	MW-12 Deep	40-50					3	Y
Non-Hazardous Waste Landfill	MW-912 Deep	40-50					3	Y
Non-Hazardous Waste Landfill	MW-09 shallow	0-15	redish brown coarse sand with some gravel trace stone	refusal on rock @ 20cm			3	Y

SITE NAME: CAM-5

RECORD OF SOIL SAMPLING

SAMPLER NAME: Aug 12 2017 JJFB

LANDFILL NAME	SOIL SAMPLE ID	DEPTH (m)	SOIL DESCRIPTION	GPS Northing	GPS Easting	GPS Elevation	Photographs	Backfilled (Y/N)
Lower Site Landfill South	CS-2 shallow	0-15	moist brown sand (loam), trace gravel, trace organics				3	Y
Lower Site Landfill South	CS-2 Deep	40-50	moist brown sand (loam), trace sand				3	Y
Lower Site Landfill South	CS-1 Shallow	0-15	moist yellow brown sand with trace gravel				3	Y
Lower Site Landfill South	CS-1 Deep	40-50	moist yellow brown sand with trace gravel				3	Y
Lower Site Landfill South	CS-5 shallow	0-15	wet silty grey sand, trace gravel	water entered hole Frozen @ 20 cm.			3	Y
Lower Site Landfill South	CS-4 shallow	0-15	wet silty grey sand, trace gravel	-water entered hole -frozen @ 15cm, hydrocarbon sheen in area			3	Y
Lower Site Landfill South	CS-3 Shallow	0-15	wet grey sand with some gravel and Stone				3	Y
Lower Site Landfill South	CS-3 Deep	40-50	wet grey sand with some gravel and stone				3	Y
USAF Landfill	CS-6 Shallow	0-15	dry black sand (loam) with some organics & stone	-refusal @ 20cm on rock			3	Y
USAF Landfill	CS-7 Shallow	0-15	wet redish brown sand with some gravel & ston				3	Y

SITE NAME: CAM-5

RECORD OF SOIL SAMPLING

DATE: Aug 16, 2014
SAMPLER NAME: JEB

LANDFILL NAME	SOIL SAMPLE ID	DEPTH (m)	SOIL DESCRIPTION	GPS Northing	GPS Easting	GPS Elevation	Photographs	Backfilled (Y/N)
USAF Landfill	CS-7 deep	40-50	wet redish brown sand with some gravel & stone	-water entered hole			3	Y
USAF Landfill	C5-8 shallow	0-15	wet brown sand with some gravel & stone				3	Y
US AF Landfill	C5-8 Deep	40-50	wet brown sand with some gravel & stone	-water entered hole			3	Y
USAF Landfill	C5-97 Deep	40-50	wet redish brown Sand with some gravel & stone				3	Y

CAM-5
VT-1

ANNEX M: Thermistor Inspection Template

Inspector Name:	Reza Moghaddam	Inspection Date:	Aug 11, 2017
Inspector Signature / Prepared By:			

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

Site Name:	CAM-5	Landfill:	Tier II		
Thermistor Number:	VT-1	Inclination:	Vertical		
Datalogger model no:	[illegible]	Datalogger cable download model:	US[illegible]		
*Install Date:		First Date Event	2011	Last Date Event	2017
*Coordinates and Elevation		N 7690516	E 553025	Elev	
Length of Cable (m)	10.5	Cable Lead Above Ground (m)	3.47		
Datalogger Serial #	711005 0	Nodal Points	16		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☑	☐	
Beads	☑	☐	
Lock condition	☑	☐	New lock

Battery Installation Date

Battery Levels Main 11.34 Aux 13.32

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	1.0305	2.27
2	0.9548	0.40
3	0.9592	0.54
4	0.8098	-1.43
5	0.8487	-3.15
6	0.8151	-4.30
7	0.7840	-5.39
8	0.7608	-6.21

Bead	ohms	Degrees C
9	0.7410	-6.92
10	0.7186	-7.72
11	0.7035	-8.27
12	0.6902	-8.61
13	0.6825	-9.05
14	0.6722	-9.41
15	0.6680	-9.59
16	0.6639	-9.74

Battery Information

Batteries changed ? Yes ☑ No ☐ Monitoring Year: 7(2017)

Battery model number installed: UB1815

Expected battery life (years): ~~15~~ 2024

Datalogger Programming (Describe programming completed; beads and frequency)

Memory wraparound was enabled →

Observations and Proposed Maintenance

changed all batteries.

CAM-5
VT-2

ANNEX M: Thermistor Inspection Template

Inspector Name:	CAM A/S Reza	Inspection Date:	Aug 11 2017
Inspector Signature / Prepared By:	Mognaddam		

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

Site Name:	[redacted]	Landfill:	Tcell		
Thermistor Number:	[redacted]	Inclination:	Vertical		
Datalogger model no:	[redacted]	Datalogger cable download model:	US[redacted]		
*Install Date:		First Date Event	2011	Last Date Event	2017
*Coordinates and Elevation		N 7580525	E 553546	Elev	
Length of Cable (m)	8.25 m	Cable Lead Above Ground (m)	3m		
Datalogger Serial #	7110973	Nodal Points	12		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☑	☐	
Beads	☑	☐	
Lock condition	☑	☐	New lock
Battery Installation Date			
Battery Levels	Main 11.34	Aux 12.76	

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	1.0422	4.58
2	1.0454	5.03
3	1.0779	4.44
4	1.0092	2.13
5	0.9379	-0.15
6	0.9041	-1.28
7	0.8425	-3.37
8	0.8100	-4.46

Bead	ohms	Degrees C
9	0.7883	-5.24
10	0.7691	-5.91
11	0.7508	-6.56
12	0.7375	-7.04

Battery Information

Batteries changed ? Yes ☑ No ☐ Monitoring Year: 7(2017)

Battery model number installed: UB12 7.15

Expected battery life (years): 2 2014

Datalogger Programming (Describe programming completed: beads and frequency)

Memory whatever

Observations and Proposed Maintenance

changed all batteries.

CAM-5
VT-3

ANNEX M: Thermistor Inspection Template

Inspector Name:	Reza Moghaddam	Inspection Date:	Aug 11, 2017
Inspector Signature / Prepared By:			

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

Site Name:	CAM [redacted]	Landfill:	Tier II		
Thermistor Number:	VT-3 [redacted]	Inclination:	Vertical		
Datalogger model no:	[redacted]	Datalogger cable download model:	USB [redacted]		
*Install Date:		First Date Event	2011	Last Date Event	2017
*Coordinates and Elevation		N 7580502	E 553517	Elev	
Length of Cable (m)	9.25	Cable Lead Above Ground (m)	3.53		
Datalogger Serial #	7110076	Nodal Points	14		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☑	☐	
Beads	☑	☐	
Lock condition	☑	☐	New lock

Battery Installation Date

Battery Levels Main 11.34 Aux 13.26

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	1.1417	6.57
2	1.1214	5.88
3	1.1049	5.23
4	1.1076	5.41
5	1.0537	3.65
6	0.9671	0.70
7	0.9265	-0.73
8	0.8473	-3.2

Bead	ohms	Degrees C
9	0.8156	-4.29
10	0.7944	-5.20
11	0.7691	-5.71
12	0.7522	-6.51
13	0.7365	-7.08
14	0.7236	-7.54

Battery Information

Batteries changed ? Yes ☑ No ☐ Monitoring Year: 7 (2017)

Battery model number installed: U181 AIS

Expected battery life (years): 2024

Datalogger Programming (Describe programming completed; beads and frequency)

Restart memory Aug 11 → 20 Dec 2014

Observations and Proposed Maintenance

changed all batteries.

CAM-5

VT-4

ANNEX M: Thermistor Inspection Template

Inspector Name:	Reza Moghaddam	Inspection Date:	Aug 11, 2017
Inspector Signature / Prepared By:	[signature]		

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

Site Name:	[redacted]	Landfill:	Tier II		
Thermistor Number:	[redacted]	Inclination:	Vertical		
Datalogger model no:	[redacted]	Datalogger cable download model:	US[redacted]		
*Install Date:		First Date Event	2011	Last Date Event	2017
*Coordinates and Elevation		N 7586002 E 553557.8		Elev	
Length of Cable (m)	10.1	Cable Lead Above Ground (m)	3.9		
Datalogger Serial #	7/10077	Nodal Points	16		

Thermistor Inspection

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

Battery Installation Date

Battery Levels Main 11.3 vl Aux 13.87

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	1.1927	8.20
2	1.0718	4.24
3	1.0561	3.73
4	1.0195	2.53
5	0.9514	0.28
6	0.9038	-1.32
7	0.8675	-2.52
8	0.8381	-3.52

Bead	ohms	Degrees C
9	0.856	-4.28
10	0.7949	-5.0
11	0.7754	-5.67
12	0.7628	-6.24
13	0.7467	-6.74
14	0.7386	-7.00
15	0.7316	-7.26
16	0.7291	-7.52

Battery Information

Batteries changed ? Yes ☑ No ☐ Monitoring Year: 7 (2017)

Battery model number installed: ULB1 & ULB15

Expected battery life (years): 2024

Datalogger Programming (Describe programming completed: beads and frequency)

Memory wiped Mind

Observations and Proposed Maintenance

changed all batteries.

INSTRUMENT CALIBRATION REPORT

Pine Environmental Services LLC

159 Colonnade Road
Unit 3
Ottawa, Ontario K2E 7L9

Pine Environmental Services, Inc.

Instrument ID 25326
Description Horiba U-52 Sonde 2m Cable
Calibrated 7/12/2017 10:38:04AM

Manufacturer Horiba
Model Number U-5000
Serial Number/ Lot Number TBKUUMSS
Location Ottawa
Department

State Certified
Status Pass
Temp °C 21.6
Humidity % 56

Calibration Specifications

Group # 1
Group Name PH
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
7.01 / 7.01	PH	7.01	PH	6.83	7.01	0.00%	Pass
4.01 / 4.01	PH	4.01	PH	3.82	4.01	0.00%	Pass

Group # 2
Group Name Turbidity
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
0.00 / 0.00	NTU	0.00	NTU	1.70	0.00	0.00%	Pass
800.00 / 800.00	NTU	800.00	NTU	813.00	800.00	0.00%	Pass

Group # 3
Group Name Conductivity
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.000

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
0.718 / 0.718	ms/cm	0.718	ms/cm	0.700	0.718	0.00%	Pass
5.000 / 5.000	ms/cm	5.000	ms/cm	5.140	5.000	0.00%	Pass
80.000 / 80.000	ms/cm	80.000	ms/cm	84.600	80.000	0.00%	Pass

Group # 4
Group Name Redox (ORP)
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
240.00 / 240.00	mv	240.00	mv	249.00	240.00	0.00%	Pass

Group # 5
Group Name Disolved Oxygen Zero
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

INSTRUMENT CALIBRATION REPORT

Pine Environmental Services LLC

159 Colonnade Road
Unit 3
Ottawa, Ontario K2E 7L9

Pine Environmental Services, Inc.

Instrument ID 25326
Description Horiba U-52 Sonde 2m Cable
Calibrated 7/12/2017 10:38:04AM

Group # 5 | **Range Acc %** 0.0000
Group Name Disolved Oxygen Zero | **Reading Acc %** 3.0000
Stated Accy Pct of Reading | **Plus/Minus** 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
0.00 / 0.00	mg/L	0.00	mg/L	0.52	0.00	0.00%	Pass

Group # 6 | **Range Acc %** 0.0000
Group Name Temperature DO Span | **Reading Acc %** 0.0000
Stated Accy Plus / Minus | **Plus/Minus** 3.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
19.20 / 20.50	degrees C	8.68	mg/L	7.16	8.68	0.00%	Pass

Test Instruments Used During the Calibration **(As Of Cal Entry Date)**

Test Standard ID	Description	Manufacturer	Model Number	Serial Number / Lot Number	Last Cal Date/ Opened Date	Next Cal Date / Expiration Date

Notes about this calibration

Calibration Result Calibration Successful
Who Calibrated Shawn Neely

All instruments are calibrated by Pine Environmental Services LLC according to the manufacturer's specifications, but it is the customer's responsibility to calibrate and maintain this unit in accordance with the manufacturer's specifications and/or the customer's own specific needs.

Notify Pine Environmental Services LLC of any defect within 24 hours of receipt of equipment
Please call 800-301-9663 for Technical Assistance

APPENDIX C

Laboratory Certificates of Analysis and QA/QC Reports

CAM-5 Lower Site Landfill South - Summary of Soil Monitoring Analytical Data

Link To: Table of Contents

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	As* (mg/kg)	Cd* (mg/kg)	Cr* (mg/kg)	Co* (mg/kg)	Cu (mg/kg)	Pb* (mg/kg)	Ni (mg/kg)	Zn (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						0.83	1.00	21.8	9.5	10.5	10.0	14.0	31.0	0.100				N/A
Baseline Data - Arithmetic Mean						**1.00**	**1.00**	**20.0**	**5.0**	**5.7**	**10.0**	**6.8**	**15.3**	**0.003**				**17.1**
Baseline Data - Standard Deviation						0.00	0.00	0.0	0.0	5.0	0.0	0.0	0.0	0.000				7.3
Baseline Data Mean + 3xStandard Deviation						**1.00**	**1.00**	**20.0**	**5.0**	**20.7**	**10.0**	**6.8**	**15.3**	**0.003**				**38.9**
**** 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						*30*	*5*	*250*	*50*	*100*	*500*	*100*	*500*	*5*				*2500*
Monitoring Data															**TPH Sum will appear when F1, F2 and F3 fractions are entered.**			
Upgradient																		
	C5-1 surface																	
11-29096/97	C5-1	2011	1	Phase I	0-10	<1.0	<1.0	<20	<5.0	3.7	<10	5.6	<15	<0.050	<10	4.0	<9.0	13.5
2013-C5-1-A	C5-1	2013	3	Phase I	0-15	<1.0	<0.10	7.0	2.5	4.1	2.0	4.5	14.0	<0.010	<10	<10	<10	15.0
C5-1	C5-1	2015	5	Phase I	0-15	**1.20**	<0.5	6.8	2.2	**7.1**	2.4	4.5	11.3	<0.05	<7	<8	<6	10.5
C5-1 Shallow	C5-1	2017	7	Phase II	0-15	<1.0	<0.5	6.0	1.5	2.7	2.2	3.2	9.0	<0.05	<7	<4	<8	9.5
	C5-1		10	Phase II														#N/A
	C5-1		15	Phase II														#N/A
	C5-1		25	Phase II														#N/A
																		#N/A
																		#N/A
																		#N/A
																		#N/A
																		#N/A
	C5-1 depth																	
11-29098	C5-1	2011	1	Phase I	20-30	**2.70**	<1.0	<20	<5.0	4.3	<10	**7.3**	15.0	<0.050	<10	<4.0	<9.0	11.5
2013-C5-1-B	C5-1	2013	3	Phase I	40-50	<1.0	<0.1	5.0	1.5	3.4	2.0	3.7	9.0	<0.010	<10	<10	<10	15.0
C5-1	C5-1	2015	5	Phase I	40-50	<1.0	<0.5	4.3	1.6	3.3	1.5	3.4	7.5	<0.05	<7	<4	<8	9.5
C5-1 Deep	C5-1	2017	7	Phase II	40-50	**11.3**	**10.5**	19.6	**14.3**	**19.8**	**15.7**	**17.3**	**35.2**	<0.05	<7	<4	<8	9.5
	C5-1		10	Phase II														#N/A
	C5-1		15	Phase II														#N/A
	C5-1		25	Phase II														#N/A
																		#N/A
																		#N/A
																		#N/A
																		#N/A
																		#N/A

CAM-5 Lower Site Landfill South - Summary of Soil Monitoring Analytical Data

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Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	As* (mg/kg)	Cd* (mg/kg)	Cr* (mg/kg)	Co* (mg/kg)	Cu (mg/kg)	Pb* (mg/kg)	Ni (mg/kg)	Zn (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						0.83	1.00	21.8	9.5	10.5	10.0	14.0	31.0	0.100				N/A
Baseline Data - Arithmetic Mean						**1.00**	**1.00**	**20.0**	**5.0**	**5.7**	**10.0**	**6.8**	**15.3**	**0.003**				**17.1**
Baseline Data - Standard Deviation						0.00	0.00	0.0	0.0	5.0	0.0	0.0	0.0	0.000				7.3
Baseline Data Mean + 3xStandard Deviation						**1.00**	**1.00**	**20.0**	**5.0**	**20.7**	**10.0**	**6.8**	**15.3**	**0.003**				**38.9**
Downgradient																		
	C5-2 surface																	
11-29080	C5-2	2011	1	Phase I	0-10	<1.0	<1.0	<20	<5.0	<3.0	<10	<5.0	<15	<0.050	<10	<4.0	<9.0	11.5
2013-C5-2-A	C5-2	2013	3	Phase I	0-15	<1.0	<0.1	5.0	2.0	3.1	2.0	3.1	9.0	<0.010	<10	<10	14.0	**24.0**
C5-2	C5-2	2015	5	Phase I	0-15	<1.0	<0.5	6.0	1.4	2.1	2.0	2.7	7.7	<0.05	<7	<4	38.0	**43.5**
C5-2 Shallow	C5-2	2017	7	Phase II	0-15	<1.0	<0.5	3.3	1.3	2.6	1.8	3.0	7.9	<0.05	<7	<4	<8	9.5
	C5-2		10	Phase II														#N/A
	C5-2		15	Phase II														#N/A
	C5-2		25	Phase II														#N/A
																		#N/A
																		#N/A
																		#N/A
	C5-2 depth																	
11-29082	C5-2	2011	1	Phase I	20-30	<1.0	<1.0	<20	<5.0	<3.0	<10	<5.0	<15	<0.050	<10	<4.0	9.5	16.5
2013-C5-2-B	C5-2	2013	3	Phase I	40-50	<1.0	<0.1	7.0	2.0	5.3	3.0	3.8	11.0	<0.010	<10	<10	34.0	**44.0**
C5-2	C5-2	2015	5	Phase I	40-50	<1.0	<0.5	5.2	1.5	2.5	1.6	3.0	7.6	<0.05	<7	<4	24.0	**29.5**
C5-2 Deep	C5-2	2017	7	Phase II	40-50	<1.0	<0.5	9.7	4.1	**9.0**	4.5	6.6	**25.2**	<0.05	<7	<4	<8	9.5
	C5-2		10	Phase II														#N/A
	C5-2		15	Phase II														#N/A
	C5-2		25	Phase II														#N/A
																		#N/A
																		#N/A
																		#N/A
	C5-3 surface																	
11-29084	C5-3	2011	1	Phase I	0-10	<1.0	<1.0	**27.0**	**7.4**	**11.0**	<10	**13.0**	**28.0**	<0.050	<10	<4.0	<9.0	11.5
2013-C5-3-A/3-A-D	C5-3	2013	3	Phase I	0-15	<1.0	<0.1	2.4	**6.3**	**14.5**	4.5	**15.0**	**33.0**	<0.010	<10	<10	<10	15.0
C5-3	C5-3	2015	5	Phase I	0-15	**1.10**	<0.5	**24.6**	**5.9**	**12.8**	4.6	**14.6**	**27.9**	<0.05	<7	<4	<8	9.5
C5-3 Shallow	C5-3	2017	7	Phase II	0-15	**11.8**	**11.2**	14.5	**12.5**	**14.2**	**12.6**	**14.2**	**18.2**	<0.05	<7	<4	<8	9.5
	C5-3		10	Phase II														#N/A
	C5-3		15	Phase II														#N/A
	C5-3		25	Phase II														#N/A
																		#N/A
																		#N/A
																		#N/A
	C5-3 depth																	
11-29086	C5-3	2011	1	Phase I	20-30	1.0	<1.0	**26.0**	**7.9**	**12.0**	<10	**15.0**	**35.0**	<0.050	<10	<4.0	<9.0	11.5
2013-C5-3-B	C5-3	2013	3	Phase I	40-50	<1.0	<0.1	**29.0**	**7.2**	**17.0**	5.0	**18.0**	**36.0**	<0.010	<10	<10	<10	15.0
C5-3	C5-3	2015	5	Phase I	40-50	<1.0	<0.5	**25.1**	**6.1**	**13.0**	5.1	**14.7**	**28.7**	<0.05	<7	<4	<8	9.5
C5-3 Deep	C5-3	2017	7	Phase II	40-50	**12.0**	**11.8**	12.0	**12.0**	**12.4**	**12.1**	**12.2**	11.2	<0.05	<7	<4	<8	9.5
	C5-3		10	Phase II														#N/A
	C5-3		15	Phase II														#N/A
	C5-3		25	Phase II														#N/A

CAM-5 Lower Site Landfill South - Summary of Soil Monitoring Analytical Data

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Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	As* (mg/kg)	Cd* (mg/kg)	Cr* (mg/kg)	Co* (mg/kg)	Cu (mg/kg)	Pb* (mg/kg)	Ni (mg/kg)	Zn (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						0.83	1.00	21.8	9.5	10.5	10.0	14.0	31.0	0.100				N/A
Baseline Data - Arithmetic Mean						**1.00**	**1.00**	**20.0**	**5.0**	**5.7**	**10.0**	**6.8**	**15.3**	**0.003**				**17.1**
Baseline Data - Standard Deviation						0.00	0.00	0.0	0.0	5.0	0.0	0.0	0.0	0.000				7.3
Baseline Data Mean + 3xStandard Deviation						**1.00**	**1.00**	**20.0**	**5.0**	**20.7**	**10.0**	**6.8**	**15.3**	**0.003**				**38.9**
	C5-4 surface																	
11-29088	C5-4	2011	1	Phase I	0-10	<1.0	<1.0	**25.0**	**7.0**	**9.0**	<10	**14.0**	**27.0**	<0.050	<10	<4.0	<9.0	11.5
2013-C5-4-A	C5-4	2013	3	Phase I	0-15	<1.0	<0.10	**45.0**	**9.4**	**23.0**	6.0	**28.0**	**54.0**	<0.010	<10	<10	41.0	**51.0**
C5-4[1]	C5-4	2015	5	Phase I	0-15	**1.10**	<0.5	**20.4**	4.4	**8.7**	3.6	**11.9**	**25.0**	<1	<7	<4	32.0	**37.5**
C5-4 Shallow	C5-4	2017	7	Phase II	0-15	<1.0	<0.5	3.9	1.4	2.7	1.4	2.8	8.2	<0.05	<7	<4	<8	9.5
	C5-4		10	Phase II														#N/A
	C5-4		15	Phase II														#N/A
	C5-4		25	Phase II														#N/A
																		#N/A
																		#N/A
	C5-4 depth																	
11-29090	C5-4	2011	1	Phase I	20-30	<1.0	<1.0	**56.0**	**9.8**	**14.0**	<10	**25.0**	**36.0**	<0.050	<10	<4.0	<9.0	11.5
2013-C5-4-B	C5-4	2013	3	Phase I	40-50	<1.0	<0.10	**46.0**	1.0	**24.0**	6.0	**30.0**	**50.0**	<0.010	<10	<10	22.0	**32.0**
C5-4	C5-4	2015	5	Phase I	40-50	<1.0	<0.5	**37.3**	**8.0**	**17.6**	5.7	**22.7**	**37.4**	<0.05	<7	<4	<8	9.5
Not sampled, frozen ground	C5-4	2017	7	Phase II														#N/A
	C5-4		10	Phase II														#N/A
	C5-4		15	Phase II														#N/A
	C5-4		25	Phase II														#N/A
																		#N/A
																		#N/A
	C5-5 surface																	
11-29092	C5-5	2011	1	Phase I	0-10	<1.0	<1.0	<20	5.0	4.3	<10	**7.6**	**20.0**	<0.050	<10	<4.0	<9.0	11.5
2013-C5-5-A	C5-5	2013	3	Phase I	0-15	<1.0	<0.10	8.0	2.1	5.5	2.0	4.4	13.0	<0.010	<10	<10	<10	15.0
C5-5	C5-5	2015	5	Phase I	0-15	1.0	<0.5	**22.5**	**5.2**	**10.1**	3.0	**13.8**	**24.7**	<0.05	<7	<4	<8	9.5
C5-5 Shallow	C5-5	2017	7	Phase II	0-15	<1.0	<0.5	9.7	2.2	4.7	2.4	5.0	11.1	<0.05	<7	<4	<8	9.5
	C5-5		10	Phase II														#N/A
	C5-5		15	Phase II														#N/A
	C5-5		25	Phase II														#N/A
																		#N/A
																		#N/A
	C5-5 depth																	
11-29094	C5-5	2011	1	Phase I	20-30	<1.0	<1.0	<20	**5.1**	4.1	<10	**7.9**	**18.0**	<0.050	<10	<4.0	<9.0	11.5
2013-C5-5-B	C5-5	2013	3	Phase I	40-50	<1.0	<0.10	10.0	2.4	4.0	2.0	5.5	14.0	<0.010	<10	<10	<10	15.0
C5-5	C5-5	2015	5	Phase I	40-50	**1.30**	<0.5	**35.6**	**7.7**	**16.6**	5.9	**21.8**	**36.3**	<0.05	<7	<4	<8	9.5
Not sampled, frozen ground	C5-5	2017	7	Phase II														#N/A
	C5-5		10	Phase II														#N/A
	C5-5		15	Phase II														#N/A
	C5-5		25	Phase II														#N/A
																		#N/A

Note ^: Modified TPH Total (C_6-C_{34}) has been calculated by adding results for F1, F2 and F3.

N/A = not analyzed

1. PCB results for C-4 surface shows higher detection limit from required dilution due to presence of other analytes. This value has not been included in the charts.

Legend

XX	**Sample exceeds baseline mean.**
XX	**Sample exceeds baseline mean + 3xSD**

CAM-5 Lower Site Landfill South Trends in Soil Inorganics, PCBs and Modified TPH

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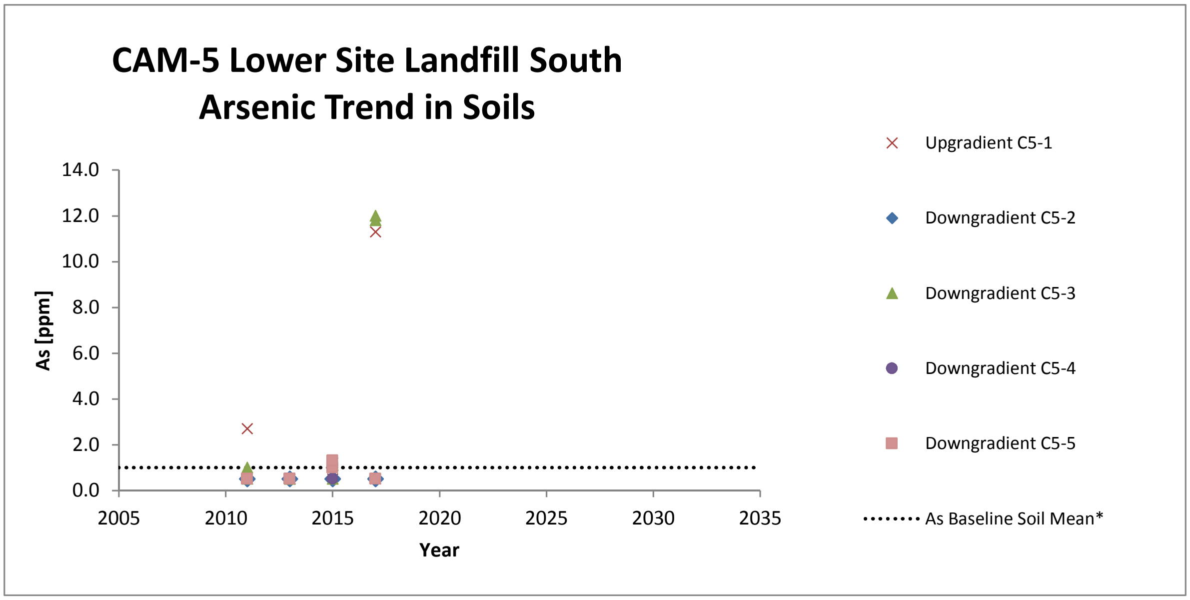
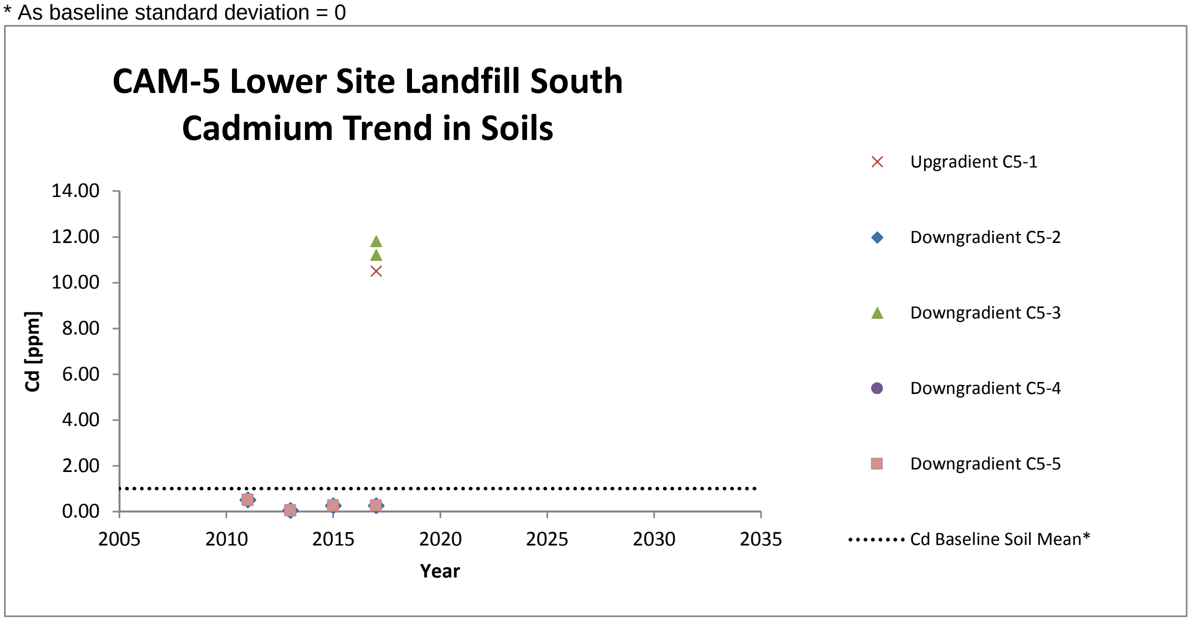
Where results are below detection, half of the detection limit has been used in the charts for the sample points.

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.



* As baseline arithmetic mean is equal to the baseline detection limit
* As baseline standard deviation = 0



* Cd baseline arithmetic mean is equal to the baseline detection limit
* Cd baseline standard deviation = 0

CAM-5 Lower Site Landfill South Trends in Soil Inorganics, PCBs and Modified TPH

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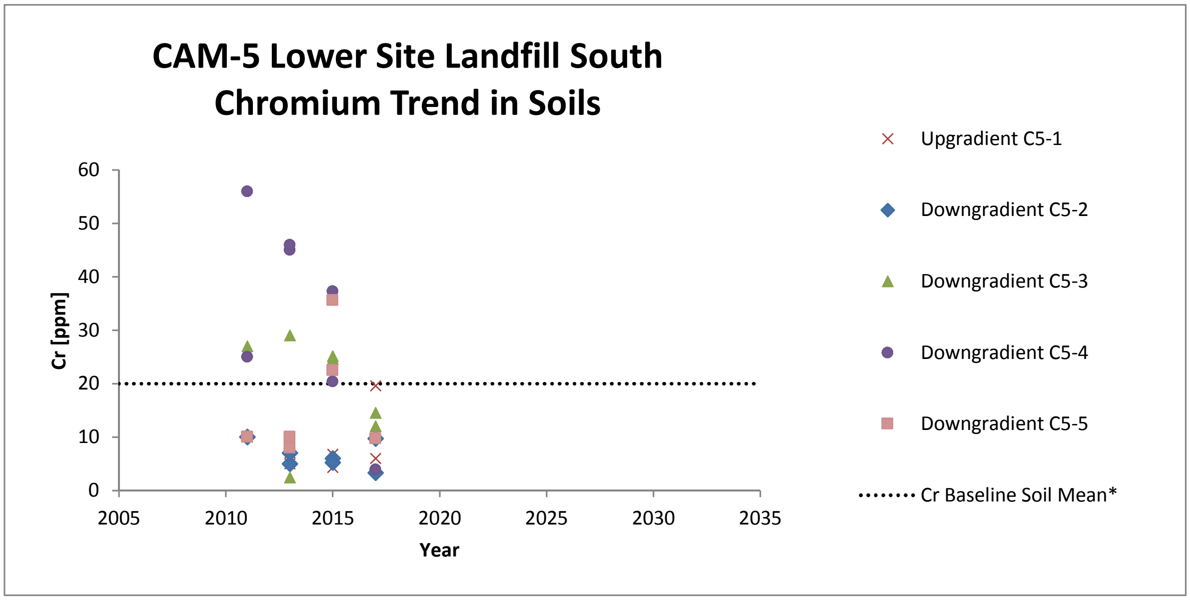
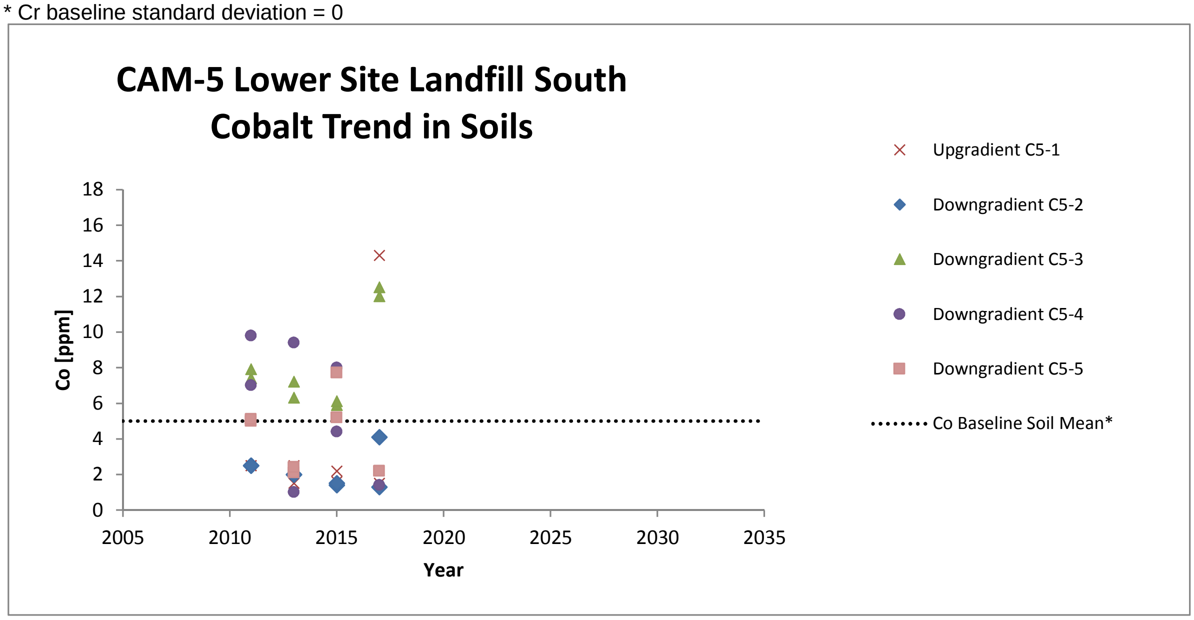
Where results are below detection, half of the detection limit has been used in the charts for the sample points.

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.



* Cr baseline arithmetic mean is equal to the baseline detection limit
* Cr baseline standard deviation = 0



* Co baseline arithmetic mean is equal to the baseline detection limit
* Co baseline standard deviation = 0

CAM-5 Lower Site Landfill South Trends in Soil Inorganics, PCBs and Modified TPH

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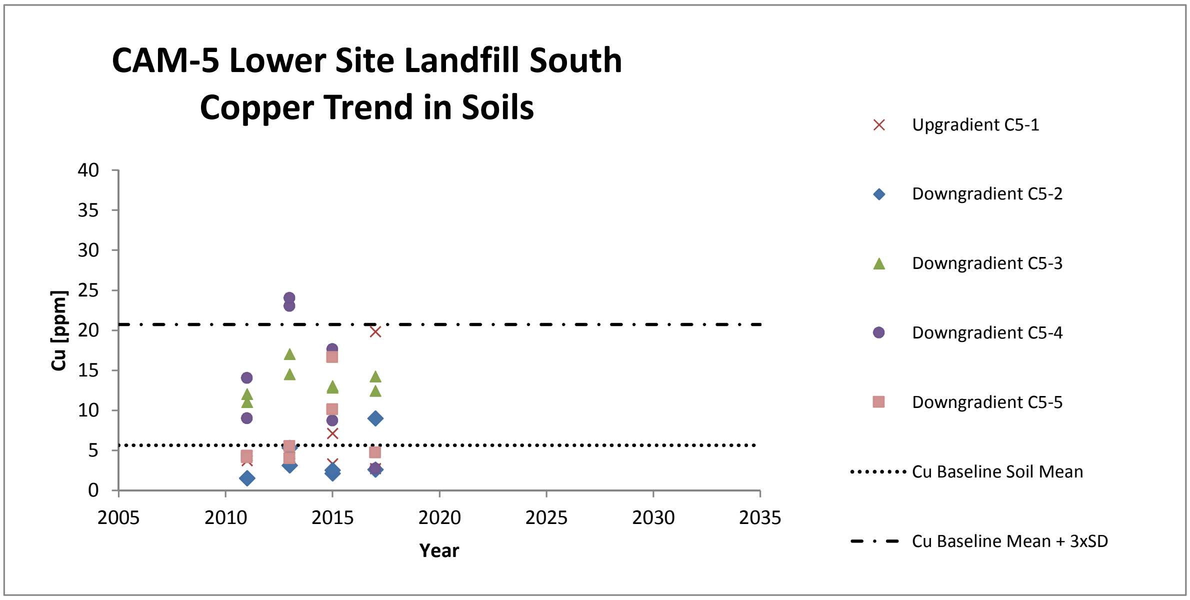
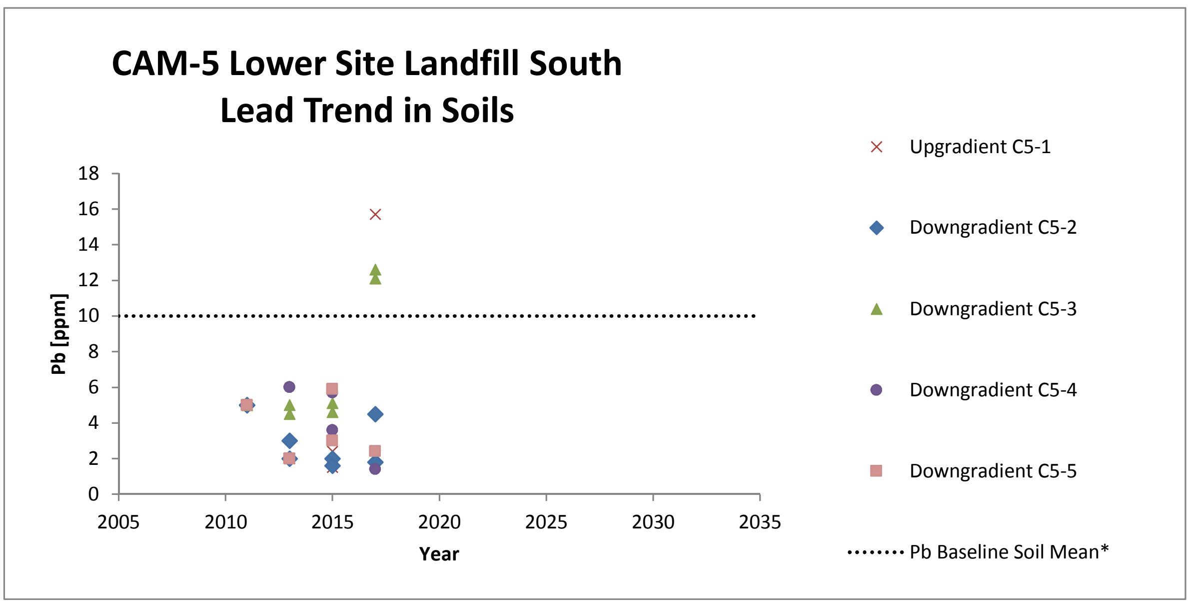
Where results are below detection, half of the detection limit has been used in the charts for the sample points.

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.





* Pb baseline arithmetic mean is equal to the baseline detection limit

* Pb baseline standard deviation = 0

CAM-5 Lower Site Landfill South Trends in Soil Inorganics, PCBs and Modified TPH

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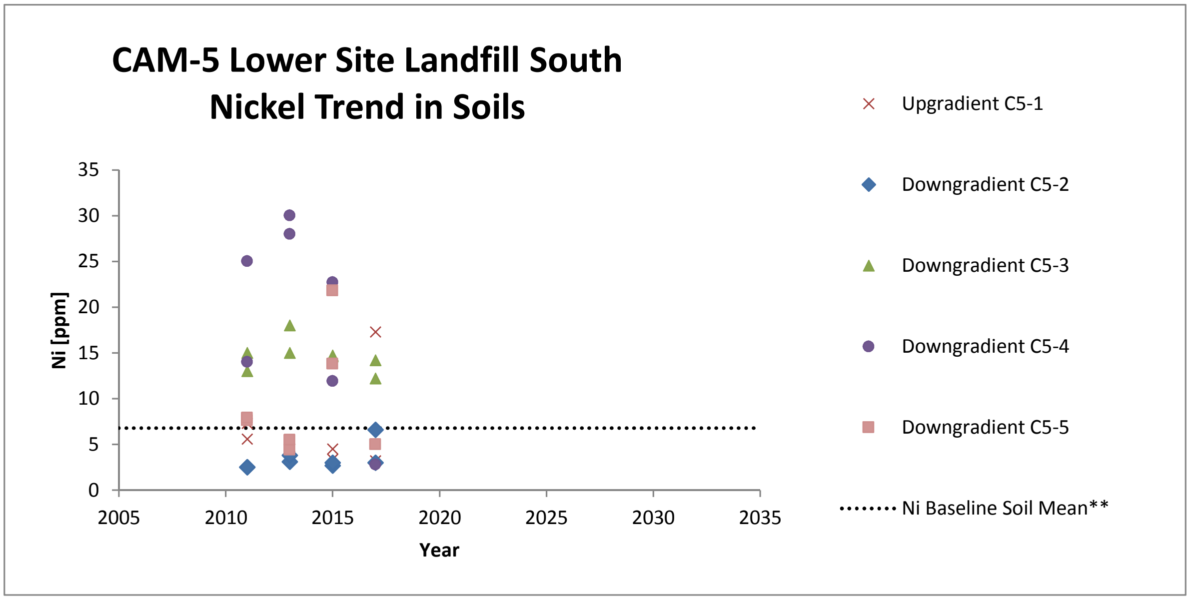
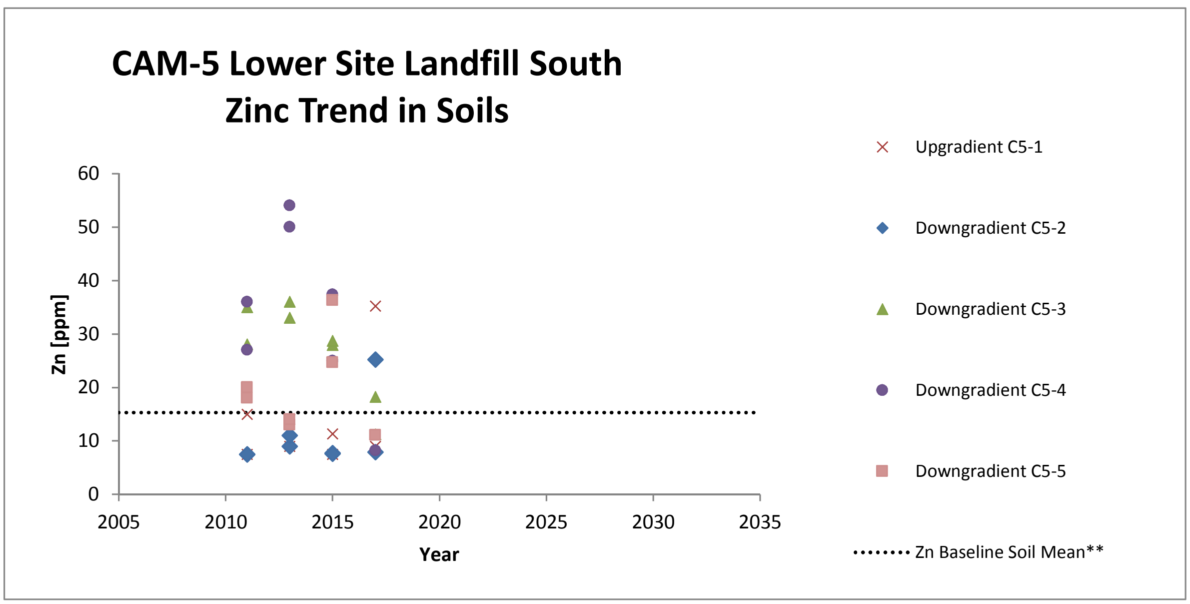
Where results are below detection, half of the detection limit has been used in the charts for the sample points.

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.



** Ni baseline standard deviation = 0



** Zn baseline standard deviation = 0

CAM-5 Lower Site Landfill South Trends in Soil Inorganics, PCBs and Modified TPH

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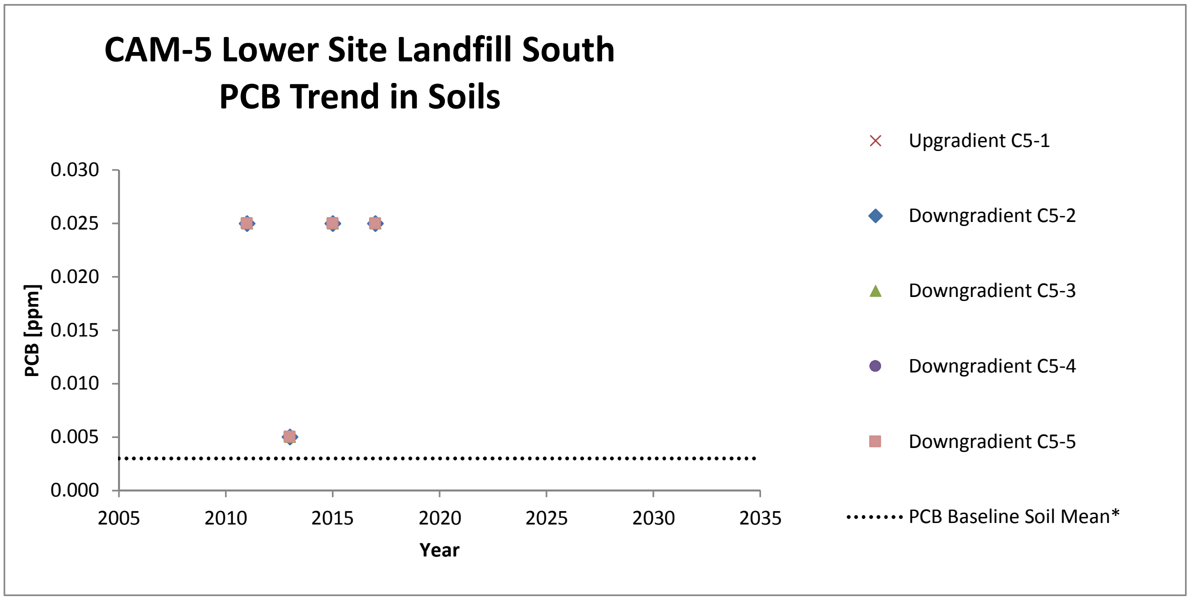
Where results are below detection, half of the detection limit has been used in the charts for the sample points.

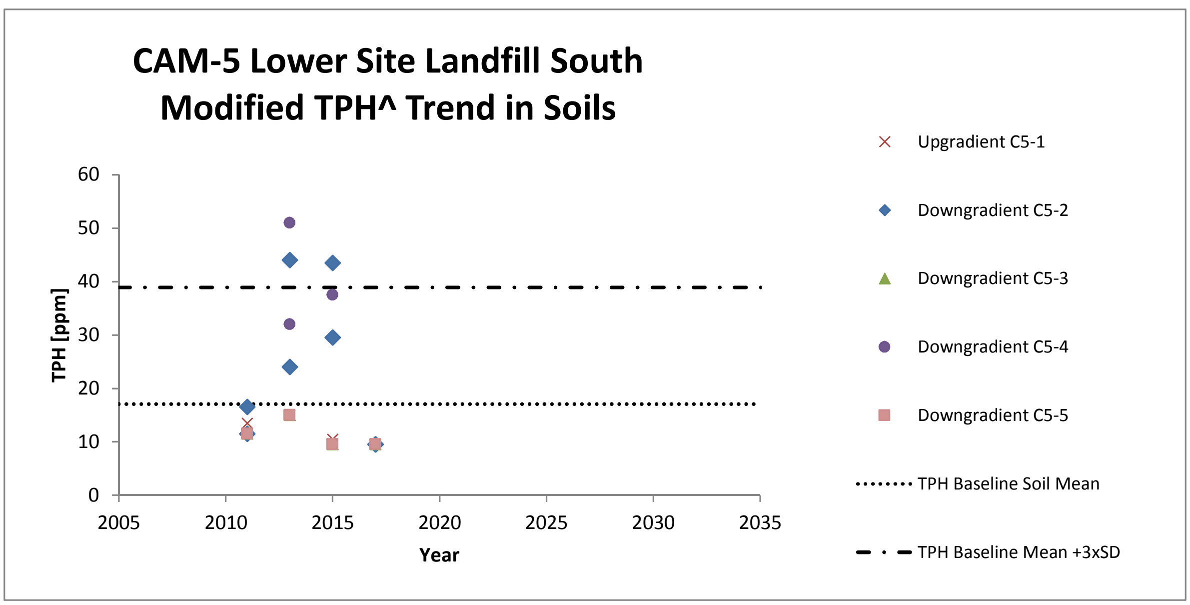
Trendlines are intended for visual interpretation of temporal trends. When all monitoring results are below detection, trendlines are a reflection of changes in detection limit. Users should refer to data tables.



* PCB baseline arithmetic mean is equal to the baseline detection limit

* PCB baseline standard deviation = 0

Note: variations seen to 2017 are an indication of changing detection limits; all results below detection limits



^ Modified TPH is sum of F1, F2 and F3 fractions (C_6 - C_{34})

CAM-5 Non-Hazardous Waste Landfill - Summary of Soil Monitoring Analytical Data

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Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	As* (mg/kg)	Cd* (mg/kg)	Cr* (mg/kg)	Co* (mg/kg)	Cu (mg/kg)	Pb* (mg/kg)	Ni (mg/kg)	Zn (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						0.83	1.00	21.8	9.5	10.5	10.0	14.0	31.0	0.100				N/A
Baseline Data - Arithmetic Mean						**1.00**	**1.00**	**20.0**	**5.0**	**12.0**	**10.0**	**7.1**	**25.9**	**0.003**				**29.6**
Baseline Data - Standard Deviation						0.00	0.00	0.0	0.0	9.0	0.0	2.8	6.2	0.000				31.7
Baseline Data Mean + 3xStandard Deviation						**1.00**	**1.00**	**20.0**	**5.0**	**39.1**	**10.0**	**15.5**	**44.5**	**0.003**				**124.6**
**** 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						*30*	*5*	*250*	*50*	*100*	*500*	*100*	*500*	*5*				*2500*
Monitoring Data															**TPH Sum will appear when F1, F2 and F3 fractions are entered.**			
Upgradient																		
	MW-12 surface																	
11-29060	MW-12	2011	1	Phase I	0-10	<1.0	<1.0	<20	**6.0**	9.1	<10	7.1	**27.0**	<0.050	<10	<4.0	<9.0	11.5
2013-C5-MW-12-A	MW-12	2013	3	Phase I	0-15	<1.0	<0.10	17.0	**6.5**	**18.0**	6.0	**11.0**	**41.0**	<0.010	<10	<10	<10	15.0
MW12	MW-12	2015	5	Phase I	0-15	**1.3**	<0.5	9.2	3.4	8.0	4.3	5.3	18.4	<0.05	<7	<4	<8	9.5
MW-12 Shallow	MW-12	2017	7	Phase II	0-15	<1.0	<0.5	9.1	4.3	9.0	5.2	6.6	**26.1**	<0.05	<7	<4	<8	9.5
	MW-12		10	Phase II														#N/A
	MW-12		15	Phase II														#N/A
	MW-12		25	Phase II														#N/A
																		#N/A
																		#N/A
																		#N/A
																		#N/A
	MW-12 depth																	
11-29062	MW-12	2011	1	Phase I	30-40	<1.0	<1.0	<20	**5.7**	8.1	<10	6.6	23.0	<0.050	<10	<4.0	<9.0	11.5
2013-C5-MW-12-B	MW-12	2013	3	Phase I	40-50	<1.0	<0.10	20.0	**6.9**	**25.0**	6.0	**12.0**	**40.0**	<0.010	<10	<10	<10	15.0
MW12 (dup. avg.)	MW-12	2015	5	Phase I	40-50	**1.2**	<0.5	12.0	3.8	11.0	6.0	6.0	22.0	<0.1	<6	<4	<8	9.0
MW-12 Deep (dup. avg.)	MW-12	2017	7	Phase II	40-50	<1.0	<0.5	10.3	4.4	10.1	5.1	6.8	24.4	<0.05	<7	<4	<8	9.5
	MW-12		10	Phase II														#N/A
	MW-12		15	Phase II														#N/A
	MW-12		25	Phase II														#N/A
																		#N/A
																		#N/A
																		#N/A
																		#N/A
																		#N/A

CAM-5 Non-Hazardous Waste Landfill - Summary of Soil Monitoring Analytical Data

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Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	As* (mg/kg)	Cd* (mg/kg)	Cr* (mg/kg)	Co* (mg/kg)	Cu (mg/kg)	Pb* (mg/kg)	Ni (mg/kg)	Zn (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						0.83	1.00	21.8	9.5	10.5	10.0	14.0	31.0	0.100				N/A
Baseline Data - Arithmetic Mean						**1.00**	**1.00**	**20.0**	**5.0**	**12.0**	**10.0**	**7.1**	**25.9**	**0.003**				**29.6**
Baseline Data - Standard Deviation						0.00	0.00	0.0	0.0	9.0	0.0	2.8	6.2	0.000				31.7
Baseline Data Mean + 3xStandard Deviation						**1.00**	**1.00**	**20.0**	**5.0**	**39.1**	**10.0**	**15.5**	**44.5**	**0.003**				**124.6**
Downgradient/Cross-Gradient																		
	MW-09 surface																	
11-29064	MW-09	2011	1	Phase I	0-10	<1.0	<1.0	<20	**6.6**	**13.0**	<10	**8.8**	**34.0**	<0.050	<10	7.1	63	**75.1**
2013-C5-MW-09-A	MW-09	2013	3	Phase I	0-15	<1.0	<0.10	17.0	**5.9**	**32.0**	6.0	**15.0**	**47.0**	<0.010	<10	<10	25	**35.0**
MW09	MW-09	2015	5	Phase I	0-15	**1.2**	<0.5	13.7	**5.5**	8.3	5.7	**8.5**	**34.8**	<0.05	<7	<4	<8	9.5
MW-09 Shallow	MW-9	2017	7	Phase II	0-15	<1.0	<0.5	18.5	**6.1**	7.7	6.5	**9.9**	**43.0**	<0.05	<7	<4	<8	9.5
	MW-09		10	Phase II														#N/A
	MW-09		15	Phase II														#N/A
	MW-09		25	Phase II														#N/A
																		#N/A
	MW-09 depth																	
11-29066	MW-09	2011	1	Phase I	30-40	<1.0	<1.0	**21.0**	**6.8**	**16.0**	<10	**11.0**	**35.0**	<0.050	<10	<4.0	25	**32.0**
2013-C5-MW-09-B	MW-09	2013	3	Phase I	40-50	<1.0	<0.10	17.0	**7.0**	**16.0**	7.0	**13.0**	**50.0**	<0.010	<10	<10	11	21.0
MW09	MW-09	2015	5	Phase I	40-50	1.0	<0.5	12.4	4.9	**12.2**	5.2	**8.1**	**29.1**	<0.05	<7	<4	<8	9.5
Not sampled, refusal	MW-9	2017	7	Phase II														#N/A
	MW-09		10	Phase II														#N/A
	MW-09		15	Phase II														#N/A
	MW-09		25	Phase II														#N/A
																		#N/A
	MW-11 surface																	
11-29056	MW-11	2011	1	Phase I	0-10	<1.0	<1.0	<20	**5.3**	6.0	<10	**7.9**	23.0	<0.050	17	<4.0	<9.0	23.5
2013-C5-MW-11-A/11-A-D	MW-11	2013	3	Phase I	0-15	<1.0	<0.10	18.5	**5.2**	10.5	4.0	**11.0**	**26.5**	<0.010	<10	<10	<10	15.0
MW11	MW-11	2015	5	Phase I	0-15	**1.4**	<0.5	**23.5**	**5.7**	10.2	4.3	**13.3**	**26.3**	<0.05	<7	<4	<8	9.5
MW-11 Shallow	MW-11	2017	7	Phase II	0-15	<1.0	<0.5	13.8	3.6	7.4	3.8	**7.7**	18.1	<0.05	<7	<4	<8	9.5
	MW-11		10	Phase II														#N/A
	MW-11		15	Phase II														#N/A
	MW-11		25	Phase II														#N/A
																		#N/A
	MW-11 depth																	
11-29058/59	MW-11	2011	1	Phase I	30-40	<1.0	<1.0	<20	**7.1**	8.2	<10	**11.0**	**29.0**	<0.050	<10	<4.0	<9.0	11.5
2013-C5-MW-11-B	MW-11	2013	3	Phase I	40-50	<1.0	<0.10	20.0	**5.6**	11.0	5.0	**12.0**	**26.0**	<0.010	<10	<10	<10	15.0
MW11 - not sampled, refusal	MW-11	2015	5	Phase I														#N/A
MW-11 Deep	MW-11	2017	7	Phase II	40-50	<1.0	<0.5	**23.7**	**6.3**	**13.0**	6.2	**14.2**	**30.0**	<0.05	<7	<4	<8	9.5
	MW-11		10	Phase II														#N/A
	MW-11		15	Phase II														#N/A
	MW-11		25	Phase II														#N/A

Note ^: Modified TPH Total (C_6-C_{34}) has been calculated by adding results for F1, F2 and F3.

N/A = not analyzed

MW-10 was removed in 2010 when a drainage swale was created around the landfill.

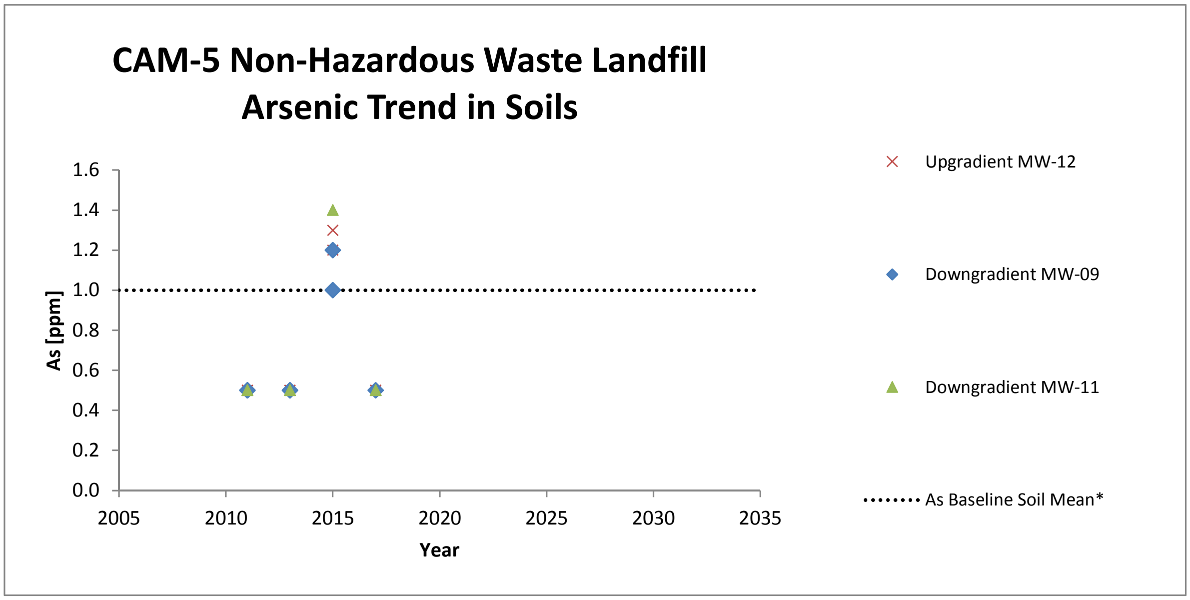
Legend	
XX	**Sample exceeds baseline mean.**
XX	**Sample exceeds baseline mean + 3xSD**

CAM-5 Non-Hazardous Waste Landfill Trends in Soil Inorganics, PCBs and Modified TPH

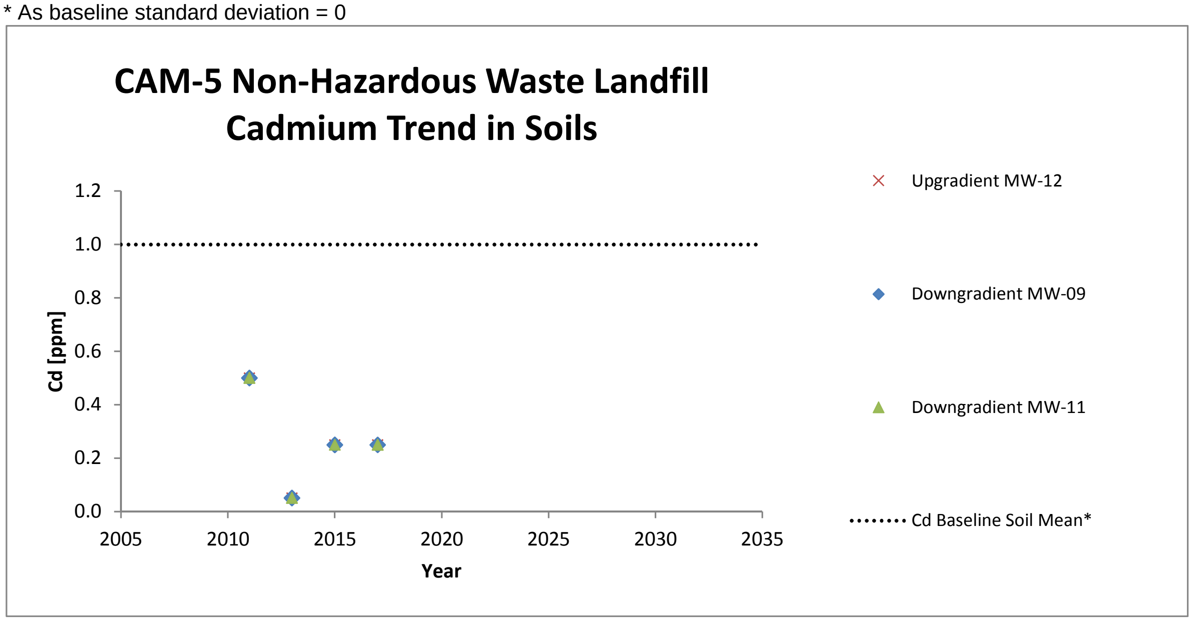
Link To: Table of Contents

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.



* As baseline arithmetic mean is equal to the baseline detection limit
* As baseline standard deviation = 0



* Cd baseline arithmetic mean is equal to the baseline detection limit
* Cd baseline standard deviation = 0

CAM-5 Non-Hazardous Waste Landfill Trends in Soil Inorganics, PCBs and Modified TPH

Link To: Table of Contents

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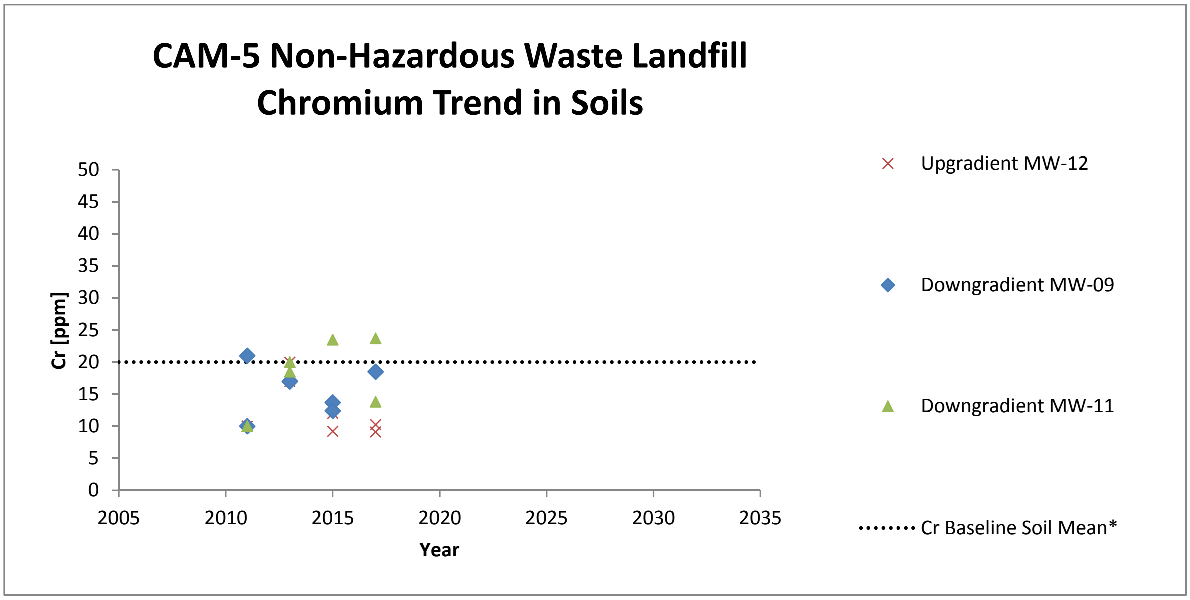
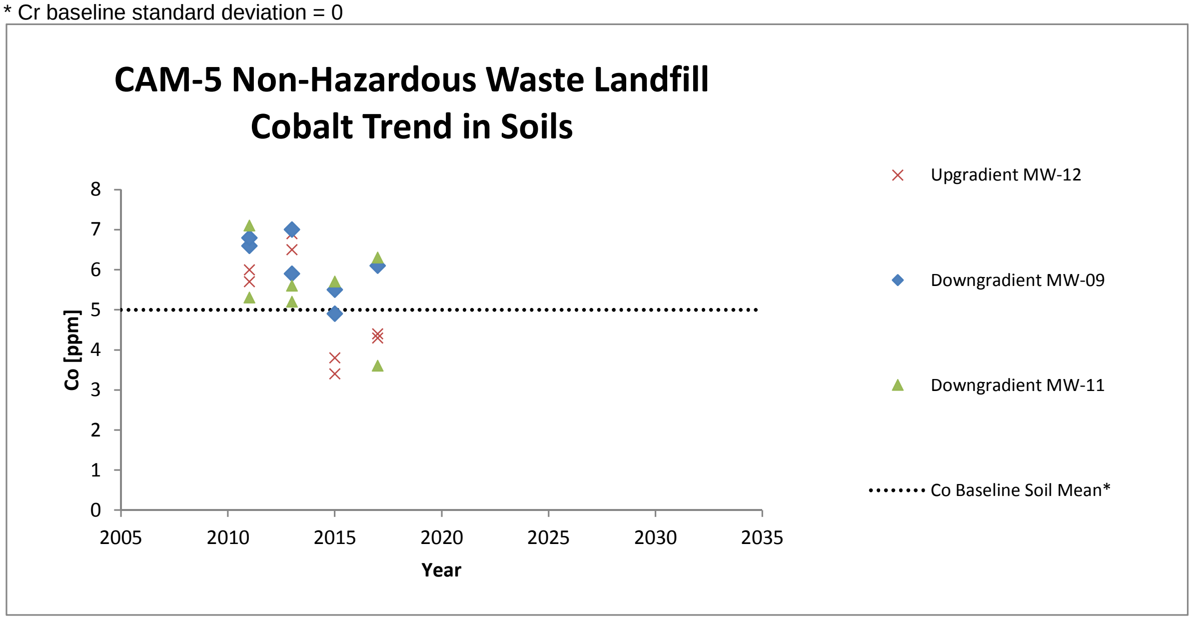


* Cr baseline arithmetic mean is equal to the baseline detection limit
* Cr baseline standard deviation = 0



* Co baseline arithmetic mean is equal to the baseline detection limit
* Co baseline standard deviation = 0

CAM-5 Non-Hazardous Waste Landfill Trends in Soil Inorganics, PCBs and Modified TPH

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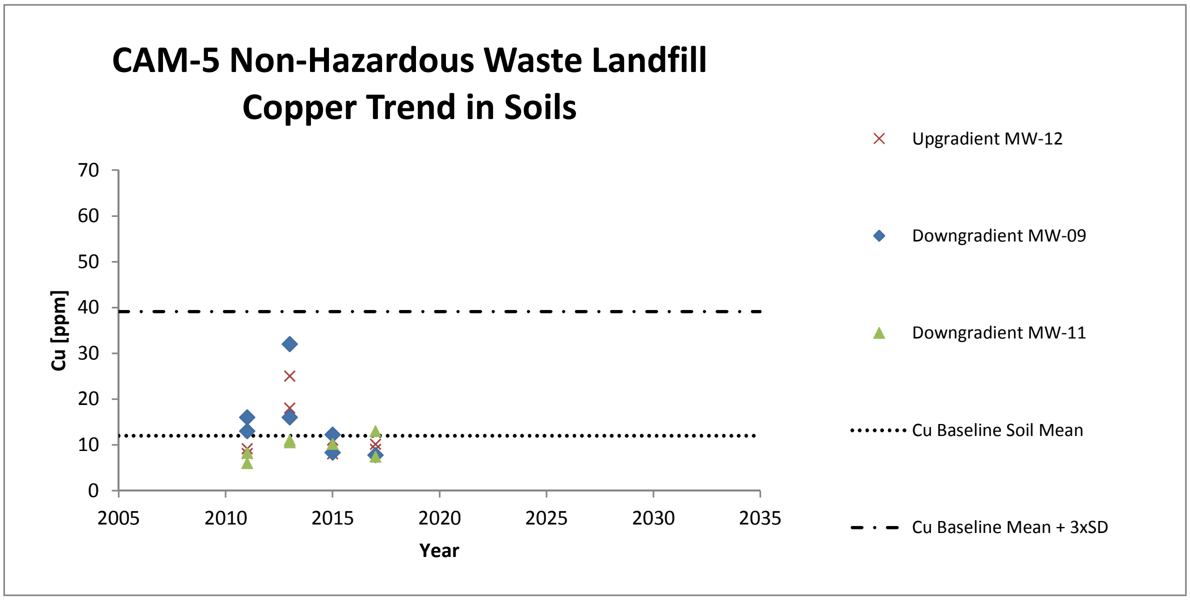

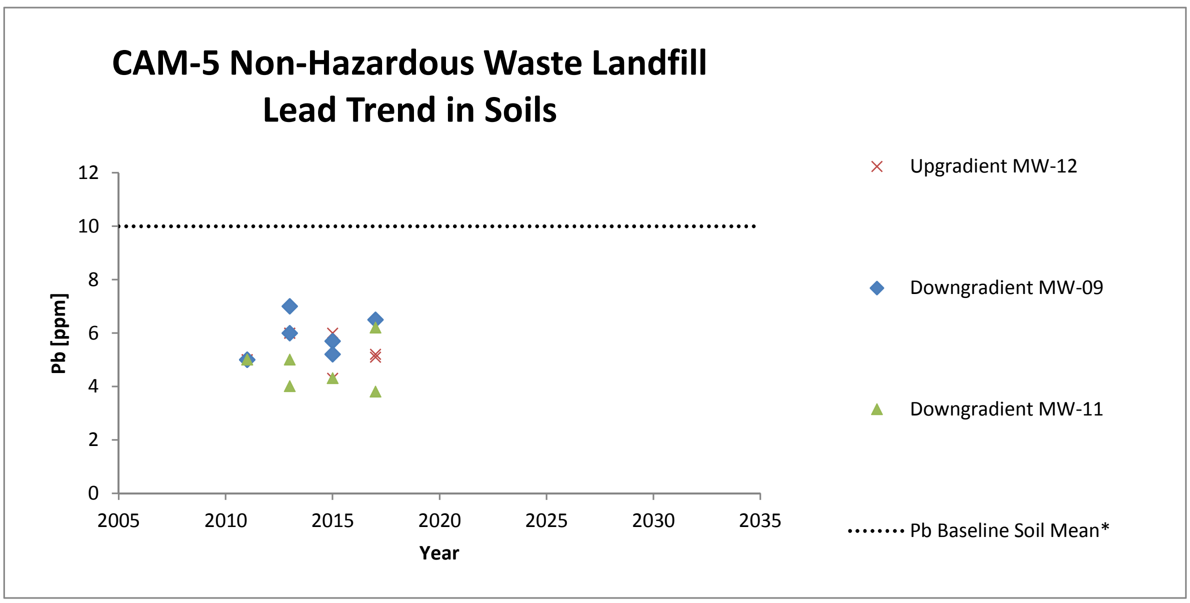

* Pb baseline arithmetic mean is equal to the baseline detection limit
* Pb baseline standard deviation = 0

CAM-5 Non-Hazardous Waste Landfill Trends in Soil Inorganics, PCBs and Modified TPH

Link To: Table of Contents

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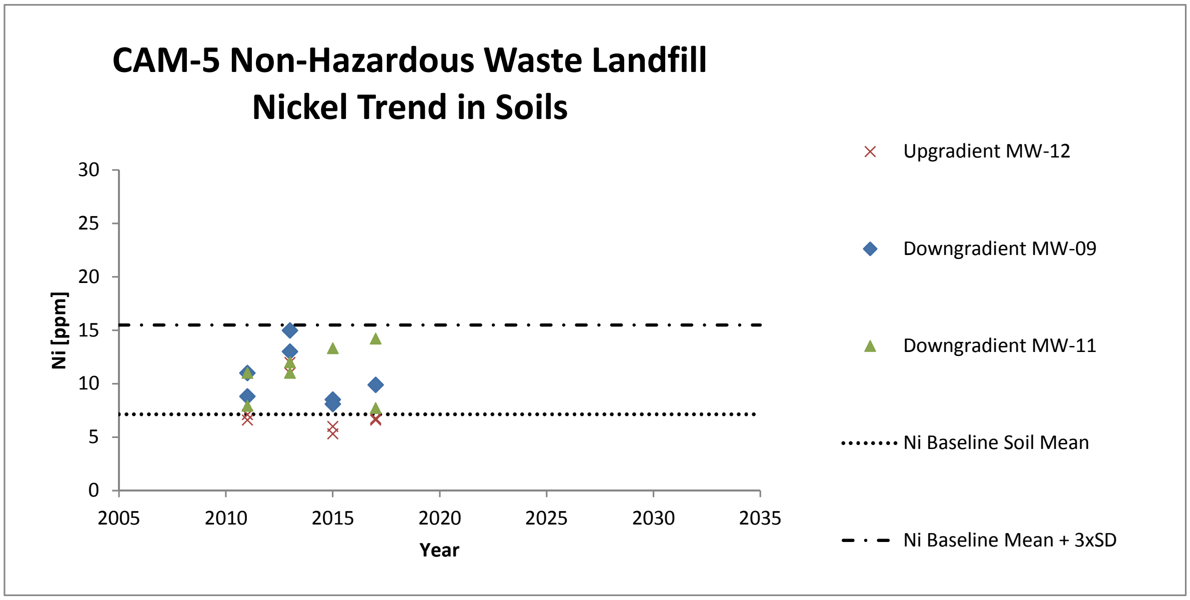

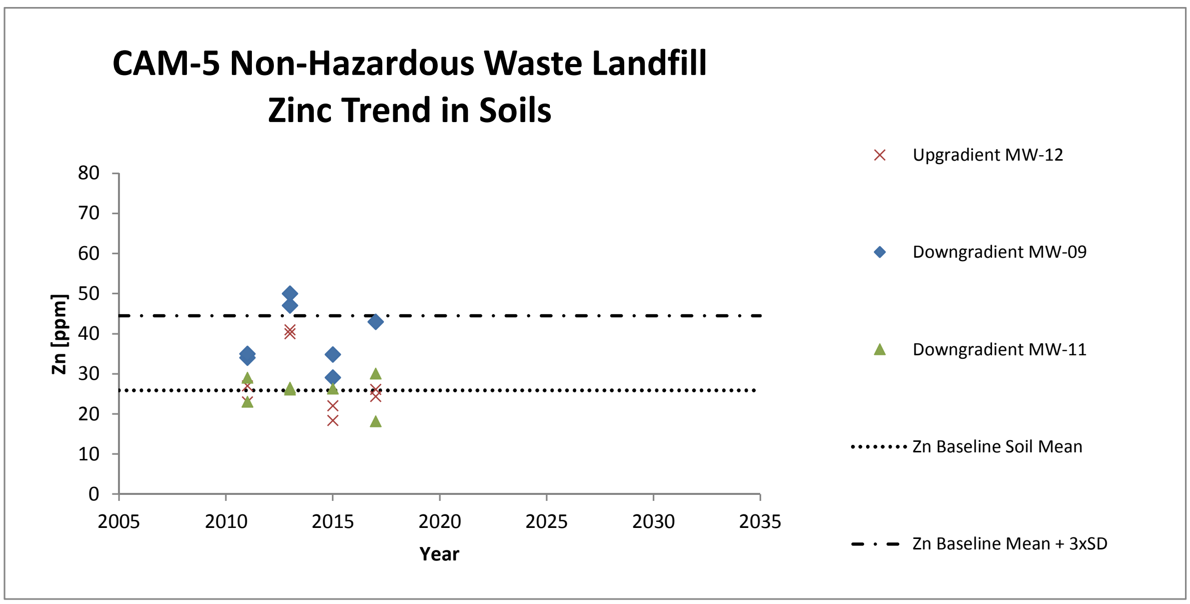

CAM-5 Non-Hazardous Waste Landfill Trends in Soil Inorganics, PCBs and Modified TPH

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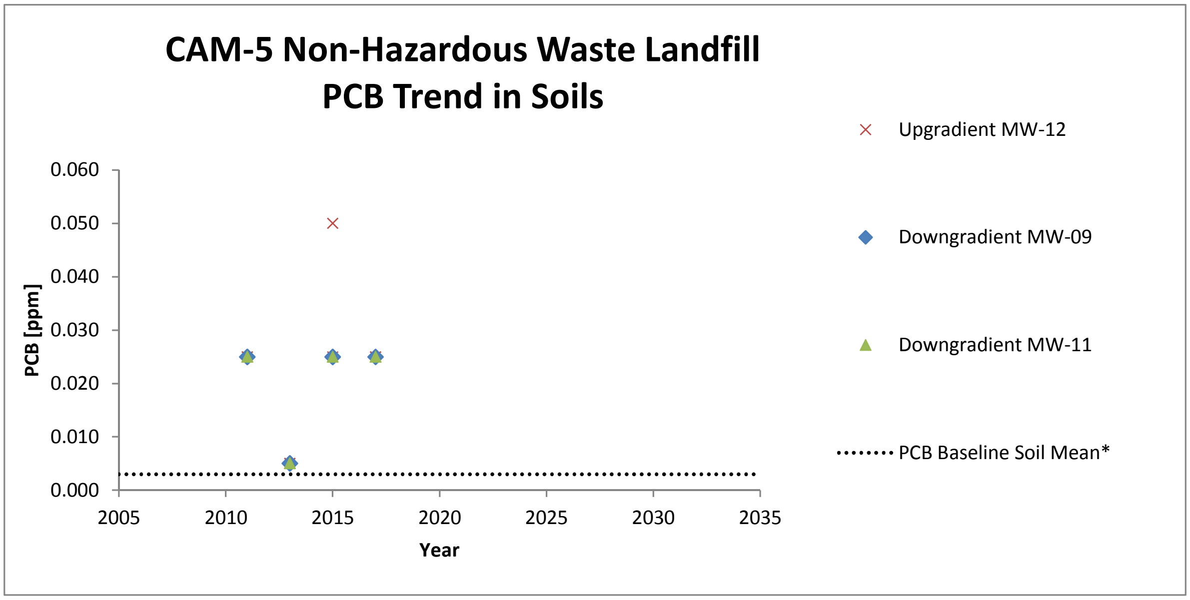
Where results are below detection, half of the detection limit has been used in the charts for the sample points.

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.



* PCB baseline arithmetic mean is equal to the baseline detection limit

* PCB baseline standard deviation = 0

Note: variations seen to 2017 are an indication of changing detection limits; all results below detection limits

CAM-5 Non-Hazardous Waste Landfill Trends in Soil Inorganics, PCBs and Modified TPH

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Where results are below detection, half of the detection limit has been used in the charts for the sample points.

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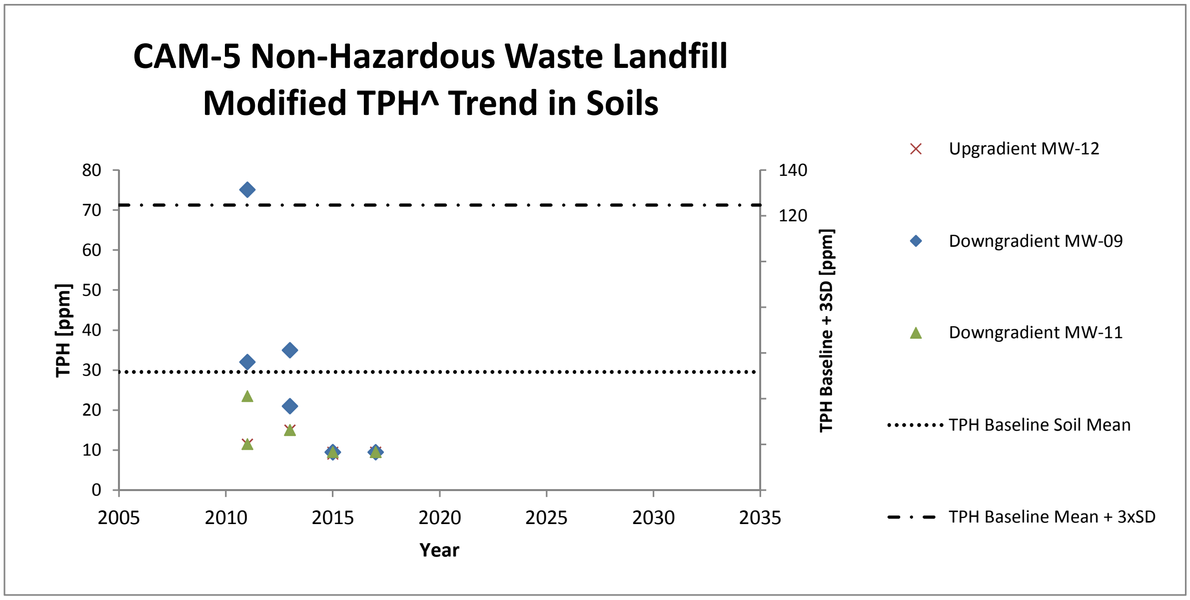
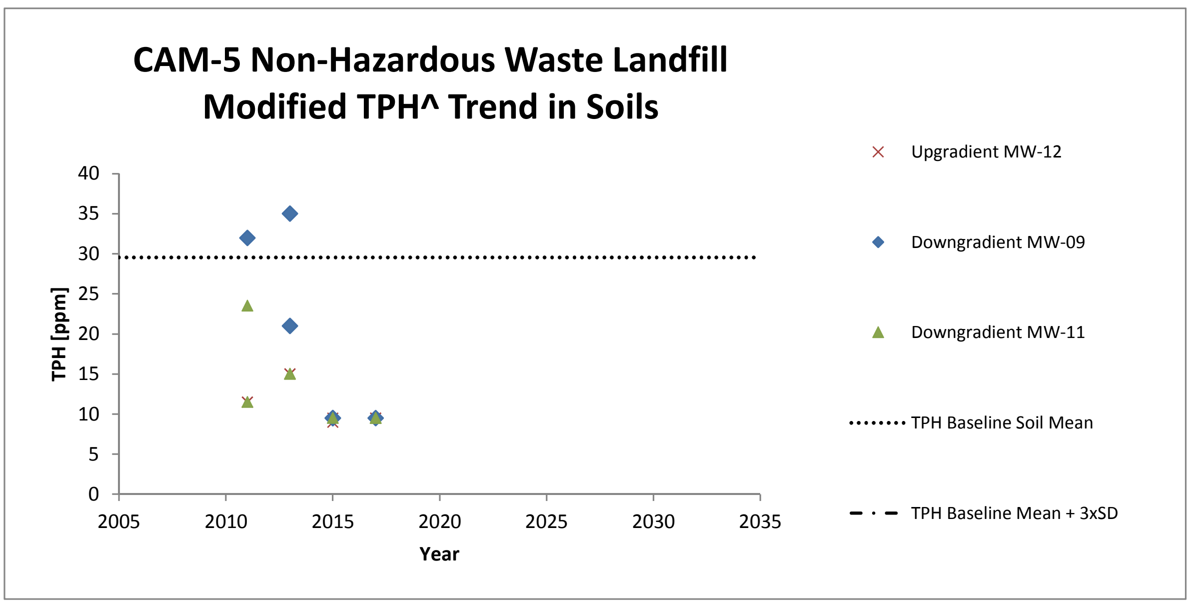


^ Modified TPH is sum of F1, F2 and F3 fractions (C_6 - C_{34})



TPH chart with Y-axis modified to not show the baseline mean + 3SD

CAM-5 Non Hazardous Waste Landfill - Summary of Groundwater Monitoring Analytical Data

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Sample ID	Location	Date	Monitoring Year	Monitoring Phase	As* (mg/L)	Cd* (mg/L)	Cr (mg/L)	Co* (mg/L)	Cu (mg/L)	Pb* (mg/L)	Ni (mg/L)	Zn (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:																
no sample taken - well dry	MW-12	2009														
Downgradient:																
08-27207	MW-11	2008			<0.0030	<0.0010	0.024	0.0055	0.12	0.0050	0.041	0.11	<0.050	<0.50	<1.0	0.78
08-27208	MW-09	2008			<0.0030	<0.0010	0.035	<0.0030	0.040	<0.0010	0.021	0.0055	<0.050	<0.50	<1.0	0.78
09-22817	MW-10	2009			<0.0030	<0.0010	0.030	<0.0030	0.010	<0.010	0.010	<0.010	<0.050	0.60	<1.0	1.13
09-22560/61	MW-11	2009			0.0060	<0.0010	0.11	0.0090	0.12	<0.010	0.050	0.11	<0.050	<0.50	<1.0	0.78
10-27911	MW-10	2010			<0.0030	<0.0010	0.007	<0.0030	<0.0050	<0.010	<0.0050	<0.010	<0.050	<0.50	<1.0	0.78
10-27898	MW-11	2010			<0.0030	<0.0010	0.030	<0.0030	0.0070	<0.010	<0.0050	0.073	<0.050	<0.50	<1.0	0.78
		N value			6	6	6	6	6	6	6	6				6
Baseline Data - Arithmetic Mean					0.0023	0.0005	0.039	0.0034	0.050	0.0043	0.021	0.051				0.83
Baseline Data - Arithmetic Mean Corrected for Detection Limit					**0.003**	**0.001**	**0.039**	**0.0034**	**0.050**	**0.010**	**0.021**	**0.051**				**1.00**
Baseline Data - Standard Deviation					0.0000	0.000	0.036	0.0000	0.056	0.000	0.020	0.052				0.00
Baseline Data - Corrected Arithmetic Mean + 3xStandard Deviation					**0.003**	**0.001**	**0.147**	**0.0034**	**0.218**	**0.010**	**0.082**	**0.209**				**1.00**
**** If baseline or background arithmetic mean was below the detection limit, the mean has been modified to match the detection limit value.***																
Monitoring Data																**Modified TPH TOTAL will appear when F1, F2, F3 fraction results are entered.**
Upgradient - MW-12																
Insufficient water	MW-12	2011	1	Phase I												
No sample collected as per TOR	MW-12	2012	2	Phase I												
2013-C5-MW-12	MW-12	2013	3	Phase I	0.0017	0.000019	0.038	**0.0055**	0.0390	0.0064	**0.0220**	0.0380	<0.025	<0.1	<0.1	0.1125
MW12	MW-12	2015	5	Phase I	<0.001	<0.0001	0.001	<0.0005	0.0037	0.0003	<0.001	<0.005	<0.025	<0.1	<0.1	0.1125
MW-12 (*dissolved metals*)	MW-12	2017	7	Phase II	*<0.001*	*<0.0001*	*<0.001*	*<0.0005*	*<0.0005*	*<0.0001*	*<0.001*	*0.0070*	*<0.025*	*<0.1*	*<0.1*	*0.1125*
	MW-12		10	Phase II												#N/A
	MW-12		15	Phase II												#N/A
	MW-12		25	Phase II												#N/A
																#N/A
																#N/A
																#N/A

CAM-5 Non Hazardous Waste Landfill - Summary of Groundwater Monitoring Analytical Data

Link To: Table of Contents

Sample ID	Location	Date	Monitoring Year	Monitoring Phase	As* (mg/L)	Cd* (mg/L)	Cr (mg/L)	Co* (mg/L)	Cu (mg/L)	Pb* (mg/L)	Ni (mg/L)	Zn (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:																
no sample taken - well dry	MW-12	2009														
Downgradient:																
08-27207	MW-11	2008			<0.0030	<0.0010	0.024	0.0055	0.12	0.0050	0.041	0.11	<0.050	<0.50	<1.0	0.78
08-27208	MW-09	2008			<0.0030	<0.0010	0.035	<0.0030	0.040	<0.0010	0.021	0.0055	<0.050	<0.50	<1.0	0.78
09-22817	MW-10	2009			<0.0030	<0.0010	0.030	<0.0030	0.010	<0.010	0.010	<0.010	<0.050	0.60	<1.0	1.13
09-22560/61	MW-11	2009			0.0060	<0.0010	0.11	0.0090	0.12	<0.010	0.050	0.11	<0.050	<0.50	<1.0	0.78
10-27911	MW-10	2010			<0.0030	<0.0010	0.007	<0.0030	<0.0050	<0.010	<0.0050	<0.010	<0.050	<0.50	<1.0	0.78
10-27898	MW-11	2010			<0.0030	<0.0010	0.030	<0.0030	0.0070	<0.010	<0.0050	0.073	<0.050	<0.50	<1.0	0.78
		N value			6	6	6	6	6	6	6	6				6
Baseline Data - Arithmetic Mean					0.0023	0.0005	0.039	0.0034	0.050	0.0043	0.021	0.051				0.83
Baseline Data - Arithmetic Mean Corrected for Detection Limit					**0.003**	**0.001**	**0.039**	**0.0034**	**0.050**	**0.010**	**0.021**	**0.051**				**1.00**
Baseline Data - Standard Deviation					0.0000	0.000	0.036	0.0000	0.056	0.000	0.020	0.052				0.00
Baseline Data - Corrected Arithmetic Mean + 3xStandard Deviation					**0.003**	**0.001**	**0.147**	**0.0034**	**0.218**	**0.010**	**0.082**	**0.209**				**1.00**
Downgradient/Cross-Gradient - MW-09																
Insufficient water	MW-09	2011	1	Phase I												
No sample collected as per TOR	MW-09	2012	2	Phase I												
2013-C5-MW-09	MW-09	2013	3	Phase I	**0.0094**	0.000087	**0.17**	**0.0230**	**0.1300**	**0.0210**	**0.0900**	**0.2000**	<0.025	<0.1	<0.1	0.1125
MW09	MW-09	2015	5	Phase I	<0.001	0.0001	0.002	**0.0188**	0.0102	0.0008	**0.0750**	0.0310	<0.025	<0.1	<0.1	0.1125
MW-09 (*dissolved metals*)	MW-09	2017	7	Phase II	*<0.001*	*<0.0001*	*<0.001*	*<0.0005*	*0.0008*	*0.0004*	*<0.001*	*<0.005*	*<0.025*	*<0.1*	*<0.1*	*0.1125*
	MW-09		10	Phase II												#N/A
	MW-09		15	Phase II												#N/A
	MW-09		25	Phase II												#N/A
																#N/A
																#N/A
Downgradient/Cross-Gradient - MW-11																
11-29113	MW-11	2011	1	Phase I	<0.0030	<0.0010	**0.18**	**0.0058**	**0.1000**	<0.010	**0.0880**	**0.0780**	<0.050	<0.50	<1.0	0.7750
No sample collected as per TOR	MW-11	2012	2	Phase I												
2013-C5-MW-11	MW-11	2013	3	Phase I	**0.0048**	0.00016	**0.067**	**0.0100**	**0.1900**	**0.0170**	**0.0590**	**0.5600**	<0.025	<0.1	<0.1	0.1125
MW11	MW-11	2015	5	Phase I	<0.001	<0.0001	<0.001	<0.0005	0.0057	0.0004	<0.001	0.0190	<0.025	<0.1	<0.1	0.1125
MW-11 (*dissolved metals*)	MW-11	2017	7	Phase II	*<0.001*	*<0.0001*	*<0.001*	*<0.0005*	*0.0005*	*0.0001*	*<0.001*	*0.0100*	*<0.025*	*<0.1*	*<0.1*	*0.1125*
	MW-11		10	Phase II												#N/A
	MW-11		15	Phase II												#N/A
	MW-11		25	Phase II												#N/A
																#N/A

Note: Modified TPH Total (C_6-C_{34}) has been calculated by adding results for F1, F2 and F3.

Legend

XX	**Sample exceeds baseline mean.**
XX	**Sample exceeds baseline mean + 3xSD**

CAM-5 Non-Hazardous Waste Landfill Trends in Groundwater Inorganics, PCBs and Modified TPH

Link To: Table of Contents

Where results are below detection, half of the detection limit has been used in the charts for the sample points.

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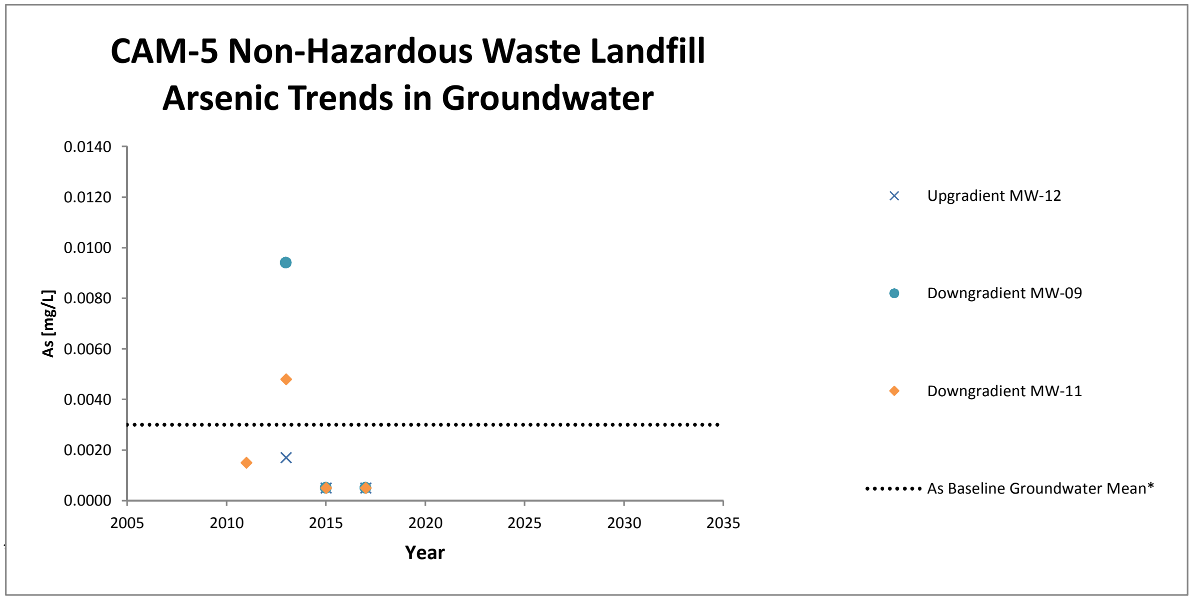
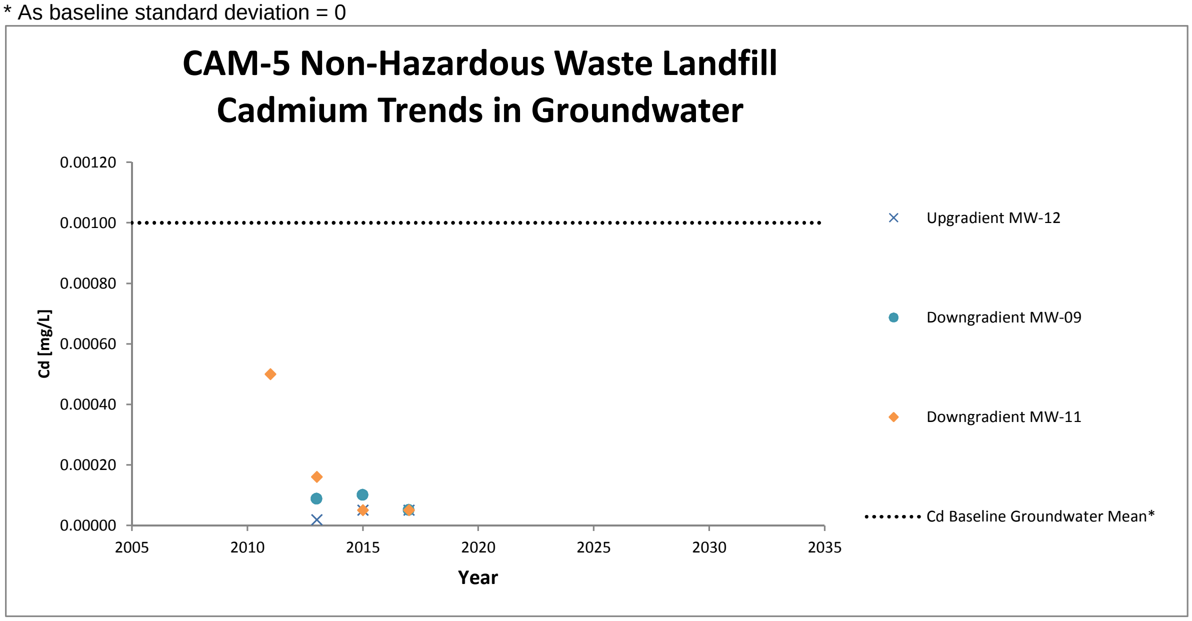


* As baseline arithmetic mean is equal to the baseline detection limit
* As baseline standard deviation = 0



* Cd baseline arithmetic mean is equal to the baseline detection limit
* Cd baseline standard deviation = 0

CAM-5 Non-Hazardous Waste Landfill Trends in Groundwater Inorganics, PCBs and Modified TPH

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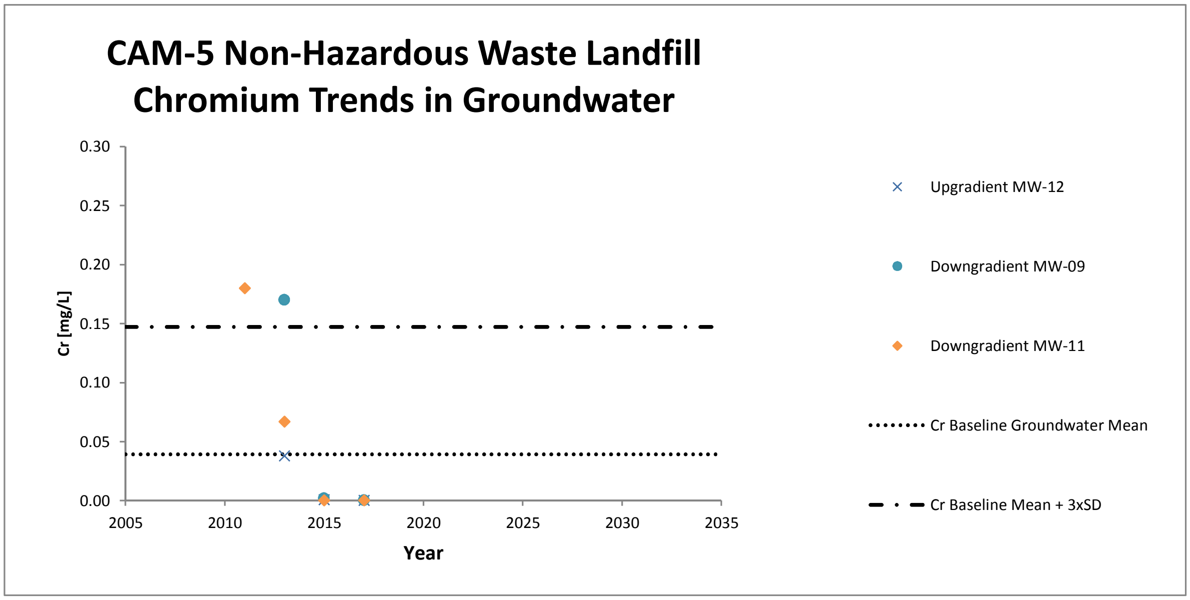

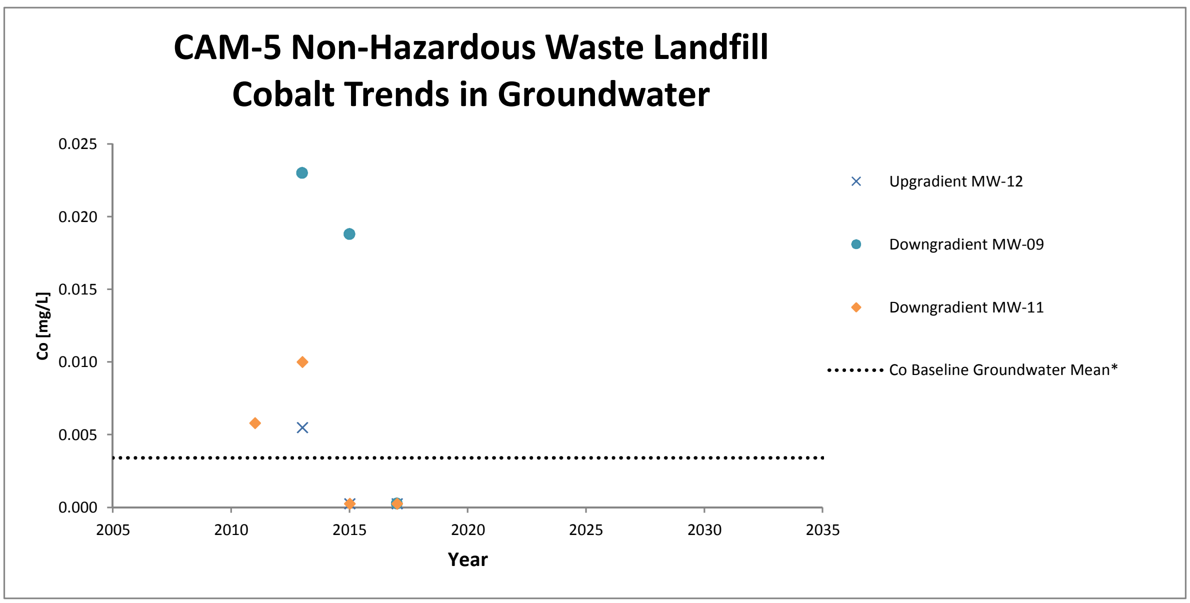

* Co baseline arithmetic mean is equal to the baseline detection limit

* Co baseline standard deviation = 0

CAM-5 Non-Hazardous Waste Landfill Trends in Groundwater Inorganics, PCBs and Modified TPH

Link To: Table of Contents

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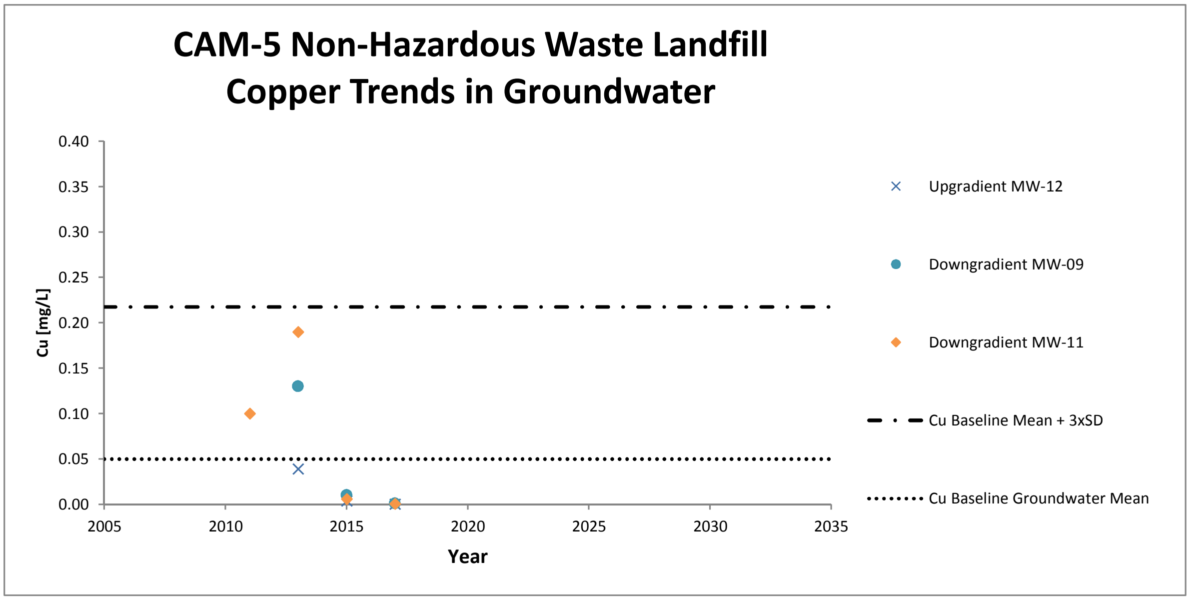

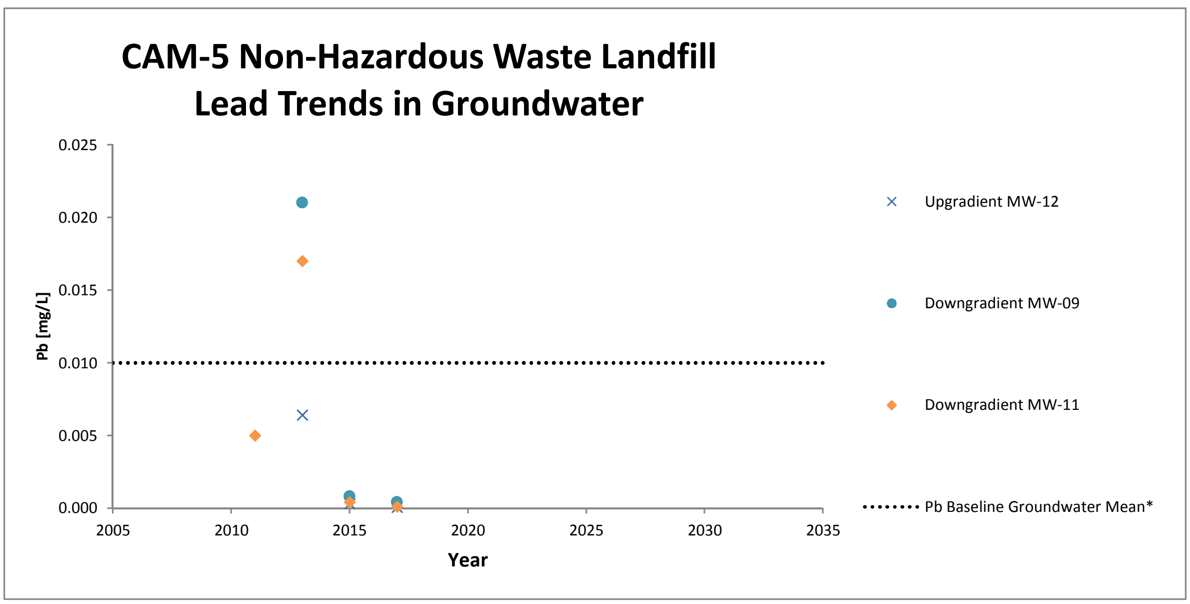

* Pb baseline arithmetic mean is equal to the baseline detection limit

* Pb baseline standard deviation = 0

CAM-5 Non-Hazardous Waste Landfill Trends in Groundwater Inorganics, PCBs and Modified TPH

Link To: Table of Contents

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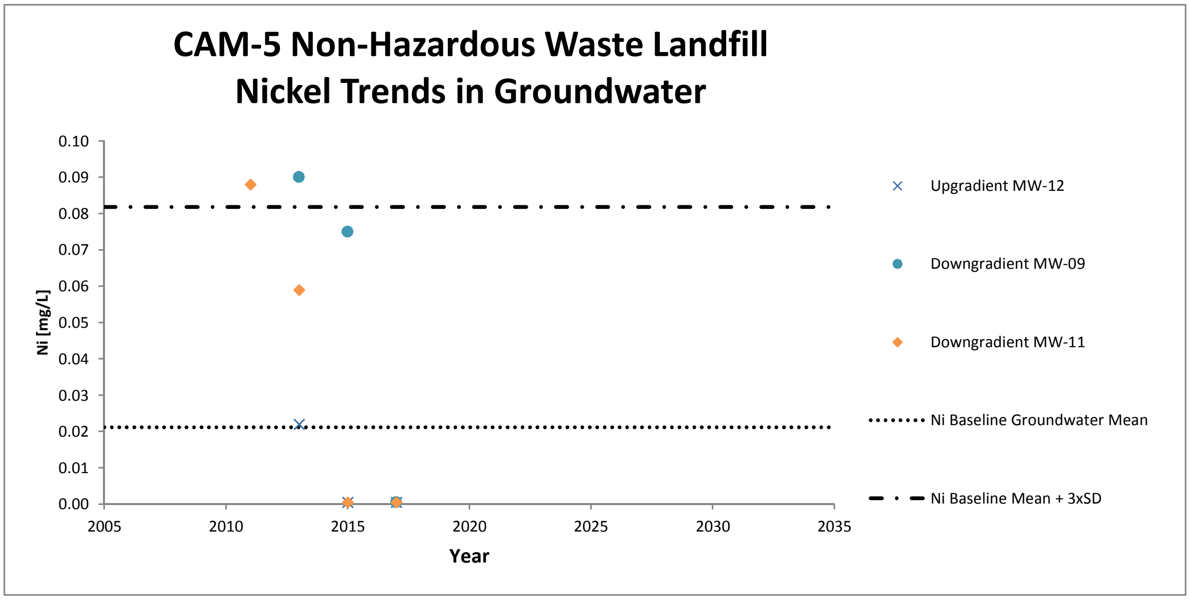
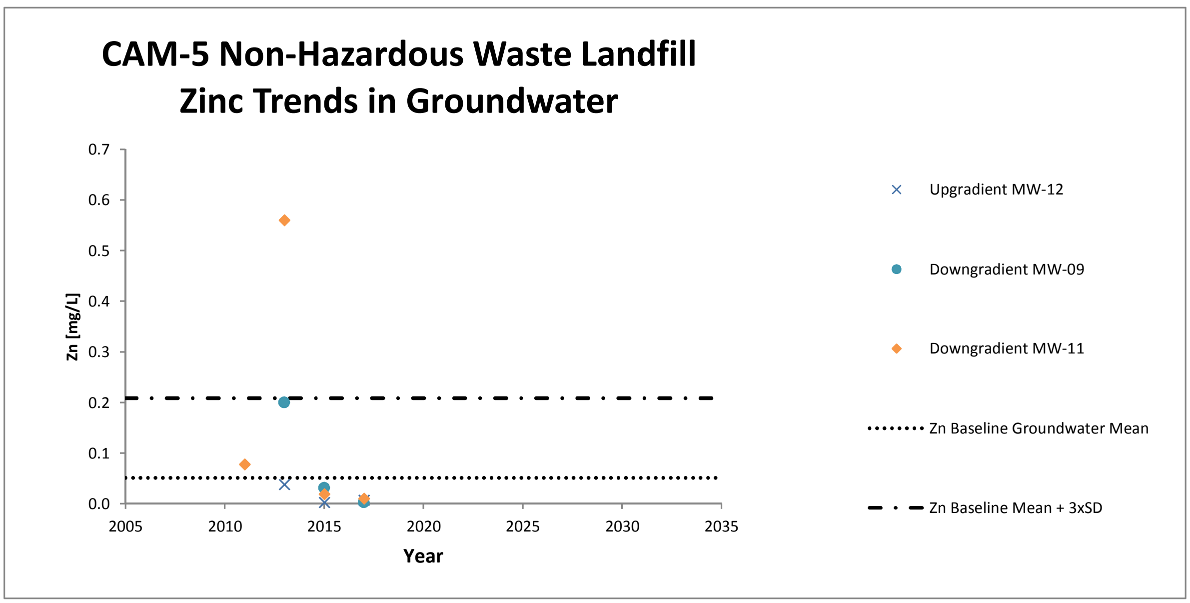
Trendlines are intended for visual interpretation of temporal trends. When all monitoring results are below detection, trendlines are a reflection of changes in detection limit. Users should refer to data tables.





CAM-5 Non-Hazardous Waste Landfill Trends in Groundwater Inorganics, PCBs and Modified TPH

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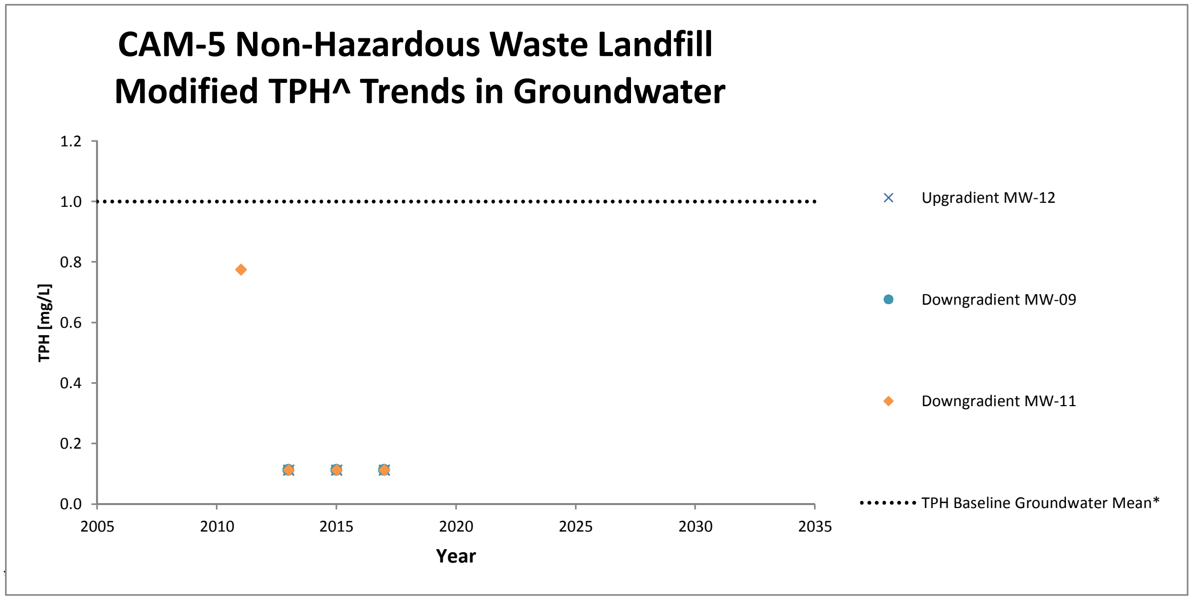
Where results are below detection, half of the detection limit has been used in the charts for the sample points.

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.



^ Modified TPH is sum of F1, F2 and F3 fractions (C_6 - C_{34})

CAM-5 USAF/Asbestos Landfill - Summary of Soil Monitoring Analytical Data

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Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	As* (mg/kg)	Cd* (mg/kg)	Cr* (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Pb* (mg/kg)	Ni (mg/kg)	Zn (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						0.83	1.00	21.8	9.5	10.5	10.0	14.0	31.0	0.100				N/A
Baseline Data - Arithmetic Mean						**1.00**	**1.00**	**20.0**	**6.4**	**9.5**	**10.0**	**7.5**	**27.3**	**0.003**				**34.5**
Baseline Data - Standard Deviation						0.00	0.00	0.0	2.4	4.3	0.0	2.1	6.9	0.000				20.7
Baseline Data Mean + 3xStandard Deviation						**1.00**	**1.00**	**20.0**	**13.6**	**22.4**	**10.0**	**13.8**	**48.1**	**0.003**				**96.7**
**** 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						*30*	*5*	*250*	*50*	*100*	*500*	*100*	*500*	*5*				*2500*
Monitoring Data															**TPH Sum will appear when F1, F2 and F3 fractions are entered.**			
Upgradient																		
	C5-6 surface																	
11-29076	C5-6	2011	1	Phase I	0-10	<1.0	<1.0	**35.0**	**11.0**	7.4	**12.0**	**9.6**	**29.0**	<0.050	11.0	51.0	26.0	**88.0**
2013-C5-6-A	C5-6	2013	3	Phase I	0-15	<1.0	<0.1	14.0	4.8	**11.0**	7.0	**7.7**	**28.0**	<0.010	<10	<10	<10	15.0
C5-6 (dup. avg.)	C5-6	2015	5	Phase I	0-15	**3.00**	<0.5	**25.0**	**8.3**	**29.0**	10.0	**15.0**	**44.0**	<0.1	<6	<4	43.0	**48.0**
C5-6 Shallow	C5-6	2017	7	Phase II	0-15	<1.0	<0.5	16.4	**7.6**	**9.6**	**10.2**	**8.6**	**30.3**	<0.05	<7	<4	<8	9.5
	C5-6		10	Phase II														#N/A
	C5-6		15	Phase II														#N/A
	C5-6		25	Phase II														#N/A
																		#N/A
																		#N/A
																		#N/A
																		#N/A
																		#N/A
	C5-6 depth																	
11-29078/79	C5-6	2011	1	Phase I	20-30	**1.20**	<1.0	16.0	**9.0**	7.5	<10	**8.5**	**31.0**	<0.050	5.8	51.0	35.0	**91.8**
2013-C5-6-B	C5-6	2013	3	Phase I	40-50	<1.0	<0.1	19.0	5.8	**14.0**	8.0	**8.2**	**29.0**	<0.010	<10	<10	<10	15.0
Not sampled, refusal	C5-6	2015	5	Phase I														#N/A
Not sampled, refusal	C5-6	2017	7	Phase II														#N/A
	C5-6		10	Phase II														#N/A
	C5-6		15	Phase II														#N/A
	C5-6		25	Phase II														#N/A
																		#N/A
																		#N/A
																		#N/A
																		#N/A
																		#N/A

CAM-5 USAF/Asbestos Landfill - Summary of Soil Monitoring Analytical Data

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Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	As* (mg/kg)	Cd* (mg/kg)	Cr* (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Pb* (mg/kg)	Ni (mg/kg)	Zn (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						0.83	1.00	21.8	9.5	10.5	10.0	14.0	31.0	0.100				N/A
Baseline Data - Arithmetic Mean						**1.00**	**1.00**	**20.0**	**6.4**	**9.5**	**10.0**	**7.5**	**27.3**	**0.003**				**34.5**
Baseline Data - Standard Deviation						0.00	0.00	0.0	2.4	4.3	0.0	2.1	6.9	0.000				20.7
Baseline Data Mean + 3xStandard Deviation						**1.00**	**1.00**	**20.0**	**13.6**	**22.4**	**10.0**	**13.8**	**48.1**	**0.003**				**96.7**
Downgradient/Cross-Gradient																		
	C5-7 surface																	
11-29074	C5-7	2011	1	Phase I	0-10	<1.0	<1.0	<20	5.2	9.4	<10	7.2	24.0	<0.050	<10	<4.0	<9.0	11.5
2013-C5-7-A	C5-7	2013	3	Phase I	0-15	<1.0	<0.1	**30.0**	**11.0**	**30.0**	9.0	**18.0**	**44.0**	<0.010	<10	<10	<10	15.0
C5-7	C5-7	2015	5	Phase I	0-15	**1.50**	<0.5	12.0	4.3	**12.4**	5.0	**8.1**	21.7	<0.05	<7	<4	<8	9.5
C5-7 Shallow	C5-7	2017	7	Phase II	0-15	<1.0	<0.5	10.8	4.8	**12.7**	6.2	**8.8**	25.7	<0.05	<7	<4	<8	9.5
	C5-7		10	Phase II														#N/A
	C5-7		15	Phase II														#N/A
	C5-7		25	Phase II														#N/A
																		#N/A
	C5-7 depth																	
11-29072	C5-7	2011	1	Phase I	20-30	<1.0	<1.0	<20	5.9	9.1	<10	7.0	23.0	<0.050	<10	<4.0	<9.0	11.5
2013-C5-7-B	C5-7	2013	3	Phase I	40-50	<1.0	<0.1	**26.0**	**12.0**	**21.0**	8.0	**15.0**	**39.0**	<0.010	<10	<10	<10	15.0
C5-7	C5-7	2015	5	Phase I	40-50	**3.20**	<0.5	15.3	6.1	**13.4**	6.0	**12.6**	26.0	<0.05	<7	<4	<8	9.5
C5-7 Deep (Dup. Avg.)	C5-7	2017	7	Phase II	40-50	<1.0	<0.5	10.4	4.3	**10.0**	4.2	7.1	23.0	<0.05	<7	<4	<8	9.5
	C5-7		10	Phase II														#N/A
	C5-7		15	Phase II														#N/A
	C5-7		25	Phase II														#N/A
																		#N/A
Downgradient																		
	C5-8 surface																	
11-29068	C5-8	2011	1	Phase I	0-10	<1.0	<1.0	<20	5.4	**10.0**	<10	**7.7**	24.0	<0.050	<10	<4.0	<9.0	11.5
2013-C5-8-A	C5-8	2013	3	Phase I	0-15	<1.0	<0.1	14.0	5.8	**17.0**	6.0	**10.0**	**36.0**	<0.010	<10	<4.0	<9.0	11.5
C5-8	C5-8	2015	5	Phase I	0-15	<1.0	<0.5	11.5	4.7	4.9	6.7	6.4	23.7	<0.05	<7	<4	<8	9.5
C5-8 Shallow	C5-8	2017	7	Phase II	0-15	<1.0	<0.5	15.5	5.9	**18.4**	5.3	**11.0**	**32.3**	<0.05	<7	<4	<8	9.5
	C5-8		10	Phase II														#N/A
	C5-8		15	Phase II														#N/A
	C5-8		25	Phase II														#N/A
																		#N/A
	C5-8 depth																	
11-29070	C5-8	2011	1	Phase I	20-30	<1.0	<1.0	<20	5.4	9.5	<10	**7.8**	27.0	<0.050	<10	20.0	<9.0	29.5
2013-C5-8-B	C5-8	2013	3	Phase I	40-50	<1.0	<0.1	17.0	6.2	**22.0**	7.0	**12.0**	**36.0**	<0.010	<10	<10	<10	15.0
Not sampled, refusal	C5-8	2015	5	Phase I														#N/A
C5-8 Deep	C5-8	2017	7	Phase II	40-50	<1.0	<0.5	15.6	5.7	**17.5**	5.9	**11.4**	**32.2**	<0.05	<7	<4	<8	9.5
	C5-8		10	Phase II														#N/A
	C5-8		15	Phase II														#N/A
	C5-8		25	Phase II														#N/A
																		#N/A

Note ^: Modified TPH Total (C_6-C_{34}) has been calculated by adding results for F1, F2 and F3.

N/A = not analyzed

Legend

XX	**Sample exceeds baseline mean.**
XX	**Sample exceeds baseline mean + 3xSD**

CAM-5 USAF/Asbestos Landfill Trends in Soil Inorganics, PCBs and Modified TPH

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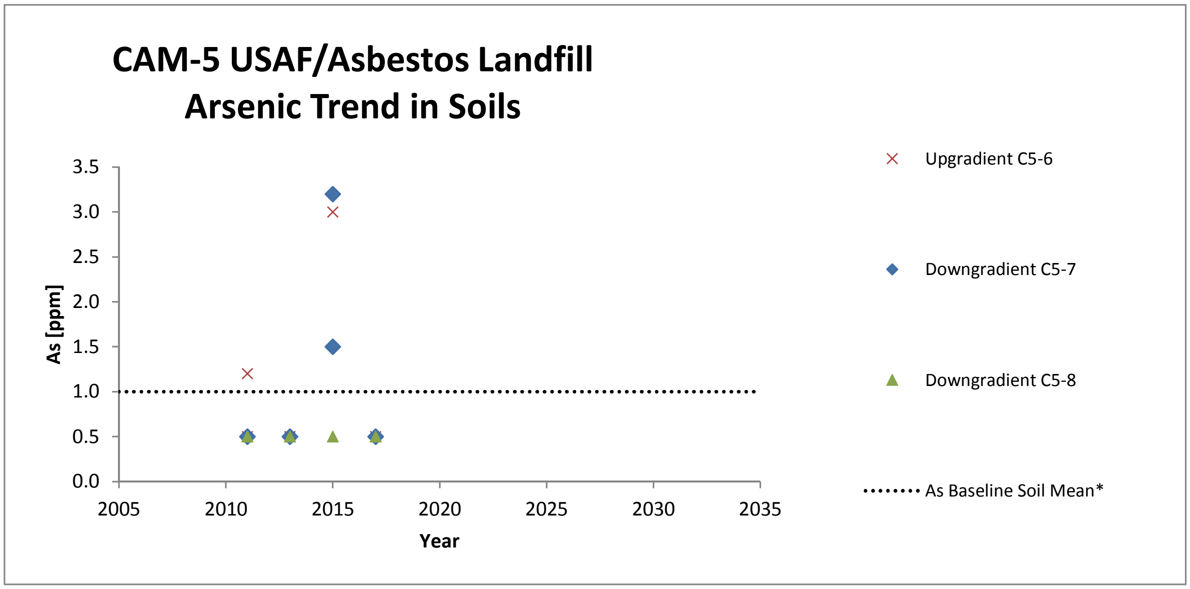
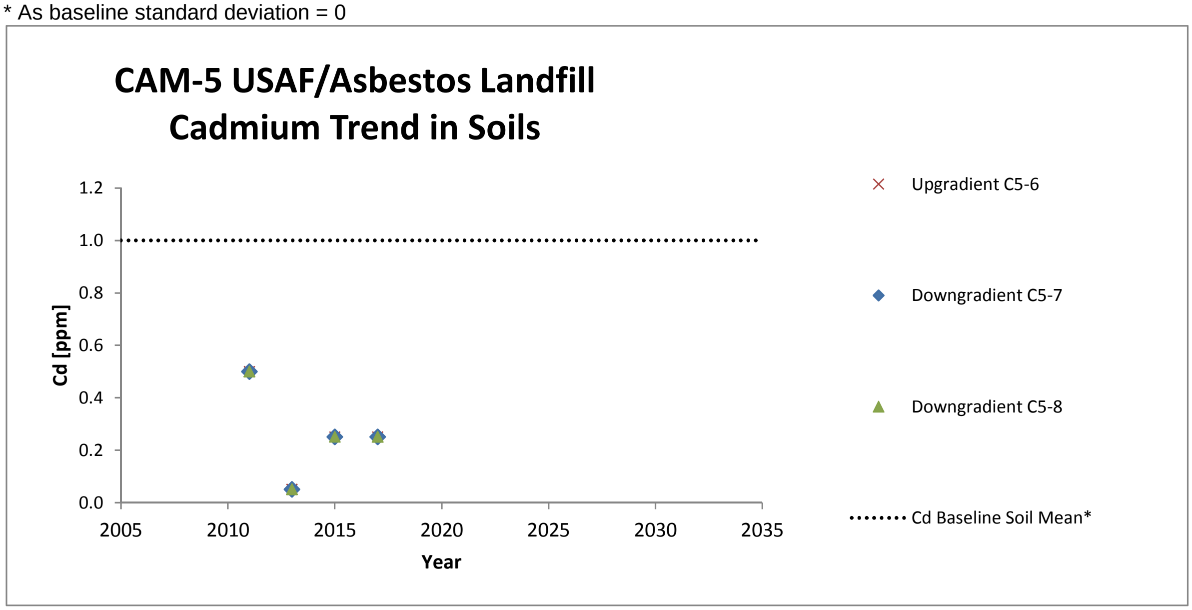
Where results are below detection, half of the detection limit has been used in the charts for the sample points.

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.



* As baseline arithmetic mean is equal to the baseline detection limit
* As baseline standard deviation = 0



* Cd baseline arithmetic mean is equal to the baseline detection limit
* Cd baseline standard deviation = 0

CAM-5 USAF/Asbestos Landfill Trends in Soil Inorganics, PCBs and Modified TPH

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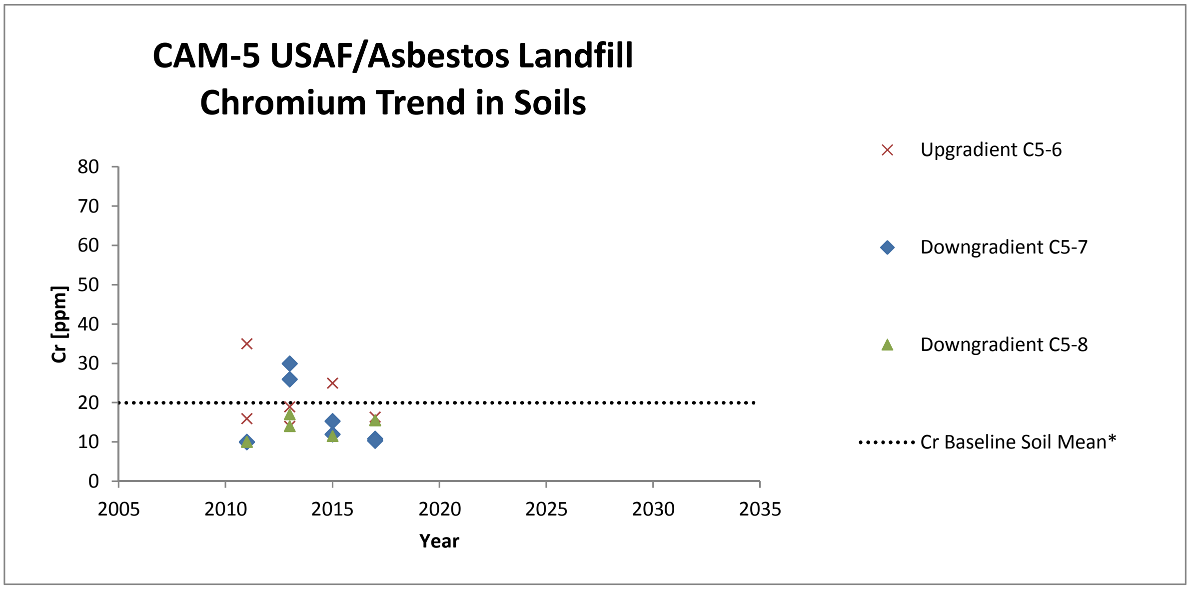
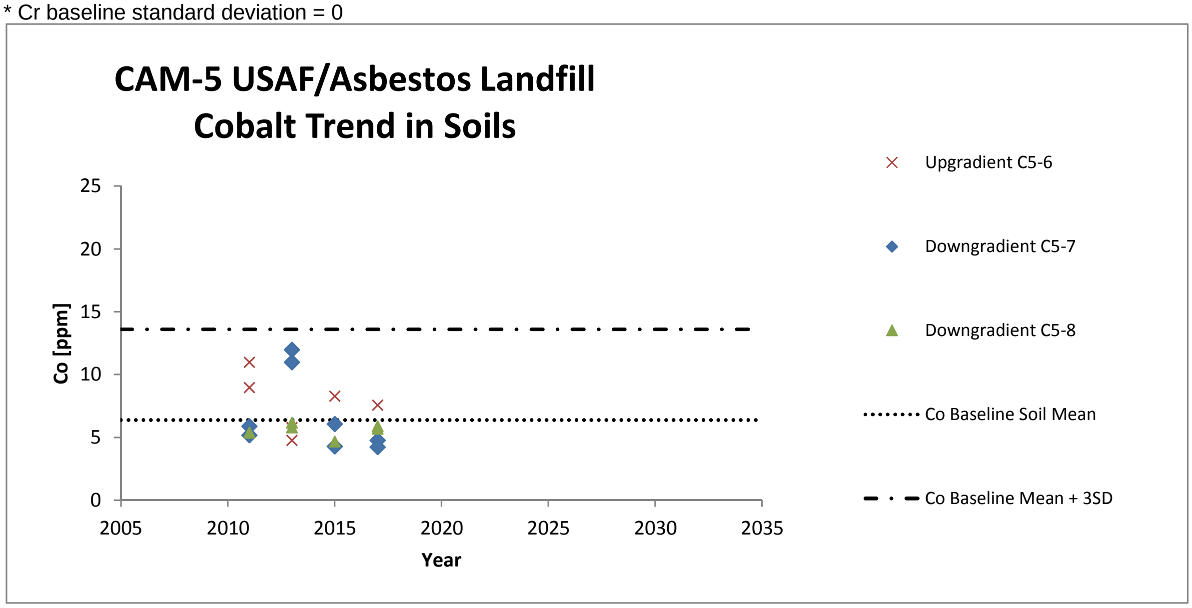
Where results are below detection, half of the detection limit has been used in the charts for the sample points.

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.



* Cr baseline arithmetic mean is equal to the baseline detection limit

* Cr baseline standard deviation = 0



CAM-5 USAF/Asbestos Landfill Trends in Soil Inorganics, PCBs and Modified TPH

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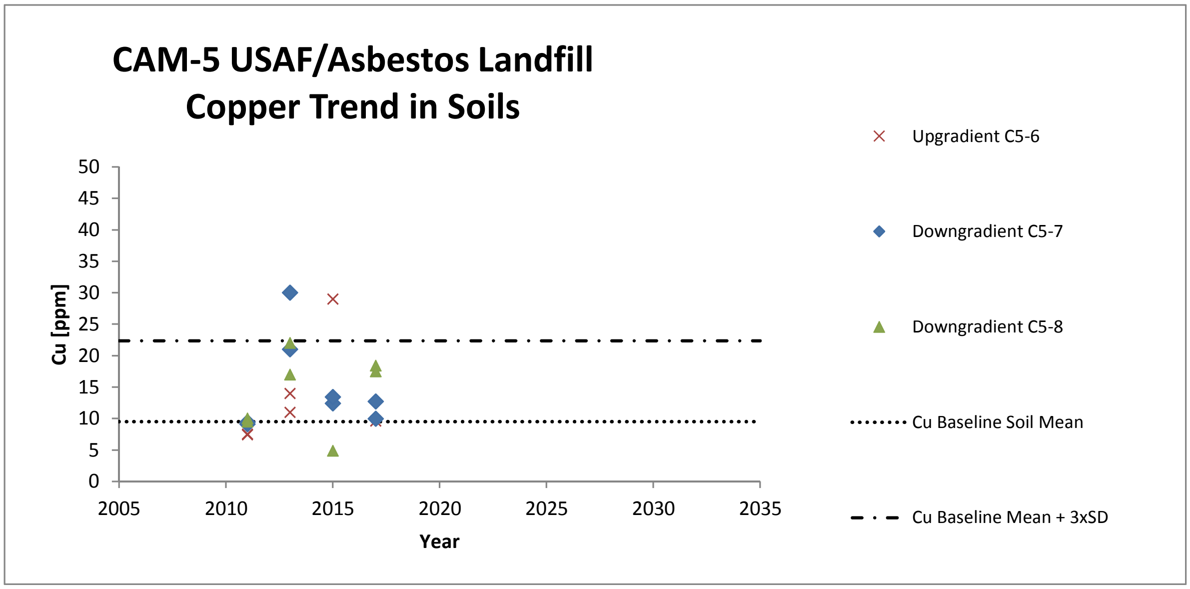
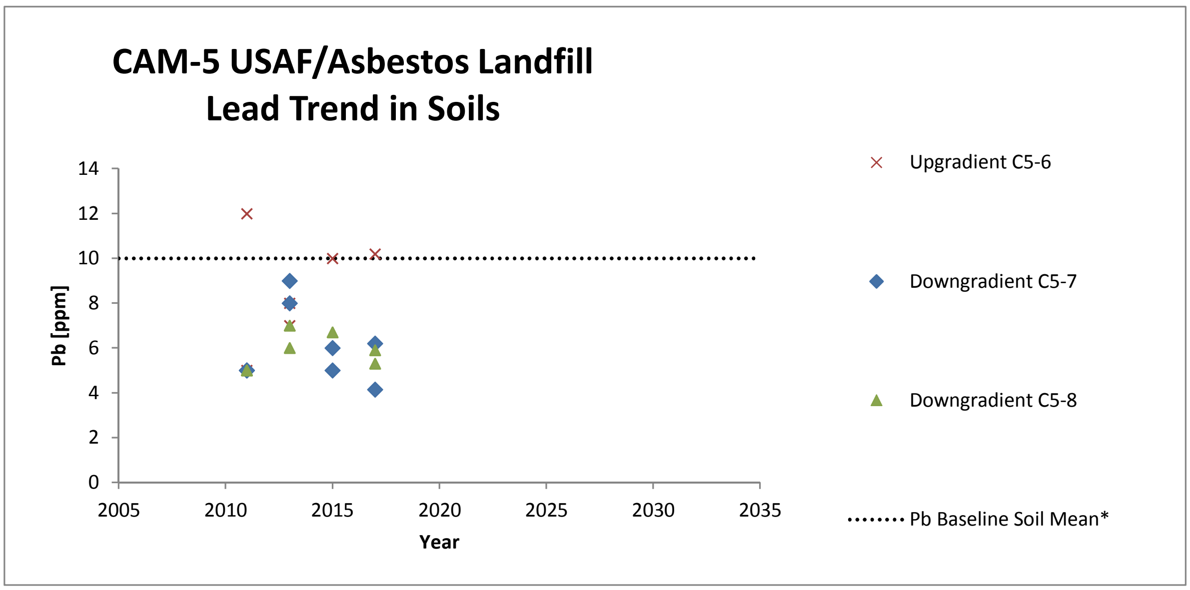
Where results are below detection, half of the detection limit has been used in the charts for the sample points.

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.





* Pb baseline arithmetic mean is equal to the baseline detection limit

* Pb baseline standard deviation = 0

CAM-5 USAF/Asbestos Landfill Trends in Soil Inorganics, PCBs and Modified TPH

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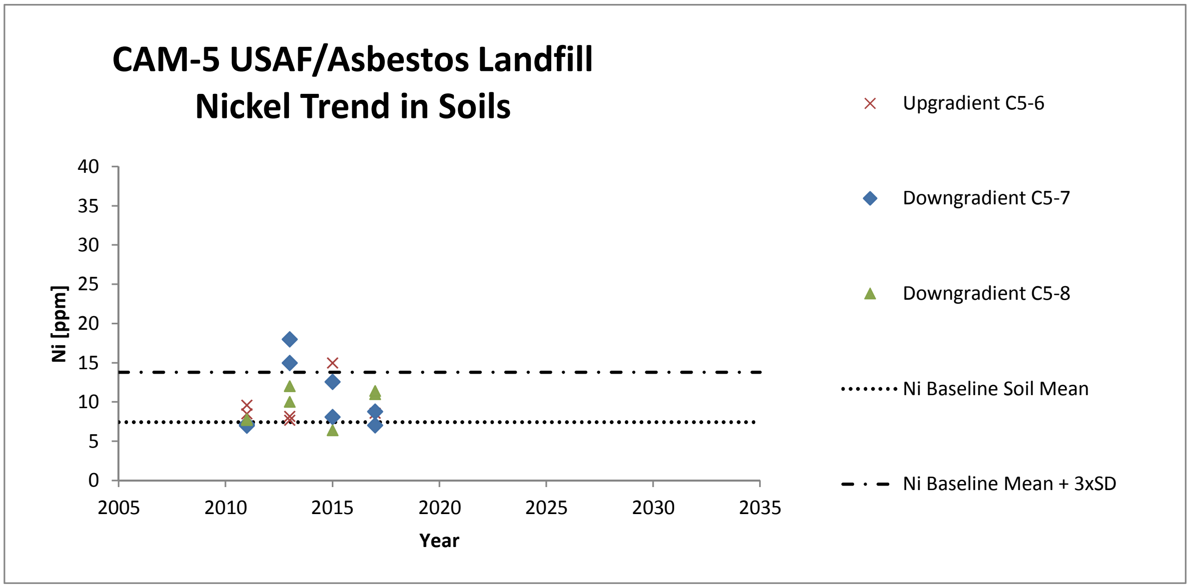
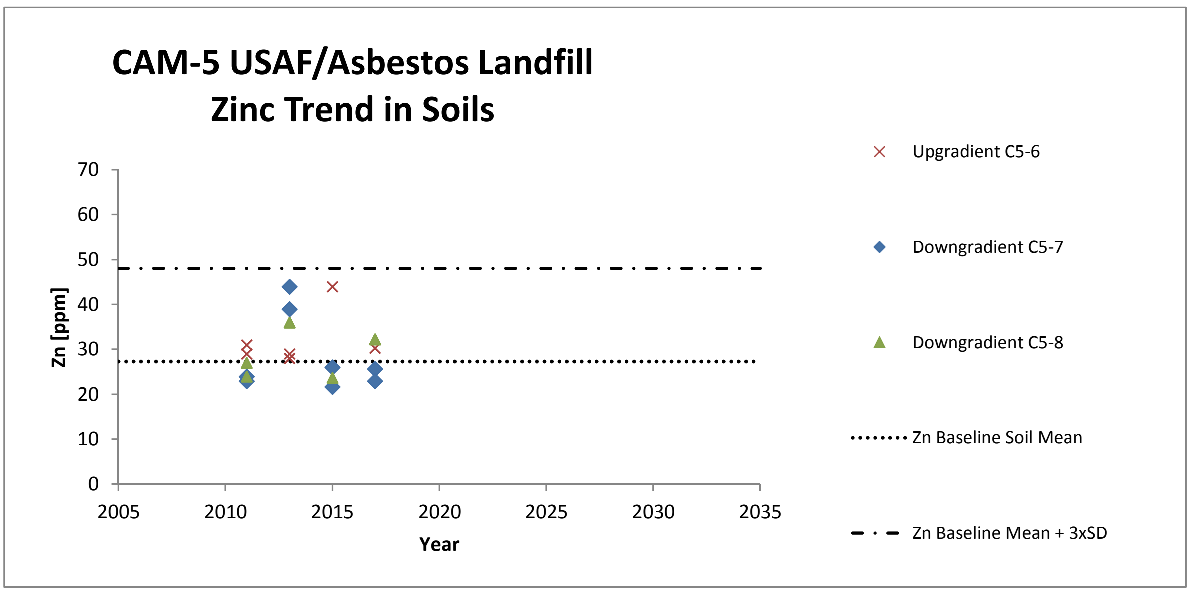
Where results are below detection, half of the detection limit has been used in the charts for the sample points.

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.





CAM-5 USAF/Asbestos Landfill Trends in Soil Inorganics, PCBs and Modified TPH

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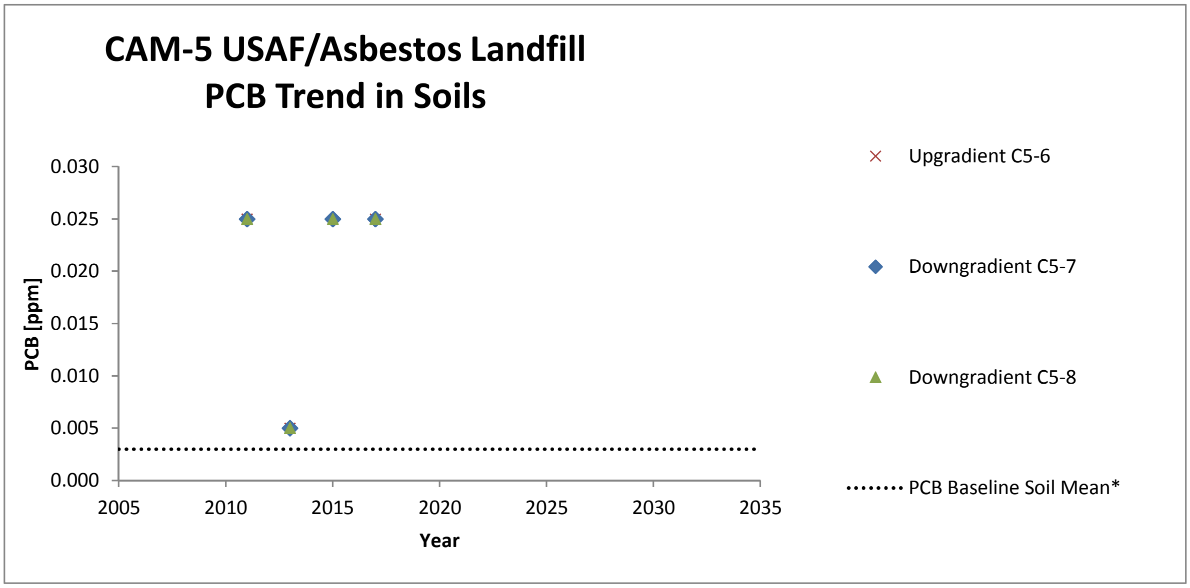
Where results are below detection, half of the detection limit has been used in the charts for the sample points.

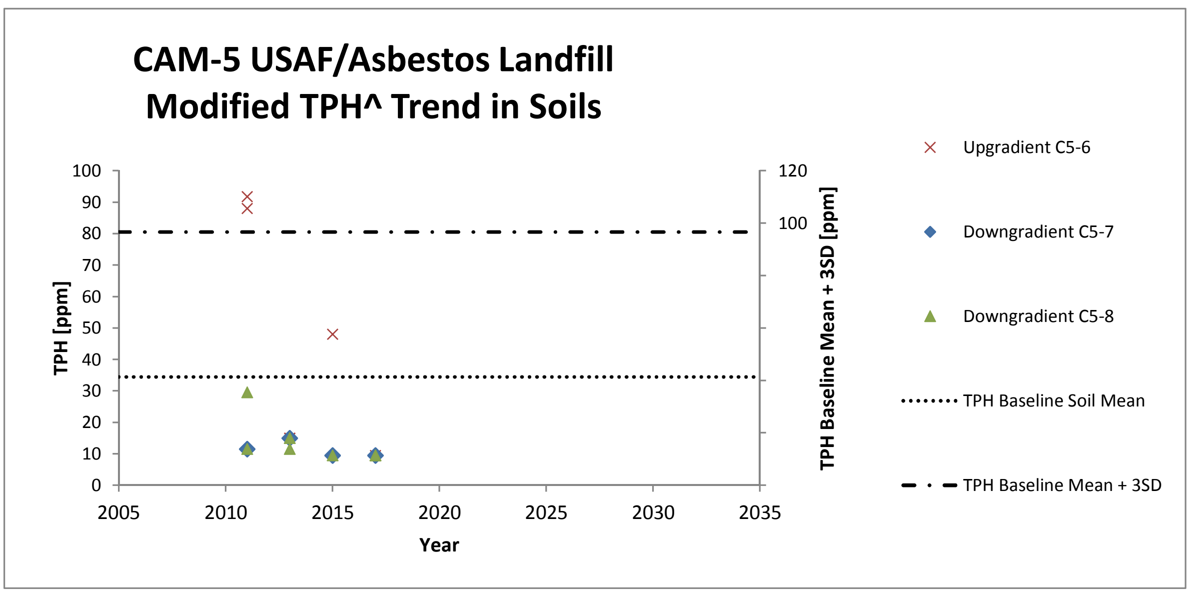
Trendlines are intended for visual interpretation of temporal trends. When all monitoring results are below detection, trendlines are a reflection of changes in detection limit. Users should refer to data tables.



* PCB baseline arithmetic mean is equal to the baseline detection limit

* PCB baseline standard deviation = 0

Note: variations seen to 2017 are an indication of changing detection limits; all results below detection limits



^ Modified TPH is sum of F1, F2 and F3 fractions (C_6 - C_{34})

CAM-5 Tier II Disposal Facility - Summary of Soil Monitoring Analytical Data

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Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	As* (mg/kg)	Cd* (mg/kg)	Cr* (mg/kg)	Co* (mg/kg)	Cu (mg/kg)	Pb* (mg/kg)	Ni (mg/kg)	Zn (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						0.83	1.00	21.8	9.5	10.5	10.0	14.0	31.0	0.100				N/A
Baseline Data - Arithmetic Mean						**1.00**	**1.00**	**20.0**	**5.0**	**6.1**	**10.0**	**5.5**	**22.3**	**0.003**				**26.2**
Baseline Data - Standard Deviation						0.00	0.00	0.0	0.0	2.0	0.0	3.6	5.2	0.000				12.1
Baseline Data Mean + 3xStandard Deviation						**1.00**	**1.00**	**20.0**	**5.0**	**12.0**	**10.0**	**16.1**	**37.8**	**0.003**				**62.6**
**** 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						*30*	*5*	*250*	*50*	*100*	*500*	*100*	*500*	*5*				*2500*
Monitoring Data															**TPH Sum will appear when F1, F2 and F3 fractions are entered.**			
Upgradient																		
	MW-05 surface																	
11-29052	MW-05	2011	1	Phase I	0-10	<1.0	<1.0	<20	<5.0	<3.0	<10	<5.0	16.0	<0.050	<10	<4.0	18	25.0
C5-12-MW-05-A	MW-05	2012	2	Phase I	0-15	<0.50	<0.50	5.0	2.3	**7.6**	2.7	3.1	18.0	<0.050	<10	<10	<10	15.0
2013-C5-MW-05-A	MW-05	2013	3	Phase I	0-15	<1.0	<0.10	15.0	4.3	**10.0**	4.0	**9.1**	**23.0**	<0.010	<10	<10	<10	15.0
C514-5WA	MW-05	2014	4	Phase I	0-15	0.20	0.01	4.6	2.2	3.1	<4.9	3.0	14.0	<0.10	<10	<50	<50	**55.0**
MW05	MW-05	2015	5	Phase I	0-15	**1.40**	<0.5	12.0	**5.8**	**19.8**	4.0	**9.2**	**25.0**	<0.05	<7	<4	<8	9.5
MW-05 Shallow	MW-05	2017	7	Phase II	0-15	<1.0	<0.5	6.2	3.5	**8.9**	3.6	**6.4**	21.3	<0.05	<7	<4	<8	9.5
	MW-05		10	Phase II														#N/A
	MW-05		15	Phase II														#N/A
	MW-05		25	Phase II														#N/A
																		#N/A
																		#N/A
																		#N/A
	MW-05 depth																	
11-29054	MW-05	2011	1	Phase I	30-40	<1.0	<1.0	<20	<5.0	<3.0	<10	<5.0	16.0	<0.050	31	<4.0	16	**49.0**
C5-12-MW-05-B	MW-05	2012	2	Phase I	40-50	<0.50	<0.50	12.0	2.6	5.0	3.0	4.5	**23.0**	<0.050	<10	<10	69	**79.0**
2013-C5-MW-05-B	MW-05	2013	3	Phase I	40-50	<1.0	<0.50	12.0	3.7	**8.0**	4.0	**7.0**	**23.0**	<0.010	<10	<10	<10	15.0
C514-5WB	MW-05	2014	4	Phase I	40-50	0.20	0.03	3.9	2.8	5.9	<5.0	**6.1**	18.0	<0.10	<10	<50	<50	**55.0**
MW05	MW-05	2015	5	Phase I	40-50	<1.0	<0.5	11.2	3.9	**10.9**	3.3	**7.2**	18.1	<0.05	<7	<4	<8	9.5
MW-05 Deep	MW-05	2017	7	Phase II	20-30	<1.0	<0.5	8.4	3.9	**6.9**	5.9	**6.3**	**24.5**	<0.05	<7	<4	<8	9.5
	MW-05		10	Phase II														#N/A
	MW-05		15	Phase II														#N/A
	MW-05		25	Phase II														#N/A
																		#N/A
																		#N/A
																		#N/A
																		#N/A

CAM-5 Tier II Disposal Facility - Summary of Soil Monitoring Analytical Data

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Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	As* (mg/kg)	Cd* (mg/kg)	Cr* (mg/kg)	Co* (mg/kg)	Cu (mg/kg)	Pb* (mg/kg)	Ni (mg/kg)	Zn (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						0.83	1.00	21.8	9.5	10.5	10.0	14.0	31.0	0.100				N/A
Baseline Data - Arithmetic Mean						**1.00**	**1.00**	**20.0**	**5.0**	**6.1**	**10.0**	**5.5**	**22.3**	**0.003**				**26.2**
Baseline Data - Standard Deviation						0.00	0.00	0.0	0.0	2.0	0.0	3.6	5.2	0.000				12.1
Baseline Data Mean + 3xStandard Deviation						**1.00**	**1.00**	**20.0**	**5.0**	**12.0**	**10.0**	**16.1**	**37.8**	**0.003**				**62.6**
Downgradient																		
	MW-06 surface																	
11-29048	MW-06	2011	1	Phase I	0-10	<1.0	<1.0	<20	<5.0	**6.5**	<10	<5.0	**23.0**	<0.050	<10	<4.0	<9.0	11.5
C5-12-MW-06-A	MW-06	2012	2	Phase I	0-15	<0.50	<0.5	4.7	3.0	**6.8**	2.8	3.2	21.0	<0.050	<10	<10	52	**62.0**
2013-C5-MW-06-A/06-A-D	MW-06	2013	3	Phase I	0-15	<1.0	<0.10	9.5	3.8	**6.5**	4.5	**5.9**	**29.0**	<0.010	<10	<10	15.5	25.5
C514-6WA	MW-06	2014	4	Phase I	0-15	<0.20	0.02	3.1	2.3	2.2	<4.9	2.9	15.0	<0.10	<10	<50	<50	**55.0**
MW06	MW-06	2015	5	Phase I	0-15	<1.0	<0.5	8.1	3.1	4.6	3.4	4.8	19.9	<0.05	<7	<4	<8	9.5
MW-06 Shallow	MW-06	2017	7	Phase II	0-15	<1.0	<0.5	5.7	2.7	2.7	4.1	3.7	20.9	<0.05	<7	<4	<8	9.5
	MW-06		10	Phase II														#N/A
	MW-06		15	Phase II														#N/A
	MW-06		25	Phase II														#N/A
																		#N/A
	MW-06 depth																	
11-29050	MW-06	2011	1	Phase I	30-40	<1.0	<1.0	<20	**5.8**	**10.0**	<10	**7.9**	**26.0**	<0.050	<10	<4.0	<9.0	11.5
C5-12-MW-06-B	MW-06	2012	2	Phase I	40-50	<0.50	<0.50	5.8	3.4	**8.4**	2.7	4.7	**26.0**	<0.050	<10	<10	25	**35.0**
2013-C5-MW-06-B	MW-06	2013	3	Phase I	40-50	<1.0	<0.10	12.0	**5.9**	**11.0**	5.0	**7.8**	**31.0**	<0.010	<10	<10	<10	15.0
C514-6WB	MW-06	2014	4	Phase I	40-50	<0.20	<0.010	3.0	2.3	5.0	<5.0	3.1	12.0	<0.10	<10	<50	<50	**55.0**
MW06	MW-06	2015	5	Phase I	30-40	<1.0	<0.5	9.0	3.5	5.0	3.7	5.0	**23.0**	<0.05	<7	<4	<8	9.5
Not sampled, refusal	MW-06	2017	7	Phase II														#N/A
	MW-06		10	Phase II														#N/A
	MW-06		15	Phase II														#N/A
	MW-06		25	Phase II														#N/A
																		#N/A

CAM-5 Tier II Disposal Facility - Summary of Soil Monitoring Analytical Data

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Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	As* (mg/kg)	Cd* (mg/kg)	Cr* (mg/kg)	Co* (mg/kg)	Cu (mg/kg)	Pb* (mg/kg)	Ni (mg/kg)	Zn (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						0.83	1.00	21.8	9.5	10.5	10.0	14.0	31.0	0.100				N/A
Baseline Data - Arithmetic Mean						**1.00**	**1.00**	**20.0**	**5.0**	**6.1**	**10.0**	**5.5**	**22.3**	**0.003**				**26.2**
Baseline Data - Standard Deviation						0.00	0.00	0.0	0.0	2.0	0.0	3.6	5.2	0.000				12.1
Baseline Data Mean + 3xStandard Deviation						**1.00**	**1.00**	**20.0**	**5.0**	**12.0**	**10.0**	**16.1**	**37.8**	**0.003**				**62.6**
Downgradient																		
	MW-07 surface																	
11-29044	MW-07	2011	1	Phase I	0-10	<1.0	<1.0	<20	<5.0	**6.8**	<10	**5.5**	21.0	<0.050	<10	<4.0	9.5	16.5
C5-12-MW-07-A	MW-07	2012	2	Phase I	0-15	<0.50	<0.50	13.1	4.0	**8.1**	4.3	**5.9**	**25.0**	<0.050	<10	<10	<10	15.0
2013-C5-MW-07-A	MW-07	2013	3	Phase I	0-15	<1.0	<0.10	**21.0**	**6.9**	**17.0**	6.0	**13.0**	**40.0**	<0.010	<10	<10	<10	15.0
C514-7WA	MW-07	2014	4	Phase I	0-15	0.70	<0.010	15.4	3.7	**8.6**	7.3	**11.4**	22.0	<0.10	<10	<50	<50	**55.0**
MW07	MW-07	2015	5	Phase I	0-15	**1.20**	<0.5	8.8	3.1	**7.6**	3.0	5.2	16.1	<0.05	<7	<4	<8	9.5
MW-07 Shallow	MW-07	2017	7	Phase II	0-15	<1.0	<0.5	13.7	4.8	**11.9**	5.8	**9.2**	**28.5**	<0.05	<7	<4	<8	9.5
	MW-07		10	Phase II														#N/A
	MW-07		15	Phase II														#N/A
	MW-07		25	Phase II														#N/A
																		#N/A
	MW-07 depth																	
11-29046	MW-07	2011	1	Phase I	30-40	**1.60**	<1.0	**37.0**	**8.3**	**48.0**	<10	**22.0**	**40.0**	<0.050	<10	<10	<9.0	14.5
C5-12-MW-07-B	MW-07	2012	2	Phase I	40-50	<0.50	<0.50	3.8	3.0	**7.6**	2.7	3.4	**24.0**	<0.050	<10	<10	<10	15.0
2013-C5-MW-07-B	MW-07	2013	3	Phase I	40-50	1.00	<0.10	**27.0**	**5.4**	**15.0**	6.0	**14.0**	**32.0**	<0.010	<10	<10	<10	15.0
C514-7WB	MW-07	2014	4	Phase I	40-50	0.20	<0.010	6.2	3.2	**6.7**	<4.9	**7.7**	20.0	<0.10	<10	<50	<50	**55.0**
MW07 (Dup. Avg.)	MW-07	2015	5	Phase I	40-50	**1.10**	<0.5	9.0	4.0	**11.0**	4.0	**6.0**	22.0	<0.1	<6	<4	<8	9.0
MW-07 Deep	MW-07	2017	7	Phase II	40-50	<1.0	<0.5	14.4	4.0	**30.9**	5.2	**10.0**	**27.9**	<0.05	<7	<4	<8	9.5
	MW-07		10	Phase II														#N/A
	MW-07		15	Phase II														#N/A
	MW-07		25	Phase II														#N/A
																		#N/A

CAM-5 Tier II Disposal Facility - Summary of Soil Monitoring Analytical Data

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Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	As* (mg/kg)	Cd* (mg/kg)	Cr* (mg/kg)	Co* (mg/kg)	Cu (mg/kg)	Pb* (mg/kg)	Ni (mg/kg)	Zn (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						0.83	1.00	21.8	9.5	10.5	10.0	14.0	31.0	0.100				N/A
Baseline Data - Arithmetic Mean						**1.00**	**1.00**	**20.0**	**5.0**	**6.1**	**10.0**	**5.5**	**22.3**	**0.003**				**26.2**
Baseline Data - Standard Deviation						0.00	0.00	0.0	0.0	2.0	0.0	3.6	5.2	0.000				12.1
Baseline Data Mean + 3xStandard Deviation						**1.00**	**1.00**	**20.0**	**5.0**	**12.0**	**10.0**	**16.1**	**37.8**	**0.003**				**62.6**
Downgradient/Cross-Gradient																		
	MW-08 surface																	
11-29040	MW-08	2011	1	Phase I	0-10	**1.10**	<1.0	<20	**6.5**	**11.0**	<10	**7.1**	**26.0**	<0.050	<10	<4.0	<9.0	11.5
C5-12-MW-08-A	MW-08	2012	2	Phase I	0-15	<0.50	<0.50	6.8	3.2	**9.4**	2.7	4.8	**25.0**	<0.050	<10	<10	<10	15.0
2013-C5-MW-08-A	MW-08	2013	3	Phase I	0-15	<1.0	<0.10	18.0	**6.7**	**19.0**	6.0	**12.0**	**37.0**	<0.010	<10	<10	<10	15.0
C514-8WA	MW-08	2014	4	Phase I	0-15	<0.20	<0.010	3.7	2.7	6.1	<5.0	**8.1**	16.0	<0.10	<10	<50	<50	**55.0**
MW08	MW-08	2015	5	Phase I	0-15	**2.30**	<0.5	15.2	**6.2**	**17.2**	5.9	**10.3**	**28.9**	<0.05	<7	<4	<8	9.5
MW-08 Shallow (Dup. Avg.)	MW-08	2017	7	Phase II	0-15	<1.0	<0.5	10.9	4.7	**11.6**	4.8	**7.5**	**25.0**	<0.05	<7	<4	<8	9.5
	MW-08		10	Phase II														#N/A
	MW-08		15	Phase II														#N/A
	MW-08		25	Phase II														#N/A
																		#N/A
	MW-08 depth																	
11-29042	MW-08	2011	1	Phase I	30-40	1.00	<1.0	<20	**6.8**	**11.2**	<10	**8.2**	**25.0**	<0.050	<10	<4.0	<9.0	11.5
C5-12-MW-08-B	MW-08	2012	2	Phase I	40-50	<0.50	<0.50	8.1	4.2	**10.6**	2.8	5.1	**28.0**	<0.050	<10	<10	<10	15.0
2013-C5-MW-08-B	MW-08	2013	3	Phase I	40-50	<1.0	<0.10	16.0	**6.7**	**20.0**	6.0	**11.0**	**34.0**	<0.010	<10	<10	<10	15.0
C514-8WA	MW-08	2014	4	Phase I	40-50	0.20	<0.010	4.6	3.2	**7.4**	<4.9	4.5	17.0	<0.10	<10	<50	<50	**55.0**
MW08	MW-08	2015	5	Phase I	40-50	**1.80**	<0.5	8.3	3.9	**8.7**	3.6	**5.8**	20.5	<0.05	<7	<4	<8	9.5
MW-08 Deep	MW-08	2017	7	Phase II	40-50	<1.0	<0.5	11.0	**5.1**	**11.6**	5.5	**7.2**	**26.5**	<0.05	<7	<4	<8	9.5
	MW-08		10	Phase II														#N/A
	MW-08		15	Phase II														#N/A
	MW-08		25	Phase II														#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.

N/A = not analyzed

Legend

XX	**Sample exceeds baseline mean.**
XX	**Sample exceeds baseline mean + 3xSD**

CAM-5 Tier II Disposal Facility Trends in Soil Inorganics, PCBs and Modified TPH

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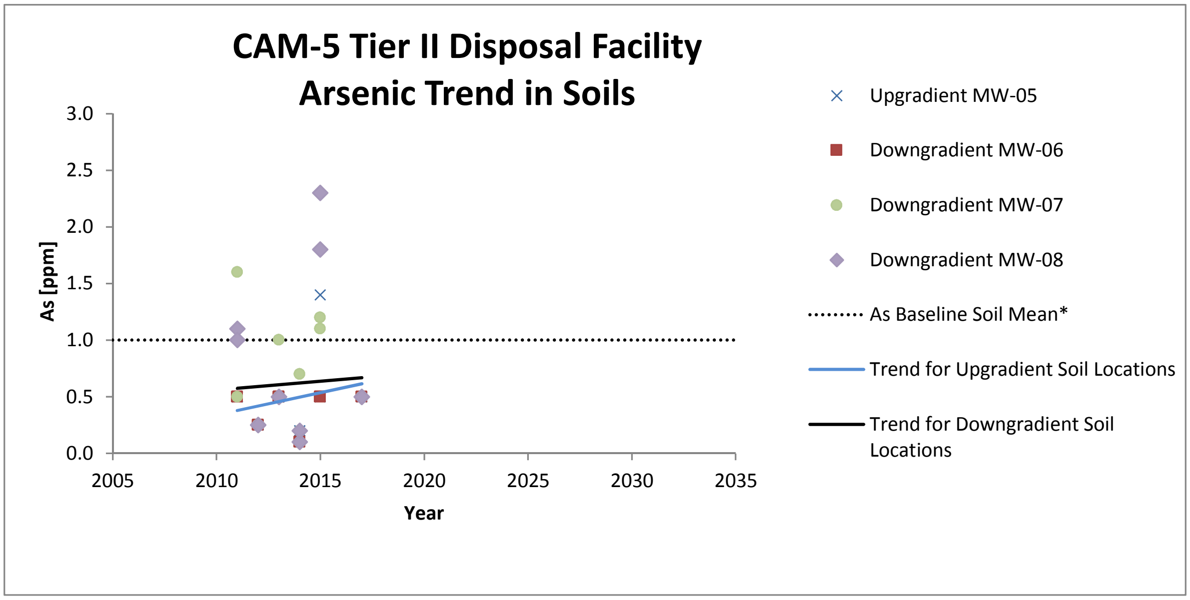
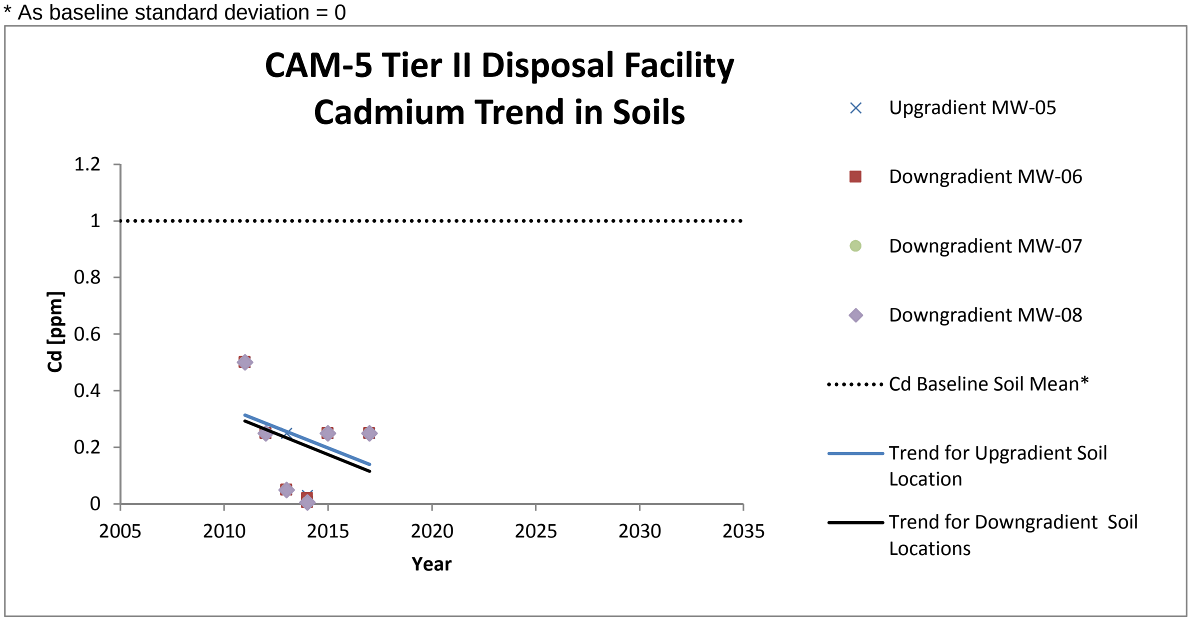
Where results are below detection, half of the detection limit has been used in the charts for the sample points.

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.



* As baseline arithmetic mean is equal to the baseline detection limit
* As baseline standard deviation = 0



* Cd baseline arithmetic mean is equal to the baseline detection limit
* Cd baseline standard deviation = 0

CAM-5 Tier II Disposal Facility Trends in Soil Inorganics, PCBs and Modified TPH

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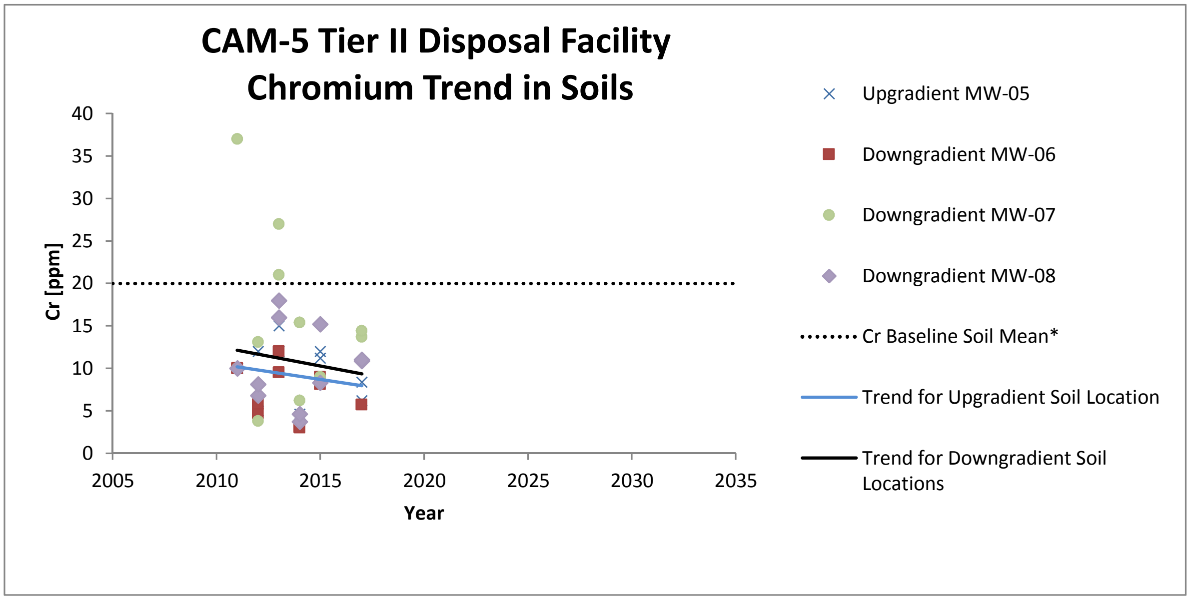
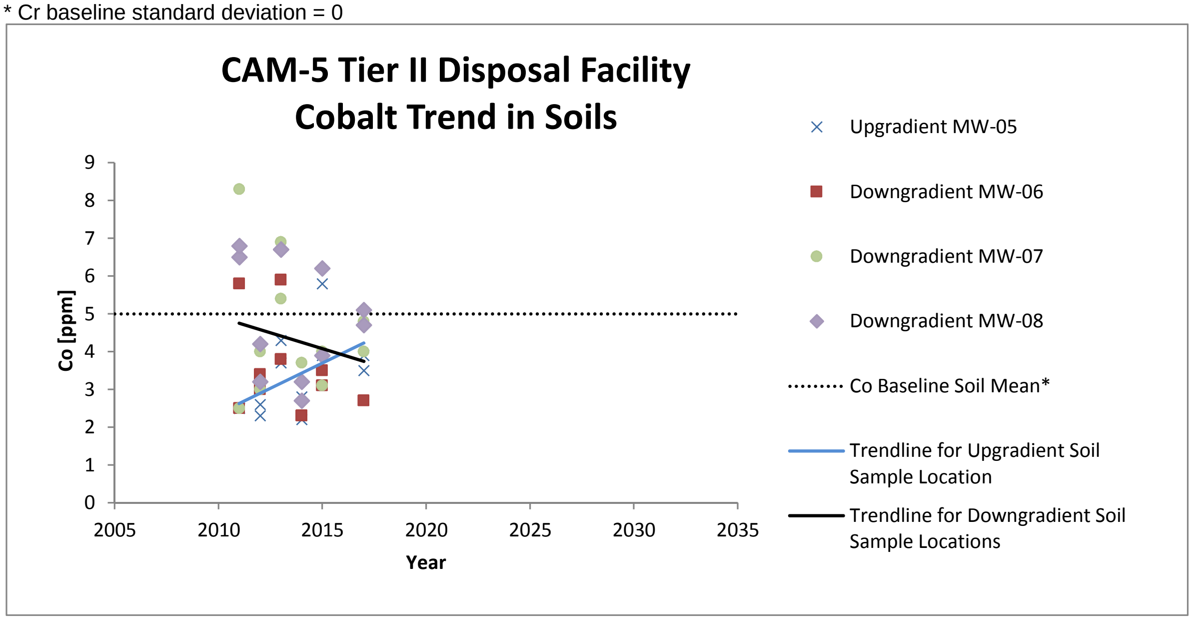
Where results are below detection, half of the detection limit has been used in the charts for the sample points.

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.



* Cr baseline arithmetic mean is equal to the baseline detection limit

* Cr baseline standard deviation = 0



* Co baseline arithmetic mean is equal to the baseline detection limit

* Co baseline standard deviation = 0

CAM-5 Tier II Disposal Facility Trends in Soil Inorganics, PCBs and Modified TPH

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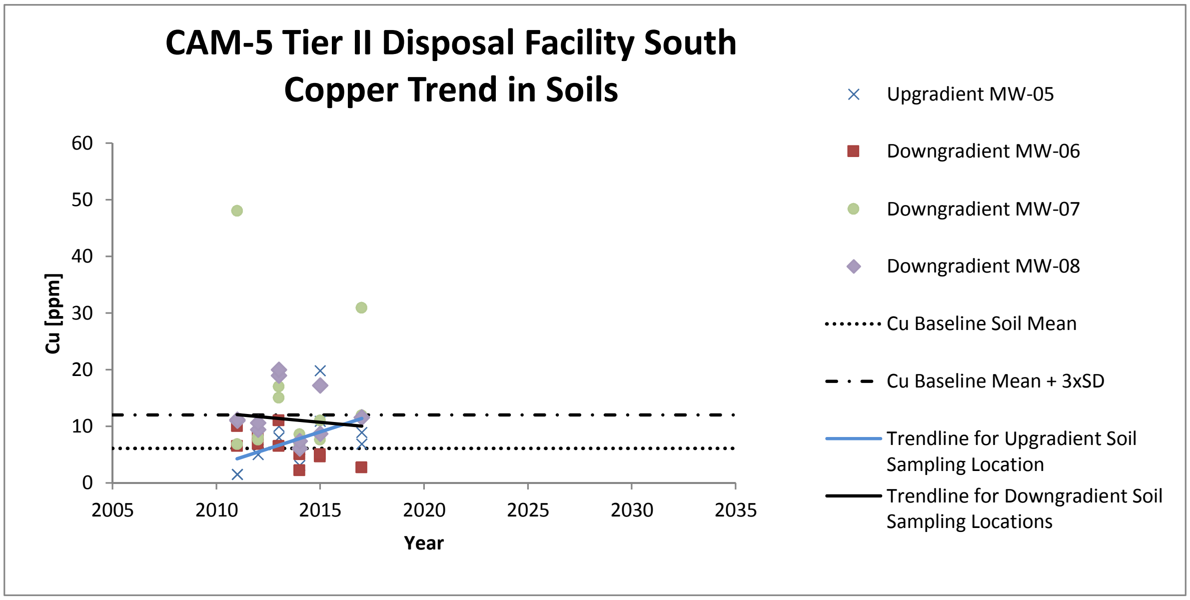
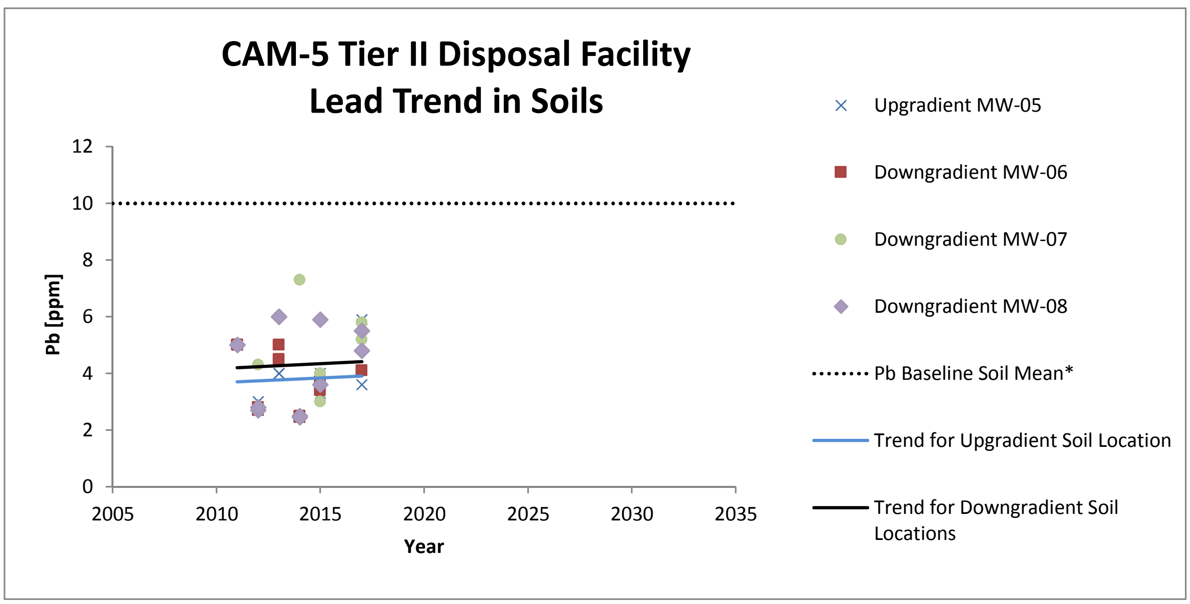
Where results are below detection, half of the detection limit has been used in the charts for the sample points.

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.





* Pb baseline arithmetic mean is equal to the baseline detection limit

* Pb baseline standard deviation = 0

CAM-5 Tier II Disposal Facility Trends in Soil Inorganics, PCBs and Modified TPH

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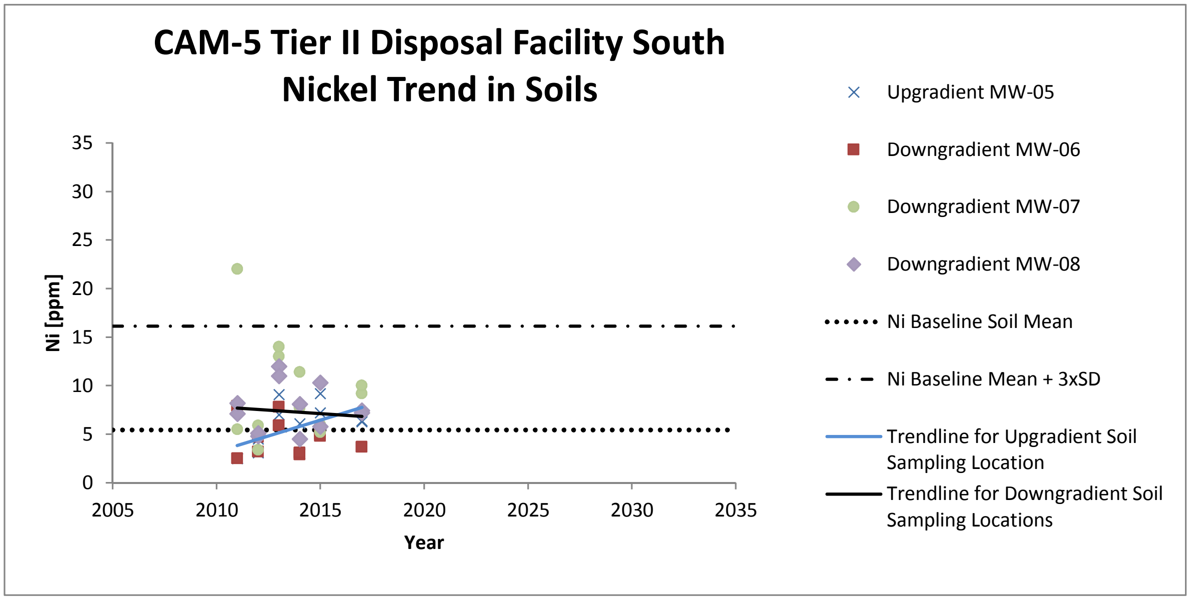
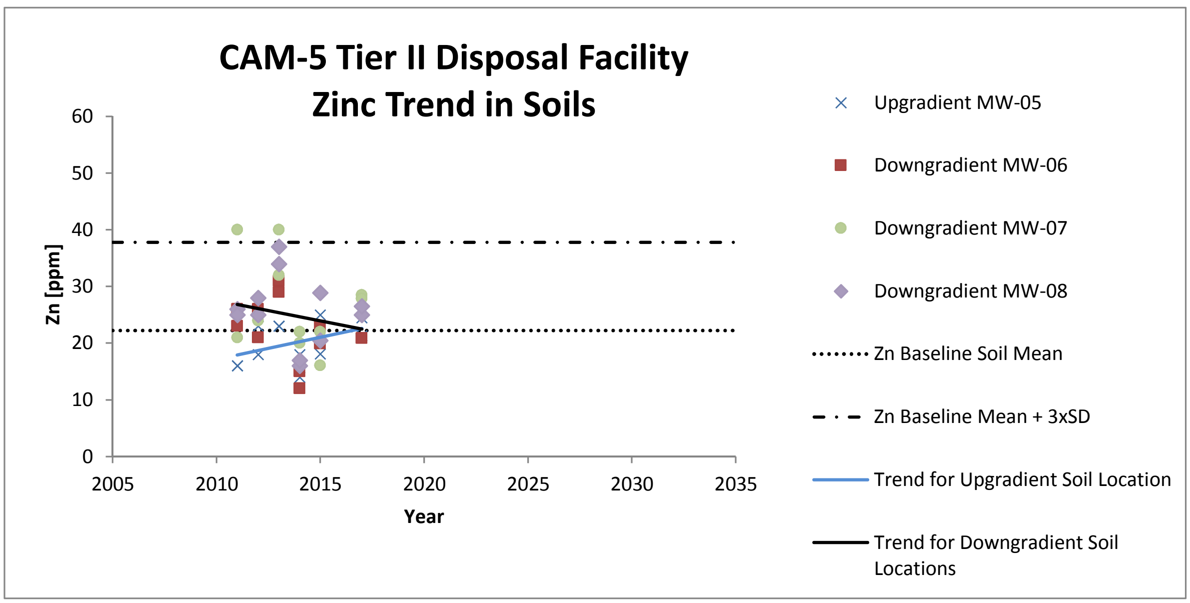
Where results are below detection, half of the detection limit has been used in the charts for the sample points.

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.





CAM-5 Tier II Disposal Facility Trends in Soil Inorganics, PCBs and Modified TPH

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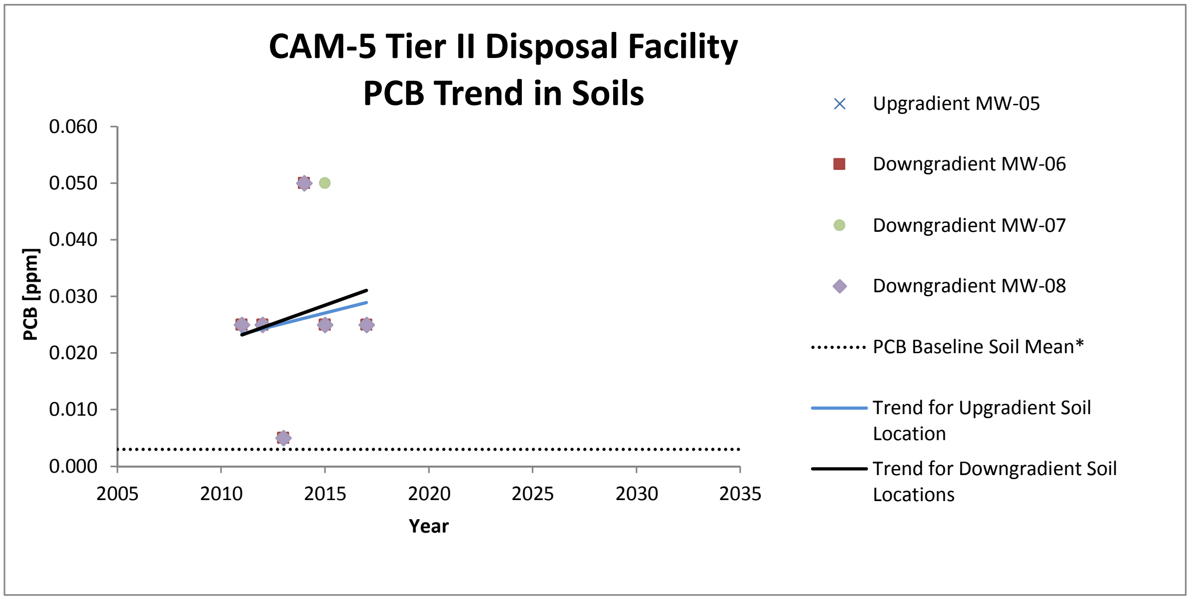
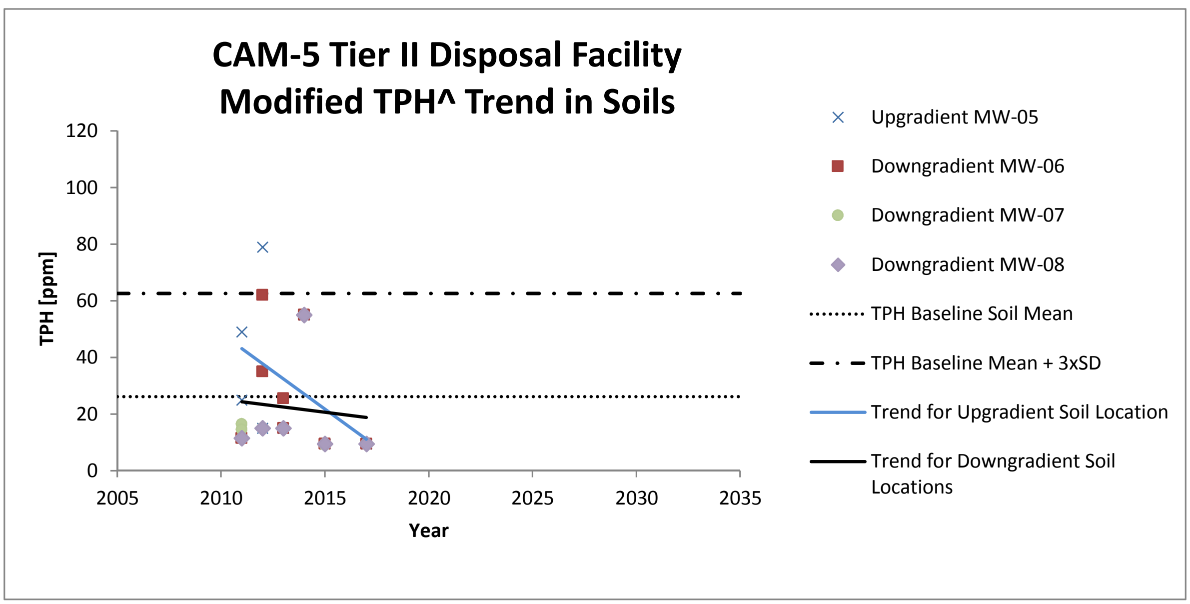
Where results are below detection, half of the detection limit has been used in the charts for the sample points.

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.



* PCB baseline arithmetic mean is equal to the baseline detection limit
* PCB baseline standard deviation = 0
Note: variations seen to 2017 are an indication of changing detection limits; all results below detection limits



^ Modified TPH is sum of F1, F2 and F3 fractions (C_6 - C_{34})

CAM-5 Tier II Disposal Facility - Summary of Groundwater Monitoring Analytical Data

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Sample ID	Location	Date	Monitoring Year	Monitoring Phase	As* (mg/L)	Cd* (mg/L)	Cr (mg/L)	Co* (mg/L)	Cu (mg/L)	Pb* (mg/L)	Ni (mg/L)	Zn* (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:																
08-27206	MW-05	2008			<0.0030	<0.0010	0.024	<0.0030	0.010	<0.0010	0.011	<0.0050	<0.050	<0.50	<1.0	0.78
Downgradient:																
09-22816	MW-06	2009			<0.0030	<0.0010	0.030	<0.0030	0.010	<0.010	0.010	<0.010	<0.050	2.2	<1.0	2.73
09-22815	MW-07	2009			<0.0030	<0.0010	<0.0050	<0.0030	<0.0050	<0.010	0.0060	<0.010	<0.050	1.4	<1.0	1.93
09-22814	MW-08	2009			<0.0030	<0.0010	0.040	0.0030	0.067	<0.010	0.054	0.020	<0.050	<0.50	<1.0	0.78
10-27889	MW-06	2010			<0.0030	<0.0010	0.010	<0.0030	<0.0050	<0.010	<0.0050	<0.010	<0.050	<0.50	<1.0	0.78
10-27884	MW-07	2010			<0.0030	<0.0010	0.009	<0.0030	<0.0050	<0.010	<0.0050	<0.010	<0.050	<0.50	<1.0	0.78
10-27879	MW-08	2010			<0.0030	0.0030	0.029	<0.0030	0.011	<0.010	0.0090	0.056	<0.050	<0.50	<1.0	0.78
		N value			7	7	7	7	7	7	7	7				7
Baseline Data - Arithmetic Mean					0.0015	0.00086	0.021	0.0017	0.015	0.0044	0.014	0.014				1.22
Baseline Data - Arithmetic Mean Corrected for Detection Limit					**0.003**	**0.001**	**0.021**	**0.0030**	**0.015**	**0.010**	**0.014**	**0.010**				**1.22**
Baseline Data - Standard Deviation					0.000	0.000	0.014	0.0000	0.023	0.000	0.018	0.000				0.00
Baseline Data - Corrected Arithmetic Mean + 3xStandard Deviation					**0.003**	**0.001**	**0.062**	**0.0030**	**0.085**	**0.010**	**0.068**	**0.010**				**1.22**
**** If baseline or background arithmetic mean was below the detection limit, the mean has been modified to match the detection limit value.***																
Monitoring Data													**Modified TPH TOTAL will appear when F1, F2, F3 fraction results are entered.**			
Upgradient - MW-05																
No sample collected	MW-05	2011	1	Phase I												#N/A
No sample collected	MW-05	2012	2	Phase I												#N/A
No sample, insufficient water	MW-05	2013	3	Phase I												#N/A
No sample, well dry	MW-05	2014	4	Phase I												#N/A
Not sampled, well frozen	MW-05	2015	5	Phase I												#N/A
MW-05 (*dissolved metals*)	MW-05	2017	7	Phase II	*<0.001*	*<0.0001*	*<0.001*	*<0.0005*	*0.0023*	*0.0006*	*<0.001*	**0.0120**	*<0.025*	*<0.1*	*<0.1*	*0.1125*
	MW-05		10	Phase II												#N/A
	MW-05		15	Phase II												#N/A
	MW-05		25	Phase II												#N/A
																#N/A
																#N/A

CAM-5 Tier II Disposal Facility - Summary of Groundwater Monitoring Analytical Data

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Sample ID	Location	Date	Monitoring Year	Monitoring Phase	As* (mg/L)	Cd* (mg/L)	Cr (mg/L)	Co* (mg/L)	Cu (mg/L)	Pb* (mg/L)	Ni (mg/L)	Zn* (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:																
08-27206	MW-05	2008			<0.0030	<0.0010	0.024	<0.0030	0.010	<0.0010	0.011	<0.0050	<0.050	<0.50	<1.0	0.78
Downgradient:																
09-22816	MW-06	2009			<0.0030	<0.0010	0.030	<0.0030	0.010	<0.010	0.010	<0.010	<0.050	2.2	<1.0	2.73
09-22815	MW-07	2009			<0.0030	<0.0010	<0.0050	<0.0030	<0.0050	<0.010	0.0060	<0.010	<0.050	1.4	<1.0	1.93
09-22814	MW-08	2009			<0.0030	<0.0010	0.040	0.0030	0.067	<0.010	0.054	0.020	<0.050	<0.50	<1.0	0.78
10-27889	MW-06	2010			<0.0030	<0.0010	0.010	<0.0030	<0.0050	<0.010	<0.0050	<0.010	<0.050	<0.50	<1.0	0.78
10-27884	MW-07	2010			<0.0030	<0.0010	0.009	<0.0030	<0.0050	<0.010	<0.0050	<0.010	<0.050	<0.50	<1.0	0.78
10-27879	MW-08	2010			<0.0030	0.0030	0.029	<0.0030	0.011	<0.010	0.0090	0.056	<0.050	<0.50	<1.0	0.78
		N value			7	7	7	7	7	7	7	7				7
Baseline Data - Arithmetic Mean					0.0015	0.00086	0.021	0.0017	0.015	0.0044	0.014	0.014				1.22
Baseline Data - Arithmetic Mean Corrected for Detection Limit					**0.003**	**0.001**	**0.021**	**0.0030**	**0.015**	**0.010**	**0.014**	**0.010**				**1.22**
Baseline Data - Standard Deviation					0.000	0.000	0.014	0.0000	0.023	0.000	0.018	0.000				0.00
Baseline Data - Corrected Arithmetic Mean + 3xStandard Deviation					**0.003**	**0.001**	**0.062**	**0.0030**	**0.085**	**0.010**	**0.068**	**0.010**				**1.22**
Downgradient - MW-06																
11-29110/11	MW-06	2011	1	Phase I	<0.0030	<0.0010	0.0180	<0.0030	<0.0050	<0.010	**0.2900**	<0.045	<0.050	<0.50	<1.0	0.7750
C5-12-MW-06	MW-06	2012	2	Phase I	0.0020	**0.0027**	**0.2070**	**0.0050**	**0.0840**	0.0090	**0.2050**	**0.0810**	<0.10	<0.10	<0.10	0.1500
2013-C5-MW-06	MW-06	2013	3	Phase I	0.0005	0.0001	**0.0210**	0.0012	0.0089	0.0016	0.0120	**0.0130**	<0.025	<0.10	<0.10	0.1125
No sample, insufficient water	MW-06	2014	4	Phase I												#N/A
MW06	MW-06	2015	5	Phase I	<0.005	<0.0005	0.0200	**0.0280**	**0.0193**	0.0006	**0.0180**	<0.025	<0.025	<0.1	<0.1	0.1125
MW-06 (*dissolved metals*)	MW-06	2017	7	Phase II	*<0.001*	*<0.0001*	*<0.001*	*<0.0005*	*0.0017*	*0.0006*	*<0.001*	*0.0070*	*<0.025*	*<0.1*	*<0.1*	*0.1125*
	MW-06		10	Phase II												#N/A
	MW-06		15	Phase II												#N/A
	MW-06		25	Phase II												#N/A
																#N/A
																#N/A
Downgradient - MW-07																
No sample collected	MW-07	2011	1	Phase I												#N/A
No sample collected	MW-07	2012	2	Phase I												#N/A
No sample, insufficient water	MW-07	2013	3	Phase I												#N/A
No sample, well dry	MW-07	2014	4	Phase I												#N/A
Not sampled, well frozen	MW-07	2015	5	Phase I												#N/A
Not sampled, well frozen	MW-07	2017	7	Phase II												#N/A
	MW-07		10	Phase II												#N/A
	MW-07		15	Phase II												#N/A
	MW-07		25	Phase II												#N/A
																#N/A
																#N/A

CAM-5 Tier II Disposal Facility - Summary of Groundwater Monitoring Analytical Data

Link To: Table of Contents

Sample ID	Location	Date	Monitoring Year	Monitoring Phase	As* (mg/L)	Cd* (mg/L)	Cr (mg/L)	Co* (mg/L)	Cu (mg/L)	Pb* (mg/L)	Ni (mg/L)	Zn* (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:																
08-27206	MW-05	2008			<0.0030	<0.0010	0.024	<0.0030	0.010	<0.0010	0.011	<0.0050	<0.050	<0.50	<1.0	0.78
Downgradient:																
09-22816	MW-06	2009			<0.0030	<0.0010	0.030	<0.0030	0.010	<0.010	0.010	<0.010	<0.050	2.2	<1.0	2.73
09-22815	MW-07	2009			<0.0030	<0.0010	<0.0050	<0.0030	<0.0050	<0.010	0.0060	<0.010	<0.050	1.4	<1.0	1.93
09-22814	MW-08	2009			<0.0030	<0.0010	0.040	0.0030	0.067	<0.010	0.054	0.020	<0.050	<0.50	<1.0	0.78
10-27889	MW-06	2010			<0.0030	<0.0010	0.010	<0.0030	<0.0050	<0.010	<0.0050	<0.010	<0.050	<0.50	<1.0	0.78
10-27884	MW-07	2010			<0.0030	<0.0010	0.009	<0.0030	<0.0050	<0.010	<0.0050	<0.010	<0.050	<0.50	<1.0	0.78
10-27879	MW-08	2010			<0.0030	0.0030	0.029	<0.0030	0.011	<0.010	0.0090	0.056	<0.050	<0.50	<1.0	0.78
		N value			7	7	7	7	7	7	7	7				7
Baseline Data - Arithmetic Mean					0.0015	0.00086	0.021	0.0017	0.015	0.0044	0.014	0.014				1.22
Baseline Data - Arithmetic Mean Corrected for Detection Limit					**0.003**	**0.001**	**0.021**	**0.0030**	**0.015**	**0.010**	**0.014**	**0.010**				**1.22**
Baseline Data - Standard Deviation					0.000	0.000	0.014	0.0000	0.023	0.000	0.018	0.000				0.00
Baseline Data - Corrected Arithmetic Mean + 3xStandard Deviation					**0.003**	**0.001**	**0.062**	**0.0030**	**0.085**	**0.010**	**0.068**	**0.010**				**1.22**
Downgradient/Cross-Gradient - MW-08																
11-29112	MW-08	2011	1	Phase I	<0.0030	<0.0010	**0.0650**	<0.0030	<0.005	<0.010	**0.0270**	**0.0900**	<0.050	<0.50	<1.0	0.7750
C5-12-MW-08	MW-08	2012	2	Phase I	0.0010	0.0001	**0.0810**	**0.0090**	**0.0560**	0.0100	**0.0470**	**0.0540**	<0.10	<0.10	<0.10	0.1500
2013-C5-MW-08/08-D	MW-08	2013	3	Phase I	**0.0032**	0.0001	**0.1950**	**0.0150**	**0.0895**	**0.0130**	**0.0705**	**0.0880**	<0.025	<0.10	<0.10	0.1125
C514-8W	MW-08	2014	4	Phase I	**0.0040**	0.0001	**0.0678**	**0.0158**	**0.0920**	**0.0118**	**0.0485**	**0.0920**	<0.20	<0.20	<0.10	0.2500
MW08	MW-08	2015	5	Phase I	0.0010	0.0000	0.0070	0.0010	**0.0260**	0.0040	0.0080	0.0090	<0.025	<0.1	<0.1	0.1125
MW-08 (*dissolved metals*; Dup. Avg.)	MW-08	2017	7	Phase II	*<0.001*	*<0.0001*	*<0.001*	*<0.0005*	*0.0061*	*0.0011*	*<0.001*	*0.0100*	*<0.025*	*<0.1*	*<0.1*	*0.1125*
	MW-08		10	Phase II												#N/A
	MW-08		15	Phase II												#N/A
	MW-08		25	Phase II												#N/A
																#N/A

Note: Modified TPH Total (C_6-C_{34}) has been calculated by adding results for F1, F2 and F3.

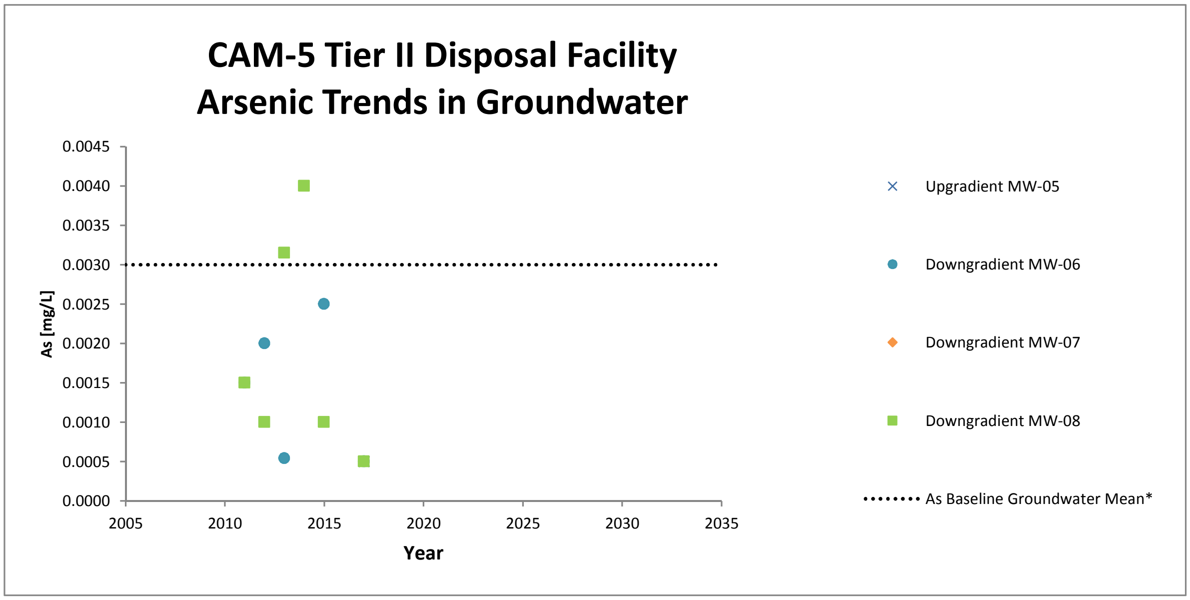
Legend	
XX	**Sample exceeds baseline mean.**
XX	**Sample exceeds baseline mean + 3xSD**

CAM-5 Tier II Disposal Facility Trends in Groundwater Inorganics, PCBs and Modified TPH

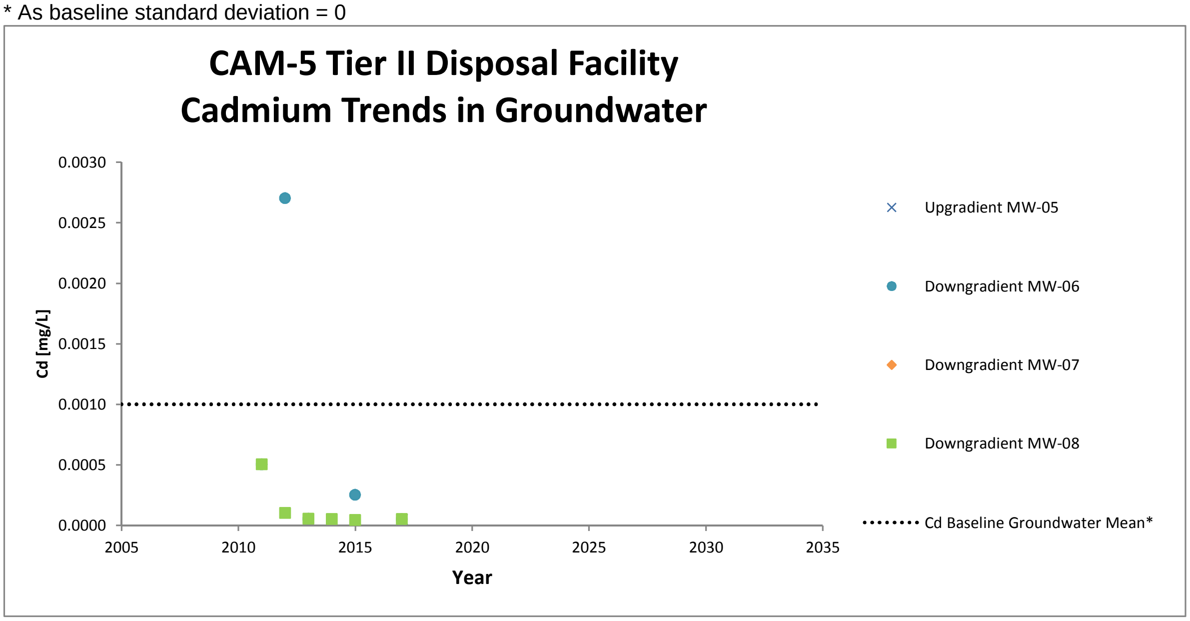
Link To: Table of Contents

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.



* As baseline arithmetic mean is equal to the baseline detection limit
* As baseline standard deviation = 0



* Cd baseline arithmetic mean is equal to the baseline detection limit
* Cd baseline standard deviation = 0

CAM-5 Tier II Disposal Facility Trends in Groundwater Inorganics, PCBs and Modified TPH

Link To: Table of Contents

Where results are below detection, half of the detection limit has been used in the charts for the sample points.

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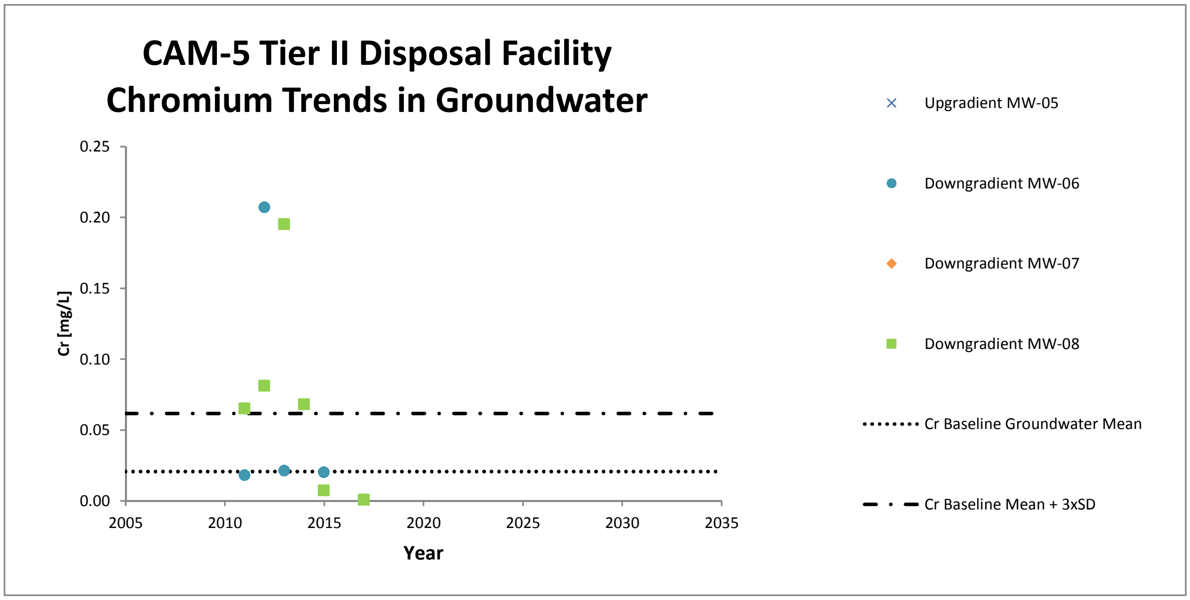

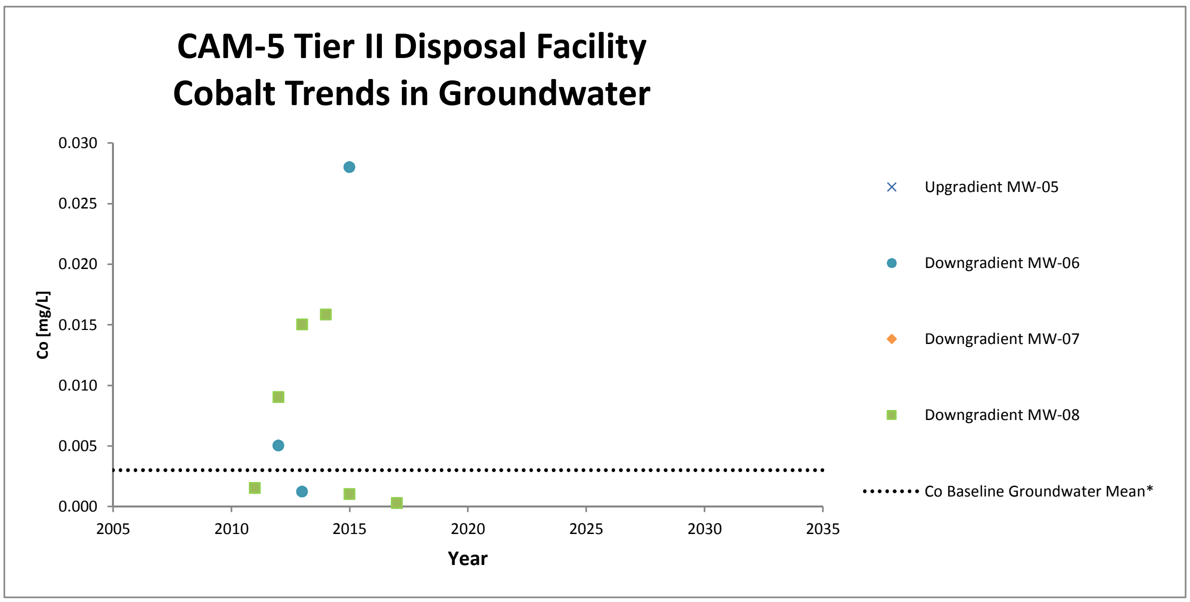

* Co baseline arithmetic mean is equal to the baseline detection limit

* Co baseline standard deviation = 0

CAM-5 Tier II Disposal Facility Trends in Groundwater Inorganics, PCBs and Modified TPH

Link To: Table of Contents

Where results are below detection, half of the detection limit has been used in the charts for the sample points.

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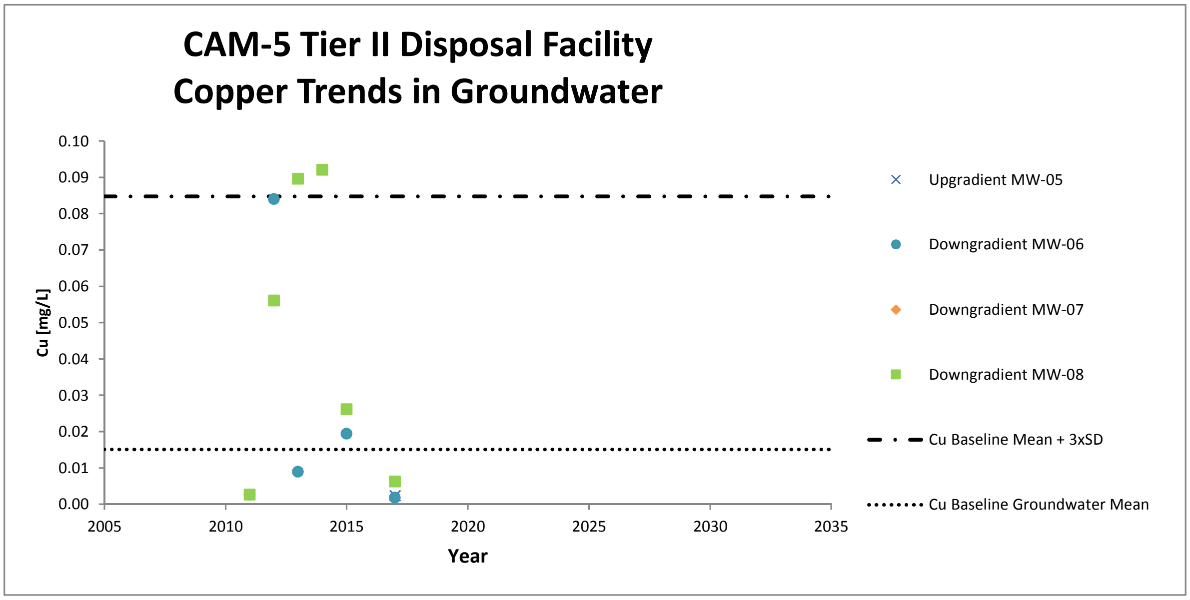

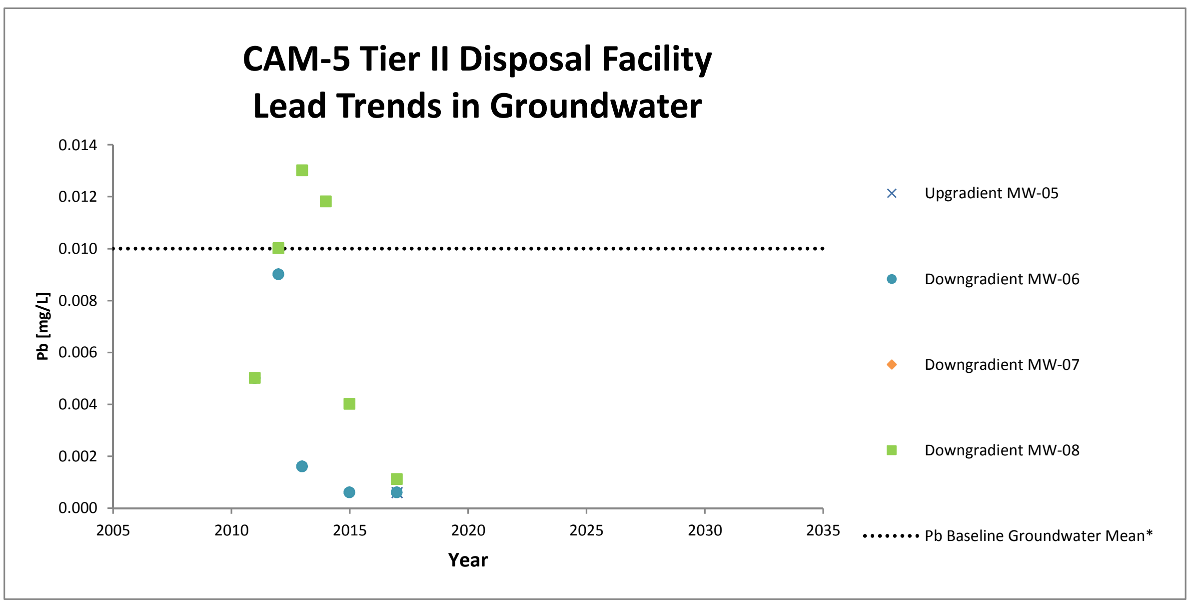

* Pb baseline arithmetic mean is equal to the baseline detection limit

* Pb baseline standard deviation = 0

CAM-5 Tier II Disposal Facility Trends in Groundwater Inorganics, PCBs and Modified TPH

Link To: Table of Contents

Where results are below detection, half of the detection limit has been used in the charts for the sample points.

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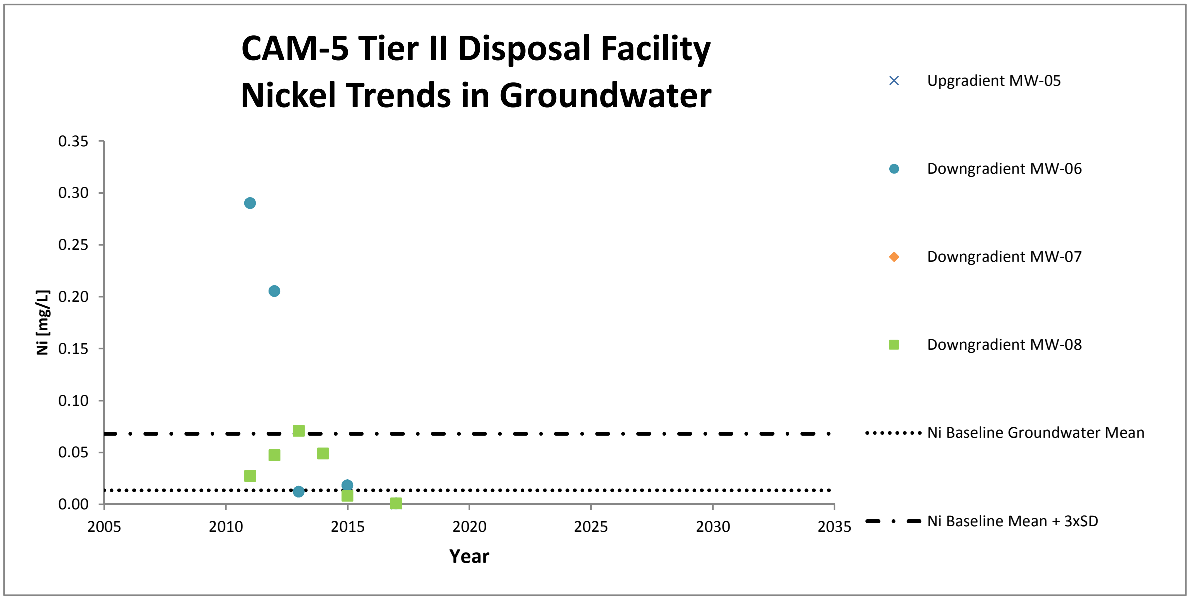
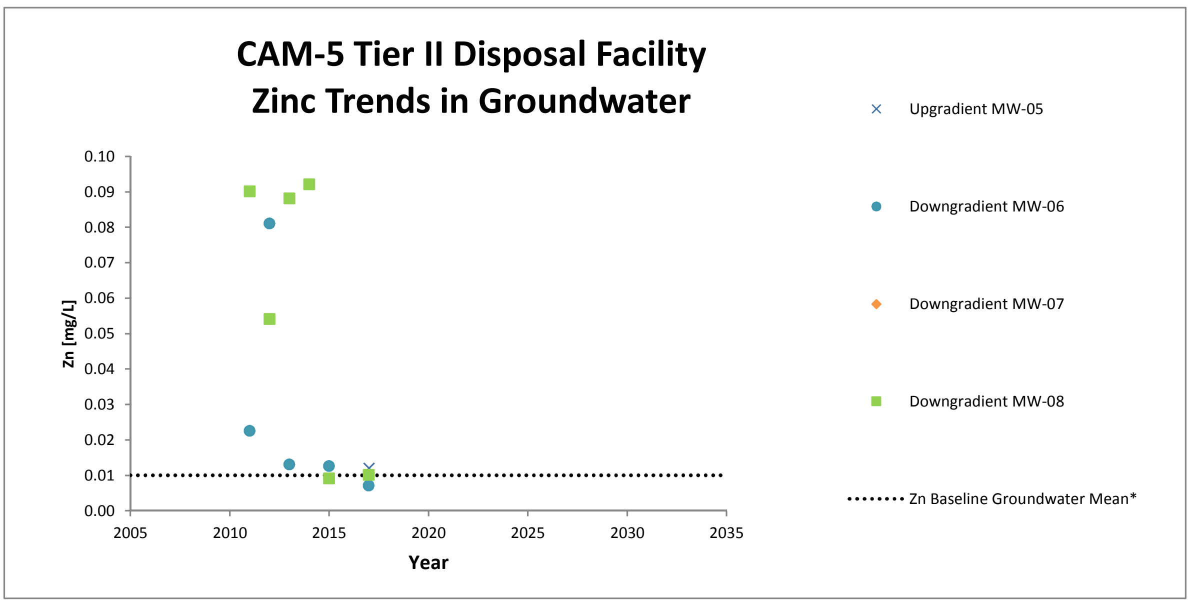




* Zn baseline arithmetic mean is equal to the baseline detection limit

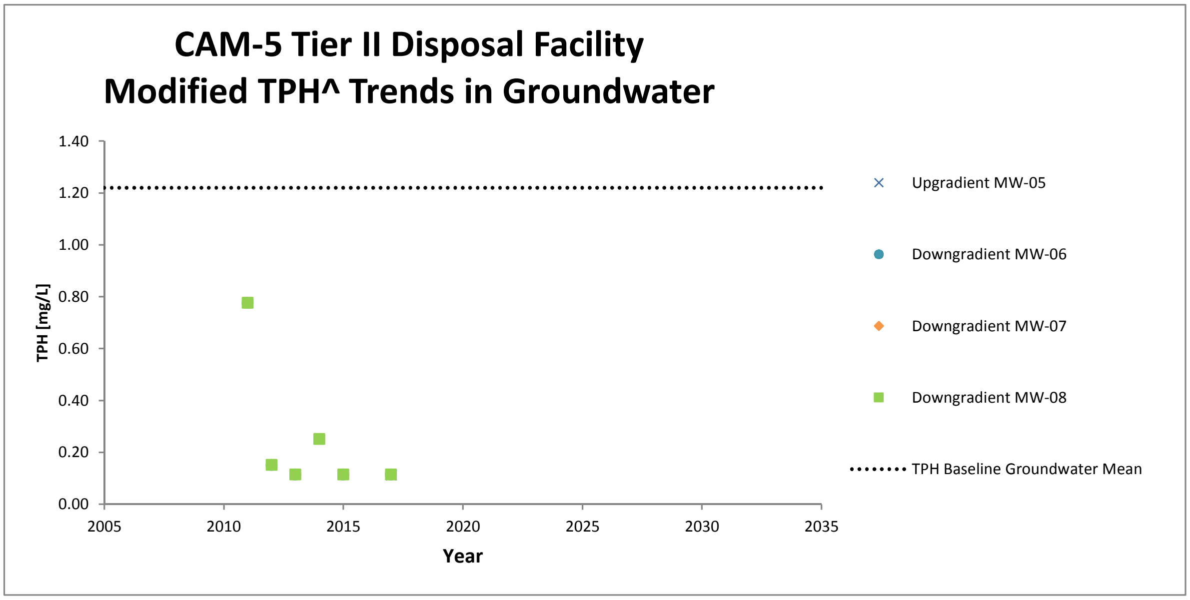
* Zn baseline standard deviation = 0

CAM-5 Tier II Disposal Facility Trends in Groundwater Inorganics, PCBs and Modified TPH

Link To: Table of Contents

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.



^ Modified TPH is sum of F1, F2 and F3 fractions (C_6 - C_{34})

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SAMPLE SUBMISSION CHECKLIST

Golder Associates Ltd. (Ottawa)

Project Number: CAM-5 Soil
Paracel Work Order #: 1733541
C of C #:

Conformance Report Soil

PO #:
Submitted By:
Submission Date: 18-Aug-17

Item #	Sample Submission Requirement	Yes	No
	Sample Integrity		
1	Samples submitted > 10 °C *and sampled more than 1 day prior to submission*	×	
2	Samples submitted > 10 °C *on day of sampling with attempt to cool*		✓
	Chain of Custody		
3	Client information complete, including contact	✓	
4	Project reference and/or PO number provided	✓	
5	Guideline Requirements included	✓	
6	Analysis Request complete	✓	
7	TAT indicated on CoC	✓	
8	Sample Date Included	✓	
9	Submitted on Non-Paracel CoC	✓	
10	CoC signed and dated		×
11	Samples received submerged in water. Suspected melted ice.		✓

Comments

5 year contract- expires Dec 31, 2020. CCME Coarse Criteria.

Additional Bottle/Sample Integrity Qualifiers

Sample ID	Code	Qualifier Note	Additional Comment
01	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved	
02	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved	
03	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved	
04	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved	
05	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved	

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SAMPLE SUBMISSION CHECKLIST

06	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved
07	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved
08	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved
09	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved
10	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved
11	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved
12	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved
13	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved
14	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved
15	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved
16	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved
17	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved
18	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved
19	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved
20	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved
21	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved
22	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved
23	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved
24	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved
25	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved
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27	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved
28	LG-SMP005a	Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved

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Certificate of Analysis

Golder Associates Ltd. (Ottawa)

1931 Robertson Rd.
Ottawa, ON K2H 5B7
Attn: Alyssa Troke

CAM-5 Soil 1 of 1

Client PO:
Project: CAM-5 Soil
Custody:

Report Date: 30-Aug-2017
Order Date: 18-Aug-2017

Order #: 1733541

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1733541-01	C5-1 Shallow
1733541-02	C5-1 Deep
1733541-03	C5-2 Shallow
1733541-04	C5-2 Deep
1733541-05	C5-3 Shallow
1733541-06	C5-3 Deep
1733541-07	C5-4 Shallow
1733541-08	C5-5 Shallow
1733541-09	MW 05 Shallow
1733541-10	MW 05 Deep
1733541-11	MW 06 Shallow
1733541-12	MW 07 Shallow
1733541-13	MW 07 Deep
1733541-14	MW 08 Shallow
1733541-15	MW 08 Deep
1733541-16	MW 908 Shallow
1733541-17	MW 09 Shallow
1733541-18	MW 11 Shallow
1733541-19	MW 11 Deep
1733541-20	MW 12 Shallow
1733541-21	MW 12 Deep
1733541-22	MW 912 Deep
1733541-23	C5-6 Shallow
1733541-24	C5-7 Shallow
1733541-25	C5-7 Deep
1733541-26	C597 Deep
1733541-27	C5-8 Shallow
1733541-28	C5-8 Deep

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Golder Associates Ltd. (Ottawa)
Client PO:

Report Date: 30-Aug-2017
Order Date: 18-Aug-2017
Project Description: CAM-5 Soil

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
CCME-SQG: Metals by ICP-OES	based on MOE E3470, ICP-OES	22-Aug-17	22-Aug-17
PCBs, total	SW846 8082A - GC-ECD	22-Aug-17	27-Aug-17
PHC F1	CWS Tier 1 - P&T GC-FID	24-Aug-17	25-Aug-17
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	18-Aug-17	25-Aug-17
Solids, %	Gravimetric, calculation	28-Aug-17	28-Aug-17

Certificate of Analysis

Client: Golder Associates Ltd. (Ottawa)

Client PO:

Report Date: 30-Aug-2017

Order Date: 18-Aug-2017

Project Description: CAM-5 Soil

	Client ID:	C5-1 Shallow	C5-1 Deep	C5-2 Shallow	C5-2 Deep
	Sample Date:	12-Aug-17	12-Aug-17	12-Aug-17	12-Aug-17
	Sample ID:	1733541-01	1733541-02	1733541-03	1733541-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	96.0	97.5	85.5	94.4
Metals					
Arsenic	1.0 ug/g dry	<1.0	11.3	<1.0	<1.0
Cadmium	0.5 ug/g dry	<0.5	10.5	<0.5	<0.5
Chromium	1.0 ug/g dry	6.0	19.6	3.3	9.7
Cobalt	1.0 ug/g dry	1.5	14.3	1.3	4.1
Copper	1.0 ug/g dry	2.7	19.8	2.6	9.0
Lead	1.0 ug/g dry	2.2	15.7	1.8	4.5
Nickel	1.0 ug/g dry	3.2	17.3	3.0	6.6
Zinc	1.0 ug/g dry	9.0	35.2	7.9	25.2
Hydrocarbons					
F1 PHCs (C6-C10)	7 mg/kg dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 mg/kg dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 mg/kg dry	<8	<8	<8	<8
F4 PHCs (C34-C50)	6 mg/kg dry	<6	<6	<6	<6
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	69.9%	65.9%	60.1%	63.5%

PARACEL LABORATORIES LTD.

Order #: 1733541

Certificate of Analysis

Client: Golder Associates Ltd. (Ottawa)

Client PO:

Report Date: 30-Aug-2017

Order Date: 18-Aug-2017

Project Description: CAM-5 Soil

	MDL/Units	C5-3 Shallow	C5-3 Deep	C5-4 Shallow	C5-5 Shallow
Sample Date:		12-Aug-17	12-Aug-17	12-Aug-17	12-Aug-17
Sample ID:		1733541-05	1733541-06	1733541-07	1733541-08
		Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	92.1	92.4	89.7	86.7
Metals					
Arsenic	1.0 ug/g dry	11.8	12.0	<1.0	<1.0
Cadmium	0.5 ug/g dry	11.2	11.8	<0.5	<0.5
Chromium	1.0 ug/g dry	14.5	12.0	3.9	9.7
Cobalt	1.0 ug/g dry	12.5	12.0	1.4	2.2
Copper	1.0 ug/g dry	14.2	12.4	2.7	4.7
Lead	1.0 ug/g dry	12.6	12.1	1.4	2.4
Nickel	1.0 ug/g dry	14.2	12.2	2.8	5.0
Zinc	1.0 ug/g dry	18.2	11.2	8.2	11.1
Hydrocarbons					
F1 PHCs (C6-C10)	7 mg/kg dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 mg/kg dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 mg/kg dry	<8	<8	<8	<8
F4 PHCs (C34-C50)	6 mg/kg dry	<6	<6	<6	<6
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	84.6%	67.6%	65.9%	63.4%

Certificate of Analysis

Client: Golder Associates Ltd. (Ottawa)

Client PO:

Report Date: 30-Aug-2017

Order Date: 18-Aug-2017

Project Description: CAM-5 Soil

Client ID:		MW 05 Shallow	MW 05 Deep	MW 06 Shallow	MW 07 Shallow
Sample Date:		11-Aug-17	11-Aug-17	11-Aug-17	11-Aug-17
Sample ID:		1733541-09	1733541-10	1733541-11	1733541-12
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	95.8	96.2	94.4	91.6
Metals					
Arsenic	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	1.0 ug/g dry	6.2	8.4	5.7	13.7
Cobalt	1.0 ug/g dry	3.5	3.9	2.7	4.8
Copper	1.0 ug/g dry	8.9	6.9	2.7	11.9
Lead	1.0 ug/g dry	3.6	5.9	4.1	5.8
Nickel	1.0 ug/g dry	6.4	6.3	3.7	9.2
Zinc	1.0 ug/g dry	21.3	24.5	20.9	28.5
Hydrocarbons					
F1 PHCs (C6-C10)	7 mg/kg dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 mg/kg dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 mg/kg dry	<8	<8	<8	<8
F4 PHCs (C34-C50)	6 mg/kg dry	<6	<6	<6	<6
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	61.5%	70.1%	67.0%	68.9%

Certificate of Analysis

Client: Golder Associates Ltd. (Ottawa)

Client PO:

Report Date: 30-Aug-2017

Order Date: 18-Aug-2017

Project Description: CAM-5 Soil

	Client ID:	MW 07 Deep	MW 08 Shallow	MW 08 Deep	MW 908 Shallow
	Sample Date:	11-Aug-17	11-Aug-17	11-Aug-17	11-Aug-17
	Sample ID:	1733541-13	1733541-14	1733541-15	1733541-16
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	97.8	97.1	97.0	97.2
Metals					
Arsenic	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	1.0 ug/g dry	14.4	12.0	11.0	9.7
Cobalt	1.0 ug/g dry	4.0	4.9	5.1	4.5
Copper	1.0 ug/g dry	30.9	12.2	11.6	10.9
Lead	1.0 ug/g dry	5.2	5.2	5.5	4.4
Nickel	1.0 ug/g dry	10.0	8.2	7.2	6.7
Zinc	1.0 ug/g dry	27.9	25.5	26.5	24.5
Hydrocarbons					
F1 PHCs (C6-C10)	7 mg/kg dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 mg/kg dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 mg/kg dry	<8	<8	<8	<8
F4 PHCs (C34-C50)	6 mg/kg dry	<6	<6	<6	<6
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	71.2%	75.0%	69.6%	63.4%

PARACEL LABORATORIES LTD.

Order #: 1733541

Certificate of Analysis

Client: Golder Associates Ltd. (Ottawa)

Client PO:

Report Date: 30-Aug-2017

Order Date: 18-Aug-2017

Project Description: CAM-5 Soil

	Client ID:	MW 09 Shallow	MW 11 Shallow	MW 11 Deep	MW 12 Shallow
	Sample Date:	11-Aug-17	11-Aug-17	11-Aug-17	11-Aug-17
	Sample ID:	1733541-17	1733541-18	1733541-19	1733541-20
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	84.3	89.5	89.4	97.2
Metals					
Arsenic	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	1.0 ug/g dry	18.5	13.8	23.7	9.1
Cobalt	1.0 ug/g dry	6.1	3.6	6.3	4.3
Copper	1.0 ug/g dry	7.7	7.4	13.0	9.0
Lead	1.0 ug/g dry	6.5	3.8	6.2	5.2
Nickel	1.0 ug/g dry	9.9	7.7	14.2	6.6
Zinc	1.0 ug/g dry	43.0	18.1	30.0	26.1
Hydrocarbons					
F1 PHCs (C6-C10)	7 mg/kg dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 mg/kg dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 mg/kg dry	<8	<8	<8	<8
F4 PHCs (C34-C50)	6 mg/kg dry	<6	<6	<6	<6
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	72.3%	63.6%	68.9%	64.0%

PARACEL LABORATORIES LTD.

Order #: 1733541

Certificate of Analysis

Client: Golder Associates Ltd. (Ottawa)

Client PO:

Report Date: 30-Aug-2017

Order Date: 18-Aug-2017

Project Description: CAM-5 Soil

Client ID:		MW 12 Deep	MW 912 Deep	C5-6 Shallow	C5-7 Shallow
Sample Date:		11-Aug-17	11-Aug-17	12-Aug-17	12-Aug-17
Sample ID:		1733541-21	1733541-22	1733541-23	1733541-24
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	97.1	97.0	87.9	91.3
Metals					
Arsenic	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	1.0 ug/g dry	10.2	10.3	16.4	10.8
Cobalt	1.0 ug/g dry	4.6	4.2	7.6	4.8
Copper	1.0 ug/g dry	10.5	9.7	9.6	12.7
Lead	1.0 ug/g dry	5.4	4.8	10.2	6.2
Nickel	1.0 ug/g dry	7.0	6.5	8.6	8.8
Zinc	1.0 ug/g dry	25.3	23.4	30.3	25.7
Hydrocarbons					
F1 PHCs (C6-C10)	7 mg/kg dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 mg/kg dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 mg/kg dry	<8	<8	<8	<8
F4 PHCs (C34-C50)	6 mg/kg dry	<6	<6	<6	<6
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	133%	136%	135%	70.0%

Certificate of Analysis

Client: Golder Associates Ltd. (Ottawa)

Client PO:

Report Date: 30-Aug-2017

Order Date: 18-Aug-2017

Project Description: CAM-5 Soil

	Client ID:	C5-7 Deep	C597 Deep	C5-8 Shallow	C5-8 Deep
	Sample Date:	12-Aug-17	12-Aug-17	12-Aug-17	12-Aug-17
	Sample ID:	1733541-25	1733541-26	1733541-27	1733541-28
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	92.3	92.3	89.1	86.6
Metals					
Arsenic	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	1.0 ug/g dry	10.0	10.7	15.5	15.6
Cobalt	1.0 ug/g dry	4.1	4.4	5.9	5.7
Copper	1.0 ug/g dry	9.3	10.6	18.4	17.5
Lead	1.0 ug/g dry	3.5	4.8	5.3	5.9
Nickel	1.0 ug/g dry	6.6	7.5	11.0	11.4
Zinc	1.0 ug/g dry	21.4	24.5	32.3	32.2
Hydrocarbons					
F1 PHCs (C6-C10)	7 mg/kg dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 mg/kg dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 mg/kg dry	<8	<8	<8	<8
F4 PHCs (C34-C50)	6 mg/kg dry	<6	<6	<6	<6
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	129%	71.0%	136%	124%

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	mg/kg						
F2 PHCs (C10-C16)	ND	4	mg/kg						
F3 PHCs (C16-C34)	ND	8	mg/kg						
F4 PHCs (C34-C50)	ND	6	mg/kg						
Metals									
Arsenic	ND	1.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium	ND	1.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	1.0	ug/g						
Lead	ND	1.0	ug/g						
Nickel	ND	1.0	ug/g						
Zinc	ND	1.0	ug/g						
PCBs									
PCBs, total	ND	0.05	ug/g						
Surrogate: Decachlorobiphenyl	*0.246*		*ug/g*		*61.5*	*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	mg/kg dry	ND				40	
F2 PHCs (C10-C16)	ND	4	mg/kg dry	ND				30	
F3 PHCs (C16-C34)	ND	8	mg/kg dry	ND				30	
F4 PHCs (C34-C50)	ND	6	mg/kg dry	ND				30	
Metals									
Antimony	ND	1.0	ug/g dry	ND			0.0	30	
Arsenic	ND	1.0	ug/g dry	ND			0.0	30	
Beryllium	ND	1.0	ug/g dry	ND			0.0	30	
Boron	1.56	1.0	ug/g dry	ND			0.0	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Molybdenum	ND	1.0	ug/g dry	ND			0.0	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	ND	0.5	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND			0.0	30	
Tin	ND	5.0	ug/g dry	ND			0.0	30	
Uranium	ND	1.0	ug/g dry	ND			0.0	30	
PCBs									
PCBs, total	ND	0.05	ug/g dry	ND				40	
Surrogate: Decachlorobiphenyl	*0.263*		*ug/g dry*		*63.2*	*60-140*			
Physical Characteristics									
% Solids	86.9	0.1	% by Wt.	87.2			0.3	25	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	202	7	mg/kg		101	80-120			
F2 PHCs (C10-C16)	74	4	mg/kg	ND	79.3	60-140			
F3 PHCs (C16-C34)	168	8	mg/kg	ND	86.7	60-140			
F4 PHCs (C34-C50)	129	6	mg/kg	ND	100	60-140			
Metals									
Antimony	218		ug/L		87.1	70-130			
Arsenic	244		ug/L		97.4	70-130			
Barium	244		ug/L		97.4	70-130			
Beryllium	229		ug/L		91.8	70-130			
Boron	232		ug/L		92.8	70-130			
Cadmium	229		ug/L		91.4	70-130			
Chromium	232		ug/L		92.8	70-130			
Cobalt	228		ug/L		91.1	70-130			
Copper	329		ug/L	54.1	110	70-130			
Lead	225		ug/L		90.0	70-130			
Molybdenum	225		ug/L		90.0	70-130			
Nickel	372		ug/L	63.7	123	70-130			
Selenium	222		ug/L		88.8	70-130			
Silver	231		ug/L		92.3	70-130			
Thallium	235		ug/L		94.0	70-130			
Tin	232		ug/L		92.9	70-130			
Uranium	237		ug/L		94.7	70-130			
Vanadium	250		ug/L		99.8	70-130			
Zinc	221		ug/L		88.5	70-130			
PCBs									
PCBs, total	0.381	0.05	ug/g	ND	91.4	60-140			
Surrogate: Decachlorobiphenyl	*0.286*		*ug/g*		*68.6*	*60-140*			

Qualifier Notes:

Login Qualifiers :

Sample - F1/BTEX/VOCs (soil) not submitted according to CCME 2016 protocols - not field preserved

Applies to samples: C5-1 Shallow, C5-1 Deep, C5-2 Shallow, C5-2 Deep, C5-3 Shallow, C5-3 Deep, C5-4 Shallow, C5-5 Shallow, MW 05 Shallow, MW 05 Deep, MW 06 Shallow, MW 07 Shallow, MW 07 Deep, MW 08 Shallow, MW 08 Deep, MW 908 Shallow, MW 09 Shallow, MW 11 Shallow, MW 11 Deep, MW 12 Shallow, MW 12 Deep, MW 912 Deep, C5-6 Shallow, C5-7 Shallow, C5-7 Deep, C597 Deep, C5-8 Shallow, C5-8 Deep

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.

PARACEL LABORATORIES LTD.

TRU
RES
REL

Paracel ID: 1733541

Office
19 St. Laurent Blvd.
, Ontario K1G 4J8
0-749-1947
cel@paracellabs.com

Chain of Custody (Lab Use Only)
№ 111084

CAM-5 soil

Page 1 of 3

Client Name: Golder Associates	Project Reference:
Contact Name: Alyssa Trela	Quote #
Address: 1931 Robertson Rd	PO #
Telephone: 613952 9600	Email Address:

Turnaround Time: ☐ 1 Day ☐ 3 Day ☐ 2 Day ☐ Regular
Date Required:

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)

Required Analyses ~~Q15-30 Mod~~ 16-010

Paracel Order Number: 1733541

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Date	Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
1	C5-1 shallow	S			Aug 12															
2	C5-1 deep	S			Aug 12															
3	C5-2 shallow	S			Aug 12															
4	C5-2 deep	S			Aug 12															
5	C5-3 shallow	S			Aug 12															
6	C5-3 deep	S			Aug 12															
7	C5-4 shallow	S			Aug 12															
8	C5-5 shallow	S			Aug 12															
9	MW 05 shallow	S			Aug 11															
10	MW 05 deep	S			Aug 11															

Comments: proceed regardless of any hold time exceedance DBZ

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: M. Drouse	Received at Lab:	Verified By:
Relinquished By (Print):	Date/Time: 18/08/17 2:50 PM	Date/Time: Aug 18/17 5:00	Date/Time: 08/18/17 3:41pm
Date/Time:	Temperature: ____ °C	Temperature: 19.0 °C	pH Verified [ ] By:

Paracel ID: 1733541

PA
LA

CAM-5 soil

Head Office
300-2319 St. Laurent Blvd.
Ottawa, Ontario K1G 4J8
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e: paracel@paracellabs.com

Chain of Custody
(Lab Use Only)
№ 110882

Page 2 of 3

Client Name: Golder	Project Reference:		
Contact Name: Alyssa Trska	Quote #		
Address: 1931 Robertson Rd	PO #		
Telephone:	Email Address:		

Turnaround Time: ☐ 1 Day ☐ 3 Day ☐ 2 Day ☐ Regular
Date Required:

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)

Required Analyses 16-010

Paracel Order Number: 1733541

#	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)							
1	MW06 Shallow	S			Aug 11															
2	MW07 shallow	S																		
3	MW07 deep	S																		
4	MW08 Shallow	S																		
5	MW08 deep	S																		
6	MW908 shallow	S																		
7	MW09 shallow	S																		
8	~~MW09~~	S																		
9	MW 11 Shallow	S																		
10	MW11 Deep	S																		

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: A. Dcouse	Received at Lab:	Verified By:
Relinquished By (Print):	Date/Time: 18/08/17 2:50 PM	Date/Time: Aug 18/17 5:05	Date/Time: 08/18/17 5:41pm
Date/Time:	Temperature: ___ °C	Temperature: 14.0 °C	pH Verified [ ] By:

Paracel ID: 1733541

PARACEL LABORATORIES LTD.

CAM5 Soil

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Ottawa, Ontario K1G 4J8
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e: paracel@paracellabs.com

Chain of Custody (Lab Use Only)
№ 110883

Client Name: Golder Associates Ltd	Project Reference:
Contact Name: Alyssa Troia	Quote #
Address:	PO #
Telephone: 613 592 9600	Email Address:

Turnaround Time: ☐ 1 Day ☐ 3 Day ☐ 2 Day ☐ Regular
Date Required:

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)

Required Analyses Q16-010

Paracel Order Number: 1733541

#	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
1	MW12 shallow	S			Aug 11															
2	MW12 deep	S			Aug 11															
3	MW912 deep	S			Aug 11															
4	CS-6 shallow	S			Aug 12															
5	CS-7 shallow	S			Aug 12															
6	CS-7 deep	S			Aug 12															
7	CS97 deep	S			Aug 12															
8	CS-8 shallow	S			Aug 12															
9	CS-8 deep	S			Aug 12															
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: M. Krouse	Received at Lab:	Verified By:
Relinquished By (Print):	Date/Time: 18/08/17 2:50 PM	Date/Time: Aug 18 17 5:00	Date/Time: 08/18/17 5:41
Date/Time:	Temperature: ___ °C	Temperature: 14.0 °C	pH Verified [ ] By:

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SAMPLE SUBMISSION CHECKLIST

Golder Associates Ltd. (Ottawa)

Project Number: DEW Line CAM-5
Paracel Work Order #: 1733535
C of C #: 111083

Conformance Report
Groundwater

PO #:
Submitted By:
Submission Date: 18-Aug-17

Item #	Sample Submission Requirement	Yes	No
	Sample Integrity		
1	Samples submitted > 10 °C *and sampled more than 1 day prior to submission*	×	
2	Samples submitted > 10 °C *on day of sampling with attempt to cool*		✓
	Chain of Custody		
3	Client information complete, including contact	✓	
4	Project reference and/or PO number provided	✓	
5	Guideline Requirements included	✓	
6	Analysis Request complete	✓	
7	TAT indicated on CoC	✓	
8	Sample Date Included	✓	
9	Submitted on Non-Paracel CoC	✓	
10	CoC signed and dated		×
11	Samples received submerged in water. Suspected melted ice.		✓

Comments

5 year contract- expires Dec 31, 2020. CCME Coarse Criteria.

Additional Bottle/Sample Integrity Qualifiers

Sample ID	Code	Qualifier Note	Additional Comment
01	WO1	Revision 1 Please note the metals concentration reported are dissolved metals concentrations.	Revision 1 Please note the metals concentration reported are dissolved metals concentrations.
02	LG-SMP007	Sample - Filtered and preserved by Paracel upon receipt at the laboratory - Metals	Metals
03	LG-SMP007	Sample - Filtered and preserved by Paracel upon receipt at the laboratory - Metals	Metals
04	LG-SMP007	Sample - Filtered and preserved by Paracel upon receipt at the laboratory - Metals	Metals

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SAMPLE SUBMISSION CHECKLIST

05	LG-SMP007	Sample - Filtered and preserved by Paracel upon receipt at the laboratory - Metals	Metals
06	LG-SMP007	Sample - Filtered and preserved by Paracel upon receipt at the laboratory - Metals	Metals
07	LG-SMP007	Sample - Filtered and preserved by Paracel upon receipt at the laboratory - Metals	Metals
08	LG-SMP007	Sample - Filtered and preserved by Paracel upon receipt at the laboratory - Metals	Metals
09	LG-SMP007	Sample - Filtered and preserved by Paracel upon receipt at the laboratory - Metals	Metals
10	LG-SMP007	Sample - Filtered and preserved by Paracel upon receipt at the laboratory - Metals	Metals
11	LG-SMP007	Sample - Filtered and preserved by Paracel upon receipt at the laboratory - Metals	Metals

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Certificate of Analysis

Golder Associates Ltd. (Ottawa)

1931 Robertson Rd.
Ottawa, ON K2H 5B7
Attn: Alyssa Troke

CAM-5 Groundwater 1 of 1

Client PO:
Project: DEW Line CAM-5
Custody: 111083

Report Date: 27-Nov-2017
Order Date: 18-Aug-2017

Order #: 1733535

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1733535-01	MW 05
1733535-02	MW 06
1733535-03	MW 08
1733535-04	MW 09
1733535-05	MW 11
1733535-06	MW 12
1733535-07	Field Blank
1733535-08	MW 908
1733535-09	C-5 Shovel R
1733535-10	C-5 Probe R
1733535-11	C-5 Trip Blank

Approved By:

Dale Robertson, BSc
Laboratory Director

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Metals, ICP-MS	EPA 200.8 - ICP-MS	23-Aug-17	23-Aug-17
PHC F1	CWS Tier 1 - P&T GC-FID	24-Aug-17	25-Aug-17
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	21-Aug-17	21-Aug-17

Certificate of Analysis

Client: Golder Associates Ltd. (Ottawa)

Client PO:

Report Date: 27-Nov-2017

Order Date: 18-Aug-2017

Project Description: DEW Line CAM-5

	MDL/Units	MW 05	MW 06	MW 08	MW 09
Client ID:		MW 05	MW 06	MW 08	MW 09
Sample Date:		11-Aug-17	11-Aug-17	11-Aug-17	11-Aug-17
Sample ID:		1733535-01	1733535-02	1733535-03	1733535-04
		Water	Water	Water	Water
Metals					
Arsenic	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Cadmium	0.0001 mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Cobalt	0.0005 mg/L	<0.0005	<0.0005	<0.0005	<0.0005
Copper	0.0005 mg/L	0.0023	0.0017	0.0064	0.0008
Lead	0.0001 mg/L	0.0006	0.0006	0.0012	0.0004
Nickel	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Zinc	0.005 mg/L	0.012	0.007	0.007	<0.005
Hydrocarbons					
F1 PHCs (C6-C10)	0.025 mg/L	<0.025	<0.025	<0.025	<0.025
F2 PHCs (C10-C16)	0.1 mg/L	<0.1	<0.1	<0.1	<0.1
F3 PHCs (C16-C34)	0.1 mg/L	<0.1	<0.1	<0.1	<0.1
F4 PHCs (C34-C50)	0.1 mg/L	<0.1	<0.1	<0.1	<0.1

	MDL/Units	MW 11	MW 12	Field Blank	MW 908
Client ID:		MW 11	MW 12	Field Blank	MW 908
Sample Date:		11-Aug-17	11-Aug-17	14-Aug-17	11-Aug-17
Sample ID:		1733535-05	1733535-06	1733535-07	1733535-08
		Water	Water	Water	Water
Metals					
Arsenic	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Cadmium	0.0001 mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Cobalt	0.0005 mg/L	<0.0005	<0.0005	<0.0005	<0.0005
Copper	0.0005 mg/L	0.0005	<0.0005	<0.0005	0.0058
Lead	0.0001 mg/L	0.0001	<0.0001	<0.0001	0.0010
Nickel	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Zinc	0.005 mg/L	0.010	0.007	0.010	0.013
Hydrocarbons					
F1 PHCs (C6-C10)	0.025 mg/L	<0.025	<0.025	<0.025	<0.025
F2 PHCs (C10-C16)	0.1 mg/L	<0.1	<0.1	<0.1	<0.1
F3 PHCs (C16-C34)	0.1 mg/L	<0.1	<0.1	<0.1	<0.1
F4 PHCs (C34-C50)	0.1 mg/L	<0.1	<0.1	<0.1	<0.1

Certificate of Analysis

Client: Golder Associates Ltd. (Ottawa)

Client PO:

Report Date: 27-Nov-2017

Order Date: 18-Aug-2017

Project Description: DEW Line CAM-5

	Client ID:	C-5 Shovel R	C-5 Probe R	C-5 Trip Blank	-
	Sample Date:	12-Aug-17	11-Aug-17	13-Jul-17	-
	Sample ID:	1733535-09	1733535-10	1733535-11	-
	MDL/Units	Water	Water	Water	-
Metals					
Arsenic	0.001 mg/L	<0.001	<0.001	<0.001	-
Cadmium	0.0001 mg/L	<0.0001	<0.0001	<0.0001	-
Chromium	0.001 mg/L	<0.001	<0.001	<0.001	-
Cobalt	0.0005 mg/L	<0.0005	<0.0005	<0.0005	-
Copper	0.0005 mg/L	<0.0005	<0.0005	<0.0005	-
Lead	0.0001 mg/L	<0.0001	<0.0001	<0.0001	-
Nickel	0.001 mg/L	<0.001	<0.001	<0.001	-
Zinc	0.005 mg/L	0.011	0.013	0.014	-
Hydrocarbons					
F1 PHCs (C6-C10)	0.025 mg/L	<0.025	<0.025	<0.025	-
F2 PHCs (C10-C16)	0.1 mg/L	<0.1	<0.1	<0.1 [1]	-
F3 PHCs (C16-C34)	0.1 mg/L	<0.1	<0.1	<0.1 [1]	-
F4 PHCs (C34-C50)	0.1 mg/L	<0.1	<0.1	<0.1 [1]	-

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	0.1	mg/L						
F3 PHCs (C16-C34)	ND	0.1	mg/L						
F4 PHCs (C34-C50)	ND	0.1	mg/L						
Metals									
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						

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									
Arsenic	ND	0.001	mg/L	ND			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	0.00509	0.0005	mg/L	ND			0.0	20	
Lead	0.00018	0.0001	mg/L	ND			0.0	20	
Nickel	0.0010	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)	1.71	0.025	mg/L		85.4	68-117			
F2 PHCs (C10-C16)	2.0	0.1	mg/L		108	60-140			
F3 PHCs (C16-C34)	3.4	0.1	mg/L		92.7	60-140			
F4 PHCs (C34-C50)	2.6	0.1	mg/L		104	60-140			
Metals									
Arsenic	50.0		ug/L	0.02	99.9	80-120			
Cadmium	47.9		ug/L	0.0002	95.7	80-120			
Chromium	48.6		ug/L	0.008	97.2	80-120			
Cobalt	47.6		ug/L	0.02	95.1	80-120			
Copper	49.3		ug/L	ND	98.6	80-120			
Lead	46.6		ug/L	0.04	93.1	80-120			
Nickel	47.7		ug/L	ND	95.4	80-120			
Zinc	69		ug/L	14	111	80-120			

Qualifier Notes:

Login Qualifiers :

Sample - One or more parameter received past hold time - CCME F1-F4

Applies to samples: C-5 Trip

Sample - Filtered and preserved by Paracel upon receipt at the laboratory - Metals

Applies to samples: MW 05, MW 06, MW 08, MW 09, MW 11, MW 12, Field , MW 908, C-5 Shovel R, C-5 Probe R, C-5 Trip

Sample Qualifiers :

1 : Holding time had been exceeded upon receipt of the sample at the laboratory.

Sample Data Revisions

None

Work Order Revisions / Comments:

Hold time based on preparation date for this QA sample (Trip Blank and/or Trip Spike) and the associated analytical requirements. Hold time exceedances do not preclude the validity of the Trip Blank /Spike data.

Revision 1 Please note the metals concentration reported are dissolved metals concentrations.

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.

Paracel ID: 1733535

PARACEL LABORATORIES LTD. | TRUSTED . RESPONSIVE . RELIABLE .

Chain of Custody (Lab Use Only) № 111083

Page 1 of 1

CAM-5 Water

Client Name: Golder Associates	Project Reference: DEW Line CAM-5	Turnaround Time:	
Contact Name: Alyssa Trike	Quote #	☐ 1 Day	☐ 3 Day
Address: 1931 Robertson	PO #	☐ 2 Day	☑ Regular
Telephone: 613 592 9600	Email Address:	Date Required:	

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)

Required Analyses ~~Q15-306 Mod~~ 16-010

Paracel Order Number: 1733535

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Date	Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)
1	MW 05	GW		4	Aug 11								
2	MW 06	GW			Aug 11								
3	MW 08	GW			Aug 11								
4	MW 09	GW			Aug 11								
5	MW 11	GW			Aug 11								
6	MW 12	GW			Aug 11								
7	Field Blank	W			Aug 14								
8	MW 908	GW			Aug 11								
9	C-5 Shovel R	W			Aug 12								
10	C-5 Probe R	W			Aug 11								

Comments: 11 C5 Trip Blank W ~~Aug~~ 16 JUL 13, 2017.
proceed regardless w/ expired Blank. DM

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: A. Dedouse	Received at Lab: Sumepurn Dokmai	Verified By:
Relinquished By (Print):	Date/Time: 18/08/17 2:50	Date/Time: AUG 18, 2017 09:20	Date/Time: 08/18/17 5:00
Date/Time:	Temperature: ___ °C PM.	Temperature: 19.0 °C	pH Verified [ ] By:

Chain of Custody (Env) - Rev 0.7 Feb. 2016

APPENDIX D

Photograph Log

Visual Inspection Photographs
Thermistor Photographs
Monitoring Well Photographs
Soil Sampling Photographs

PHOTOS

Photo 1: Lower Site Landfill South- Cover surface, facing northwest (CAM5_Photo192.jpg)

Photo 2: Lower Site Landfill South- Cover surface, facing northeast (CAM5_Photo194.jpg)

Photo 3: Lower Site Landfill South- Cover surface, facing northwest (CAM5_Photo195.jpg)

Photo 4: Lower Site Landfill South- Cover surface, facing northwest (CAM5_Photo197.jpg)

Photo 5: Lower Site Landfill South- Cover surface, facing southeast (CAM5_Photo202.jpg)

Photo 6: Lower Site Landfill South- Cover surface, facing south (CAM5_Photo204.jpg)

Photo 7: *Lower Site Landfill South- Cover surface, facing southeast (CAM5_Photo208.jpg)*

Photo 8: *Lower Site Landfill South- Cover surface, facing west (CAM5_Photo209.jpg)*

Photo 9: *Lower Site Landfill South- East crest, facing south (CAM5_Photo199.jpg)*

Photo 10: *Lower Site Landfill South- East slope (north end of Feature W2-wet area), facing southeast (CAM5_Photo201.jpg)*

Photo 11: *Lower Site Landfill South- northwest slope, facing northeast (CAM5_Photo190.jpg)*

Photo 12: *Lower Site Landfill South- North slope, facing east (CAM5_Photo205.jpg)*

Photo 13: Lower Site Landfill South- Northwest slope (Feature S), facing southeast (CAM5_Photo206.jpg)

Photo 14: Lower Site Landfill South- Northwest slope, facing southwest (CAM5_Photo207.jpg)

Photo 15: *Lower Site Landfill South- East slope, facing northwest (CAM5_Photo200.jpg)*

Photo 16: *Lower Site Landfill South- Northeast slope, facing northwest (CAM5_Photo203.jpg)*

Photo 17: Lower Site Landfill South- South crest and slope, facing southwest (CAM5_Photo196.jpg)

Photo 18: Lower Site Landfill South- South toe, facing northeast (CAM5_Photo193.jpg)

Photo 19: Lower Site Landfill South- Southeast slope, facing southwest (CAM5_Photo198.jpg)

Photo 20: Lower Site Landfill South- West crest, facing southeast (CAM5_Photo191.jpg)

Photo 21: Lower Site Landfill South- West slope, Feature A4-Minor self-armouring erosion, facing southwest (Acceptable) (CAM5_Photo56.jpg)

Photo 22: Lower Site Landfill South- West slope, Feature A3-Minor self-armouring erosion, facing southwest (Acceptable) (CAM5_Photo55.jpg)

Photo 23: Lower Site Landfill South- West slope, Feature A2-Minor self-armouring erosion, facing southeast (Acceptable) (CAM5_Photo54.jpg)

Photo 24: Lower Site Landfill South- West slope, Feature A5-Minor self-armouring erosion, facing southwest (Acceptable) (CAM5_Photo59.jpg)

Photo 25: Lower Site Landfill South- West slope, Feature A1-Minor self-armouring erosion, facing southeast (Acceptable) (CAM5_Photo52.jpg)

Photo 26: Lower Site Landfill South- Southwest crest, Feature D-Linear depression, facing northwest (Acceptable) (CAM5_Photo66.jpg)

Photo 27: Lower Site Landfill South- Cover surface east corner, Feature E-Two small minor settlement areas, facing northwest (Acceptable) (CAM5_Photo70.jpg)

Photo 28: Lower Site Landfill South- Toe of east slope, Feature F1-Previously observed crack on slope above toe (arrow), Feature W2-Wet area on slope (circle), facing northwest (Acceptable) (CAM5_Photo81.jpg)

Photo 29: *Lower Site Landfill South- East toe, Feature G-Intermittent ponded water (arrows) along toe with less iron staining, Feature W2-Wet area on slope (elipse), facing northwest (Acceptable) (CAM5_Photo80.jpg)*

Photo 30: *Lower Site Landfill South- East toe, Feature G-Previously reported as seepage with iron staining, intermittent ponded water with less staining in 2017, facing northwest (Acceptable) (CAM5_Photo83.jpg)*

Photo 31: *Lower Site Landfill South- East toe, Feature G-Ponded water, facing southeast (Acceptable) (CAM5_Photo87.jpg)*

Photo 32: *Lower Site Landfill South- Northwest slope, Feature H-Major erosion gulley, facing northwest (Acceptable) (CAM5_Photo90.jpg)*

Photo 33: *Lower Site Landfill South- Northwest slope, Feature I-Minor self-armouring erosion, facing northwest (Acceptable) (CAM5_Photo93.jpg)*

Photo 34: *Lower Site Landfill South- Northwest slope, Feature J-Minor erosion channel, facing northwest (Acceptable) (CAM5_Photo91.jpg)*

Photo 35: Lower Site Landfill South- Cover surface, Feature L-Small hydrocarbon stain, facing northeast (Acceptable) (CAM5_Photo72.jpg)

Photo 36: Lower Site Landfill South- Cover surface, Feature L-Small hydrocarbon stain (Acceptable) (CAM5_Photo71.jpg)

Photo 37: *Lower Site Landfill South- East crest, Feature M-Minor settlement depressions, facing northeast (Acceptable) (CAM5_Photo77.jpg)*

Photo 38: *Lower Site Landfill South- East crest, Feature M-Minor settlement, facing northeast (Acceptable) (CAM5_Photo78.jpg)*

Photo 39: *Lower Site Landfill South- East slope, Feature N-Minor erosion channel, facing northeast (Acceptable) (CAM5_Photo79.jpg)*

Photo 40: *Lower Site Landfill South- East slope, Feature N-Minor self-armouring erosion, facing northeast (Acceptable) (CAM5_Photo89.jpg)*

Photo 41: Lower Site Landfill South- East slope, Feature N-Minor self-armouring erosion, facing northeast (Acceptable) (CAM5_Photo85.jpg)

Photo 42: Lower Site Landfill South- Northwest toe, Feature O-Ponded water at toe, facing west (Acceptable) (CAM5_Photo94.jpg)

Photo 43: *Lower Site Landfill South- Cover surface, Feature P-Minor settlement and erosion, facing northwest (Acceptable) (CAM5_Photo67.jpg)*

Photo 44: *Lower Site Landfill South- Southwest toe, Feature Q1-Ponded water along toe, facing southeast (Acceptable) (CAM5_Photo58.jpg)*

Photo 45: Lower Site Landfill South- Southwest toe, Feature Q1-Ponded water along toe, facing northwest (Acceptable) (CAM5_Photo57.jpg)

Photo 46: Lower Site Landfill South- Southwest toe, Feature Q1-Ponded water along toe, facing south (Acceptable) (CAM5_Photo60.jpg)

Photo 47: Lower Site Landfill South- Southwest toe, Feature Q1-Ponded water along toe, facing northwest (Acceptable) (CAM5_Photo61.jpg)

Photo 48: Lower Site Landfill South- Southwest toe, Feature Q2-Running water along the toe, facing southeast (Acceptable) (CAM5_Photo53.jpg)

Photo 49: *Lower Site Landfill South- South slope, Feature R-Minor settlement, facing east (Acceptable) (CAM5_Photo64.jpg)*

Photo 50: *Lower Site Landfill South- cover surface near south slope, Feature V2-Minor erosion channels, facing southwest (Acceptable) (CAM5_Photo62.jpg)*

Photo 51: Lower Site Landfill South- East crest, Feature T-Small hydrocarbon stain, facing northeast (Acceptable) (CAM5_Photo74.jpg)

Photo 52: Lower Site Landfill South- South slope, Feature V1-Minor erosion channels, facing southeast (Acceptable) (CAM5_Photo65.jpg)

Photo 53: *Lower Site Landfill South- East slope, Feature W1-Wet area on slope, facing southeast (Acceptable) (CAM5_Photo88.jpg)*

Photo 54: *Lower Site Landfill South- East slope, Feature X-Minor self-armouring erosion, facing northeast (Acceptable) (CAM5_Photo73.jpg)*

Photo 55: *Lower Site Landfill South- Northwest crest and slope, Feature S-Crack and erosion channel, facing northwest (Acceptable) (CAM5_Photo75.jpg)*

Photo 56: *Lower Site Landfill South- East slope near crest, Feature Y-Crack on slope near crest, facing northwest (Acceptable) (CAM5_Photo86.jpg)*

Photo 57: *Lower Site Landfill South- West slope, Feature V3- Minor self-armouring erosion with new infilled cracking, facing southeast (Acceptable) (CAM5_Photo63.jpg)*

Photo 58: *Lower Site Landfill South- Cover surface, Feature Z-Two small settlement areas, facing east (Acceptable) (CAM5_Photo68.jpg)*

Photo 59: *Lower Site Landfill South- Southeast slope, Feature AA -Self armouring erosion, facing southeast (Acceptable) (CAM5_Photo69.jpg)*

Photo 60: *Lower Site Landfill South- Cover surface, Feature J -Self armouring erosion along northeast crest, facing northwest (CAM5_Photo76.jpg)*

Photo 61: Lower Site Landfill South- East slope, Feature F2 -New small minor tension crack, facing northwest (Acceptable) (CAM5_Photo82.jpg)

Photo 62: Lower Site Landfill South- East slope, Feature F1 – Previously observed crack above toe, facing northwest (CAM5_Photo84.jpg)

Photo 63: Lower Site Landfill South- Northwest slope, Feature AB–Minor self-armouring erosion, facing north (Acceptable) (CAM5_Photo92.jpg)

Photo 64: Lower Site Landfill South- Soil Sample C5-1-Before Excavation (CAM5_Photo126.jpg)

Photo 65: Lower Site Landfill South- Soil Sample C5-1-After Excavation (CAM5_Photo127.jpg)

Photo 66: Lower Site Landfill South- Soil Sample C5-1-After Backfilling (CAM5_Photo128.jpg)

Photo 67: *Lower Site Landfill South- Soil Sample C5-2-Before Excavation (CAM5_Photo123.jpg)*

Photo 68: *Lower Site Landfill South- Soil Sample C5-2-After Excavation (CAM5_Photo124.jpg)*

Photo 69: Lower Site Landfill South- Soil Sample C5-2-After Backfilling (CAM5_Photo125.jpg)

Photo 70: Lower Site Landfill South- Soil Sample C5-3-Before Excavation (CAM5_Photo135.jpg)

Photo 71: Lower Site Landfill South- Soil Sample C5-3-After Excavation (CAM5_Photo136.jpg)

Photo 72: Lower Site Landfill South- Soil Sample C5-3-After Backfilling (CAM5_Photo137.jpg)

Photo 73: Lower Site Landfill South- Soil Sample C5-4-Before Excavation (CAM5_Photo132.jpg)

Photo 74: Lower Site Landfill South- Soil Sample C5-4-After Excavation (CAM5_Photo133.jpg)

Photo 75: Lower Site Landfill South- Soil Sample C5-4-After Backfilling (CAM5_Photo134.jpg)

Photo 76: Lower Site Landfill South- Soil Sample C5-5-Before Excavation (CAM5_Photo129.jpg)

Photo 77: Lower Site Landfill South- Soil Sample C5-5-After Excavation (CAM5_Photo130.jpg)

Photo 78: Lower Site Landfill South- Soil Sample C5-5-After Backfilling (CAM5_Photo131.jpg)

Photo 79: Non-Haz Waste Landfill- Cover surface, facing west (CAM5_Photo167.jpg)

Photo 80: Non-Haz Waste Landfill- Cover surface, facing west (CAM5_Photo168.jpg)

Photo 81: Non-Haz Waste Landfill- Cover surface, facing southeast (CAM5_Photo170.jpg)

Photo 82: Non-Haz Waste Landfill- Cover surface, facing northeast (CAM5_Photo173.jpg)

Photo 83: Non-Haz Waste Landfill- Cover surface, facing northeast (CAM5_Photo174.jpg)

Photo 84: Non-Haz Waste Landfill- Cover surface, facing southwest (CAM5_Photo175.jpg)

Photo 85: Non-Haz Waste Landfill- East crest and slope, facing northwest (CAM5_Photo165.jpg)

Photo 86: Non-Haz Waste Landfill- North crest and slope, facing southwest (CAM5_Photo169.jpg)

Photo 87: Non-Haz Waste Landfill- South crest and slope, facing southwest (CAM5_Photo166.jpg)

Photo 88: Non-Haz Waste Landfill- South toe, facing northeast (CAM5_Photo176.jpg)

Photo 89: Non-Haz Waste Landfill- West crest, facing southeast (CAM5_Photo171.jpg)

Photo 90: Non-Haz Waste Landfill- West slope and toe (Ephemeral stream along toe – Feature J), facing southeast (CAM5_Photo172.jpg)

Photo 91: Non-Hazardous Waste Landfill- North slope, Feature B-Self-armouring erosion, facing southwest (Acceptable) (CAM5_Photo24.jpg)

Photo 92: Non-Hazardous Waste Landfill- North slope, Feature B-Self-armouring erosion, facing northwest (Acceptable) (CAM5_Photo25.jpg)

Photo 93: *Non-Hazardous Waste Landfill- South crest surface, Feature D-Minor settlement with ponded water, facing east (Acceptable) (CAM5_Photo33.jpg)*

Photo 94: *Non-Hazardous Waste Landfill- South toe, Feature E-Running water along toe, facing southwest (Acceptable) (CAM5_Photo12.jpg)*

Photo 95: *Non-Hazardous Waste Landfill- northeast corner crest, Feature F-Small hydrocarbon stain, facing north (Acceptable) (CAM5_Photo31.jpg)*

Photo 96: *Non-Hazardous Waste Landfill- Southwest corner along crest, Feature G-Minor linear settlement near crest, facing southeast (Acceptable) (CAM5_Photo28.jpg)*

Photo 97: Non-Hazardous Waste Landfill- South slope, Feature H-Self-armouring erosion, facing southeast (Acceptable) (CAM5_Photo32.jpg)

Photo 98: Non-Hazardous Waste Landfill- South slope, Feature A-Self-armouring erosion, facing southwest (Acceptable) (CAM5_Photo15.jpg)

Photo 99: Non-Hazardous Waste Landfill- South slope, Feature I-Self-armouring erosion, facing southeast (Acceptable) (CAM5_Photo34.jpg)

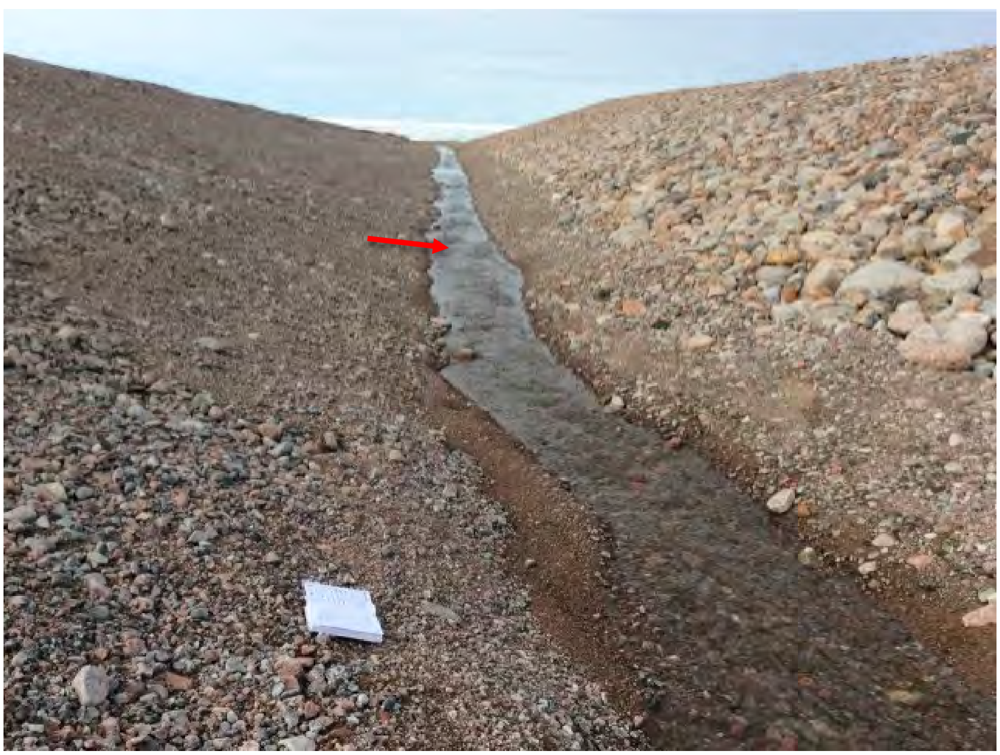

Photo 100: Non-Hazardous Waste Landfill- West toe, Feature J- Ephemeral stream along toe, facing northwest (Acceptable) (CAM5_Photo36.jpg)

Photo 101: *Non-Hazardous Waste Landfill- South toe, Feature E-Ponded/Running water along toe, facing east (Acceptable) (CAM5_Photo35.jpg)*

Photo 102: *Non-Hazardous Waste Landfill- North slope, Feature K-Self-armouring erosion, facing northwest (Acceptable) (CAM5_Photo27.jpg)*

Photo 103: Non-Hazardous Waste Landfill- North slope, Feature K-Self-armouring erosion, facing northwest (Acceptable) (CAM5_Photo26.jpg)

Photo 104: Non-Hazardous Waste Landfill- East slope, Feature L-Self-armouring erosion, facing northeast (Acceptable) (CAM5_Photo20.jpg)

Photo 105: Non-Hazardous Waste Landfill- East slope, Feature L-Self-armouring erosion, facing northeast (Acceptable) (CAM5_Photo22.jpg)

Photo 106: Non-Hazardous Waste Landfill- East slope, Feature L-Self-armouring erosion, facing northeast (Acceptable) (CAM5_Photo21.jpg)

Photo 107: *Non-Hazardous Waste Landfill- East slope, Feature L-Self-armouring erosion, facing northeast (Acceptable) (CAM5_Photo19.jpg)*

Photo 108: *Non-Hazardous Waste Landfill- East slope, Feature L-Self-armouring erosion, facing northwest (Acceptable) (CAM5_Photo18.jpg)*

Photo 109: Non-Hazardous Waste Landfill- South slope, Feature M-Settlement, facing north (CAM5_Photo14.jpg)

Photo 110: Non-Hazardous Waste Landfill- East toe, Feature N- Ponded water, facing northwest (Acceptable) (CAM5_Photo11.jpg)

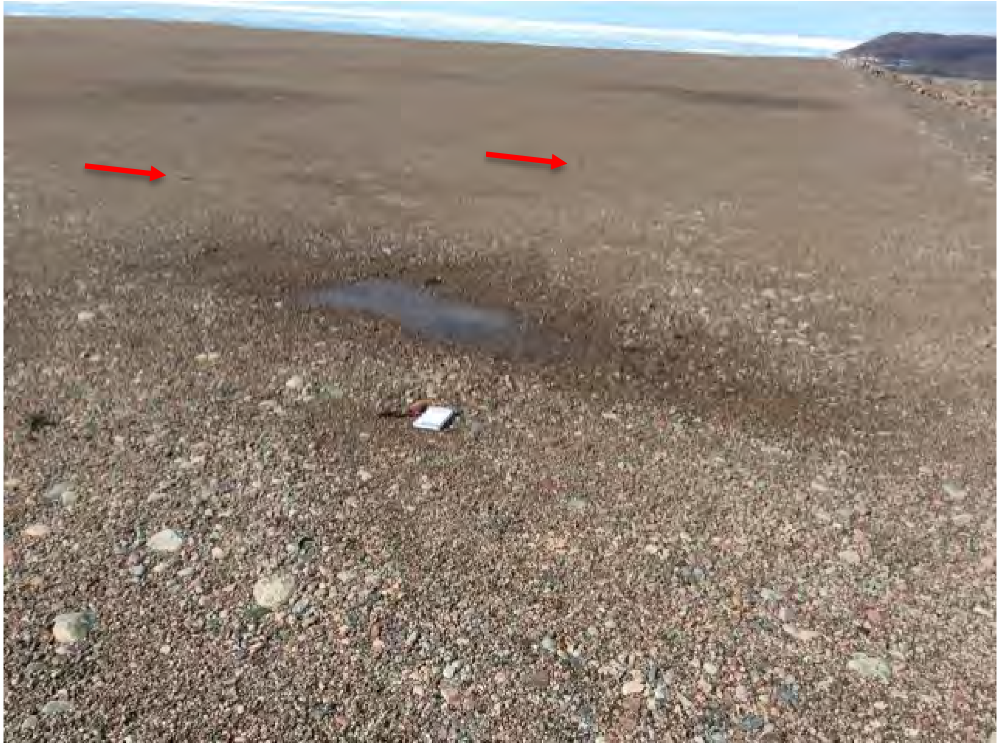

Photo 111: *Non-Hazardous Waste Landfill- Southeast corner, Feature O-Sparse vegetation, facing north (Acceptable) (CAM5_Photo13.jpg)*

Photo 112: *Non-Hazardous Waste Landfill- South east corner, Feature P-Ponded Water, facing east (Acceptable) (CAM5_Photo16.jpg)*

Photo 113: *Non-Hazardous Waste Landfill- Cover surface, Feature P-Pond water and wet area, facing north (Acceptable) (CAM5_Photo17.jpg)*

Photo 114: *Non-Hazardous Waste Landfill- North toe, Feature Q-Ponded water, facing southwest (Acceptable) (CAM5_Photo23.jpg)*

Photo 115: Non-Hazardous Waste Landfill- Cover surface, Feature P-Ponded water, facing east (Acceptable) (CAM5_Photo29.jpg)

Photo 116: Non-Hazardous Waste Landfill- Cover surface, Feature P -Ponded water, facing east (Acceptable) (CAM5_Photo30.jpg)

Photo 117: Non-Hazardous Waste Landfill- Soil Sample MW-09-Before Excavation (CAM5_Photo119.jpg)

Photo 118: Non-Hazardous Waste Landfill- Soil Sample MW-09-After Excavation (CAM5_Photo120.jpg)

Photo 119: Non-Hazardous Waste Landfill- Soil Sample MW-09-After Backfilling (CAM5_Photo121.jpg)

Photo 120: Non-Hazardous Waste Landfill- Water Sample MW-09 (CAM5_Photo122.jpg)

Photo 121: Non-Hazardous Waste Landfill- Soil Sample MW-11-Before Excavation (CAM5_Photo111.jpg)

Photo 122: Non-Hazardous Waste Landfill- Soil Sample MW-11-After Excavation (CAM5_Photo112.jpg)

Photo 123: Non-Hazardous Waste Landfill- Soil Sample MW-11-After Backfilling (CAM5_Photo113.jpg)

Photo 124: Non-Hazardous Waste Landfill- Water Sample MW-11 (CAM5_Photo114.jpg)

Photo 125: Non-Hazardous Waste Landfill- Soil Sample MW-12-Before Excavation (CAM5_Photo115.jpg)

Photo 126: Non-Hazardous Waste Landfill- Soil Sample MW-12-After Excavation (CAM5_Photo116.jpg)

Photo 127: Non-Hazardous Waste Landfill- Soil Sample MW-12-After Backfilling (CAM5_Photo117.jpg)

Photo 128: Non-Hazardous Waste Landfill- Water Sample MW-12 (CAM5_Photo118.jpg)

Photo 129: USAF & Asbestos Landfill- Cover surface, facing west (CAM5_Photo179.jpg)

Photo 130: USAF & Asbestos Landfill- Cover surface, facing northwest (CAM5_Photo180.jpg)

Photo 131: USAF & Asbestos Landfill- Cover surface, facing northeast (CAM5_Photo183.jpg)

Photo 132: USAF & Asbestos Landfill- Cover surface, facing southeast (CAM5_Photo184.jpg)

Photo 133: USAF & Asbestos Landfill- Cover surface, facing southeast (CAM5_Photo187.jpg)

Photo 134: USAF & Asbestos Landfill- Cover surface, facing southeast (CAM5_Photo188.jpg)

Photo 135: USAF & Asbestos Landfill- East crest, facing northwest (CAM5_Photo177.jpg)

Photo 136: USAF & Asbestos Landfill- East crest, facing southeast (CAM5_Photo185.jpg)

Photo 137: USAF & Asbestos Landfill- East crest, facing southeast (CAM5_Photo189.jpg)

Photo 138: USAF & Asbestos Landfill- North crest, facing northeast (CAM5_Photo186.jpg)

Photo 139: USAF & Asbestos Landfill- South crest, facing west (CAM5_Photo178.jpg)

Photo 140: USAF & Asbestos Landfill- South crest, facing east (CAM5_Photo182.jpg)

Photo 141: USAF & Asbestos Landfill- West crest, facing northwest (CAM5_Photo181.jpg)

Photo 142: USAF & Asbestos Landfill- Southeast crest surface, Feature A-Linear depression, facing southeast (Acceptable) (CAM5_Photo38.jpg)

Photo 143: USAF & Asbestos Landfill- South central crest, Feature B-Small hydrocarbon stain, facing northwest (Acceptable) (CAM5_Photo40.jpg)

Photo 144: USAF & Asbestos Landfill- West crest surface, Feature C-Minor settlement, facing northwest (Acceptable) (CAM5_Photo44.jpg)

Photo 145: USAF & Asbestos Landfill- Southeast crest surface, Feature E-Vehicle rutting with minor erosion, facing northwest (Acceptable) (CAM5_Photo37.jpg)

Photo 146: USAF & Asbestos Landfill- Northeast crest surface, Feature F-Bentonite or cement on surface, facing west (Acceptable) (CAM5_Photo50.jpg)

Photo 147: *USAF & Asbestos Landfill- North crest surface, Feature G-Rough area with minor settlement, facing northeast (Acceptable) (CAM5_Photo48.jpg)*

Photo 148: *USAF & Asbestos Landfill- Northwest slope, Feature I-Rough area with minor erosion, facing southwest (Acceptable) (CAM5_Photo51.jpg)*

Photo 149: *USAF & Asbestos Landfill- Southeast crest surface, Feature K-Linear depression, facing north (Acceptable) (CAM5_Photo39.jpg)*

Photo 150: *USAF & Asbestos Landfill- Northwest slope, Feature L-Minor erosion channel, facing east (Acceptable) (CAM5_Photo46.jpg)*

Photo 151: USAF & Asbestos Landfill- North slope, Feature M-Sparse vegetation, facing northeast (Acceptable) (CAM5_Photo47.jpg)

Photo 152: USAF & Asbestos Landfill- West crest, Feature M-Sparse vegetation, facing north (Acceptable) (CAM5_Photo42.jpg)

Photo 153: *USAF & Asbestos Landfill- Northeast crest surface, Feature N-Minor settlement, facing south (Acceptable) (CAM5_Photo49.jpg)*

Photo 154: *USAF & Asbestos Landfill- West toe, Feature O-Ponded water along toe, facing southeast (Acceptable) facing south (CAM5_Photo45.jpg)*

Photo 155: *USAF & Asbestos Landfill- West toe, Feature O-Ponded and running water, facing northwest (CAM5_Photo43.jpg)*

Photo 156: *USAF & Asbestos Landfill- West crest, Feature P -Self armouring erosion, facing southwest (CAM5_Photo41.jpg)*

Photo 157: USAF & Asbestos Landfill- Soil Sample C5-6-Before Excavation (CAM5_Photo138.jpg)

Photo 158: USAF & Asbestos Landfill- Soil Sample C5-6-After Excavation (CAM5_Photo139.jpg)

Photo 159: USAF & Asbestos Landfill- Soil Sample C5-6-After Backfilling (CAM5_Photo140.jpg)

Photo 160: USAF & Asbestos Landfill- Soil Sample C5-7-Before Excavation (CAM5_Photo141.jpg)

Photo 161: USAF & Asbestos Landfill- Soil Sample C5-7-After Excavation (CAM5_Photo142.jpg)

Photo 162: USAF & Asbestos Landfill- Soil Sample C5-7-After Backfilling (CAM5_Photo143.jpg)

Photo 163: USAF & Asbestos Landfill- Soil Sample C5-8-Before Excavation (CAM5_Photo144.jpg)

Photo 164: USAF & Asbestos Landfill- Soil Sample C5-8-After Excavation (CAM5_Photo145.jpg)

Photo 165: USAF & Asbestos Landfill- Soil Sample C5-8-After Backfilling (CAM5_Photo146.jpg)

Photo 166: Tier II Disposal Facility- Cover surface, facing southwest (CAM5_Photo150.jpg)

Photo 167: Tier II Disposal Facility- Cover surface, facing northeast (CAM5_Photo154.jpg)

Photo 168: Tier II Disposal Facility- Cover surface, facing northeast (CAM5_Photo157.jpg)

Photo 169: Tier II Disposal Facility- Northwest toe, facing northeast (CAM5_Photo159.jpg)

Photo 170: Tier II Disposal Facility- Northeast crest, facing southeast (CAM5_Photo160.jpg)

Photo 171: Tier II Disposal Facility- Northeast slope and toe, facing southeast (CAM5_Photo162.jpg)

Photo 172: Tier II Disposal Facility- Northwest slope and toe, facing southwest (CAM5_Photo161.jpg)

Photo 173: Tier II Disposal Facility- South east toe, facing northeast (CAM5_Photo153.jpg)

Photo 174: Tier II Disposal Facility- South west toe, facing northwest (CAM5_Photo152.jpg)

Photo 175: Tier II Disposal Facility- South west toe, facing southeast (CAM5_Photo158.jpg)

Photo 176: Tier II Disposal Facility- Southeast crest, facing northeast (CAM5_Photo156.jpg)

Photo 177: Tier II Disposal Facility- Southeast crest, facing southwest (CAM5_Photo163.jpg)

Photo 178: Tier II Disposal Facility- Southeast slope and toe, facing southwest (CAM5_Photo164.jpg)

Photo 179: Tier II Disposal Facility- Southwest crest, facing northwest (CAM5_Photo155.jpg)

Photo 180: Tier II Disposal Facility- VT1, facing northwest (CAM5_Photo148.jpg)

Photo 181: Tier II Disposal Facility- VT2, facing northwest (CAM5_Photo149.jpg)

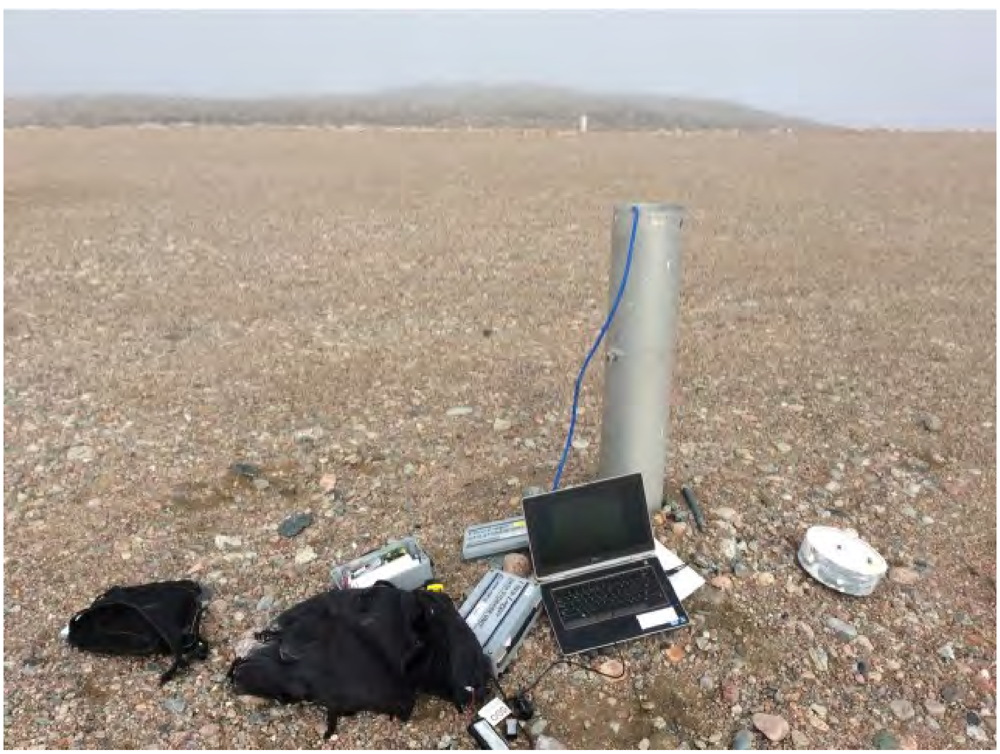

Photo 182: Tier II Disposal Facility- VT3, facing north (CAM5_Photo147.jpg)

Photo 183: *Tier II Disposal Facility- VT4, facing southeast (CAM5_Photo151.jpg)*

Photo 184: *Tier II Disposal Facility- Northeast crest surface, Feature A-Minor depressions, facing north (Acceptable) (CAM5_Photo10.jpg)*

Photo 185: Tier II Disposal Facility- Central crest surface, Feature C-Possible hydrocarbon stain, facing northeast (Acceptable) (CAM5_Photo8.jpg)

Photo 186: Tier II Disposal Facility- Cover surface, Feature D-Settlement, facing southeast (CAM5_Photo3.jpg)

Photo 187: Tier II Disposal Facility- Northeast crest surface, Feature E-Minor erosion channel, facing southwest (Acceptable) (CAM5_Photo9.jpg)

Photo 188: Tier II Disposal Facility- Cover surface, Feature E-Minor erosion channel, facing northeast (Acceptable) (CAM5_Photo6.jpg)

Photo 189: *Tier II Disposal Facility- Cover surface, Feature E-Minor erosion channel, facing northeast (Acceptable) (CAM5_Photo5.jpg)*

Photo 190: *Tier II Disposal Facility- Cover surface, Feature E-Minor erosion channel, facing northeast (Acceptable) (CAM5_Photo7.jpg)*

Photo 191: *Tier II Disposal Facility- Cover surface, Feature F-Minor erosion channel, facing southeast (Acceptable) (CAM5_Photo4.jpg)*

Photo 192: *Tier II Disposal Facility- West slope, Feature G-Sparse vegetation, facing northeast (Acceptable) (CAM5_Photo1.jpg)*

Photo 193: Tier II Disposal Facility- West toe corner, Feature H-Small ponded water, facing east (Acceptable) (CAM5_Photo2.jpg)

Photo 194: Tier II Disposal Facility- Soil Sample MW-05-Before Excavation (CAM5_Photo108.jpg)

Photo 195: Tier II Disposal Facility- Soil Sample MW-05-After Excavation (CAM5_Photo109.jpg)

Photo 196: Tier II Disposal Facility- Soil Sample MW-05-After Backfilling (CAM5_Photo110.jpg)

Photo 197: Tier II Disposal Facility- Water Sample MW-05 (CAM5_Photo107.jpg)

Photo 198: Tier II Disposal Facility- Soil Sample MW-06-Before Excavation (CAM5_Photo104.jpg)

Photo 199: Tier II Disposal Facility- Soil Sample MW-06-After Excavation (CAM5_Photo105.jpg)

Photo 200: Tier II Disposal Facility- Soil Sample MW-06-After Backfilling (CAM5_Photo106.jpg)

Photo 201: Tier II Disposal Facility- Water Sample MW-06 (CAM5_Photo103.jpg)

Photo 202: Tier II Disposal Facility- Soil Sample MW-07-Before Excavation (CAM5_Photo100.jpg)

Photo 203: Tier II Disposal Facility- Soil Sample MW-07-After Excavation (CAM5_Photo101.jpg)

Photo 204: Tier II Disposal Facility- Soil Sample MW-07-After Backfilling (CAM5_Photo102.jpg)

Photo 205: Tier II Disposal Facility- Water Sample MW-07 (CAM5_Photo99.jpg)

Photo 206: Tier II Disposal Facility- Soil Sample MW-08-Before Excavation (CAM5_Photo96.jpg)

Photo 207: Tier II Disposal Facility- Soil Sample MW-08-After Excavation (CAM5_Photo97.jpg)

Photo 208: Tier II Disposal Facility- Soil Sample MW-08-After Backfilling (CAM5_Photo98.jpg)

Photo 209: Tier II Disposal Facility- Water Sample MW-08 (CAM5_Photo95.jpg)

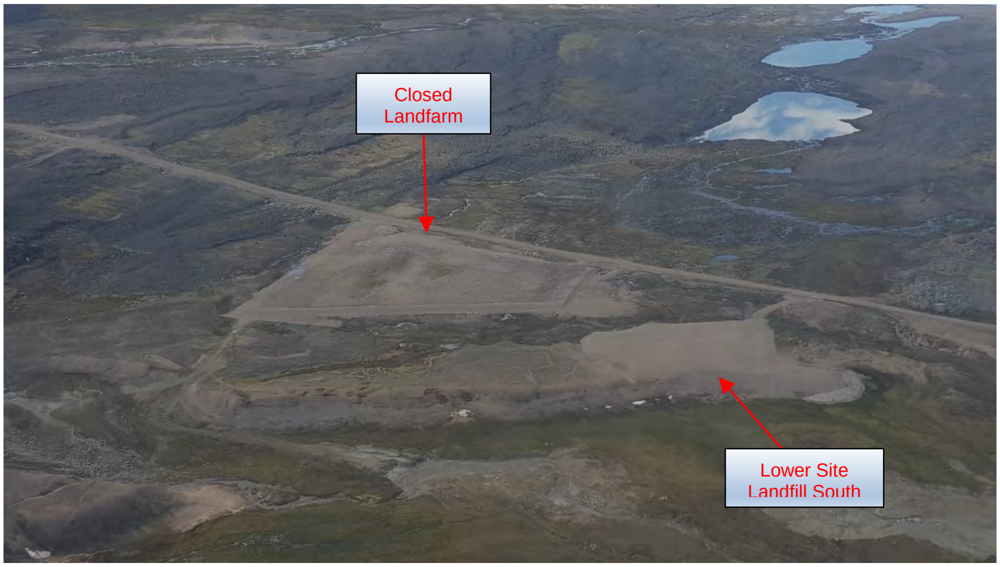

Photo 210: Aerial Photograph, Lower Site Landfill South (right foreground), Closed landfarm (middle ground) facing southwest (CAM-5 Lower Site Landfill South Aerial Photo.jpg)

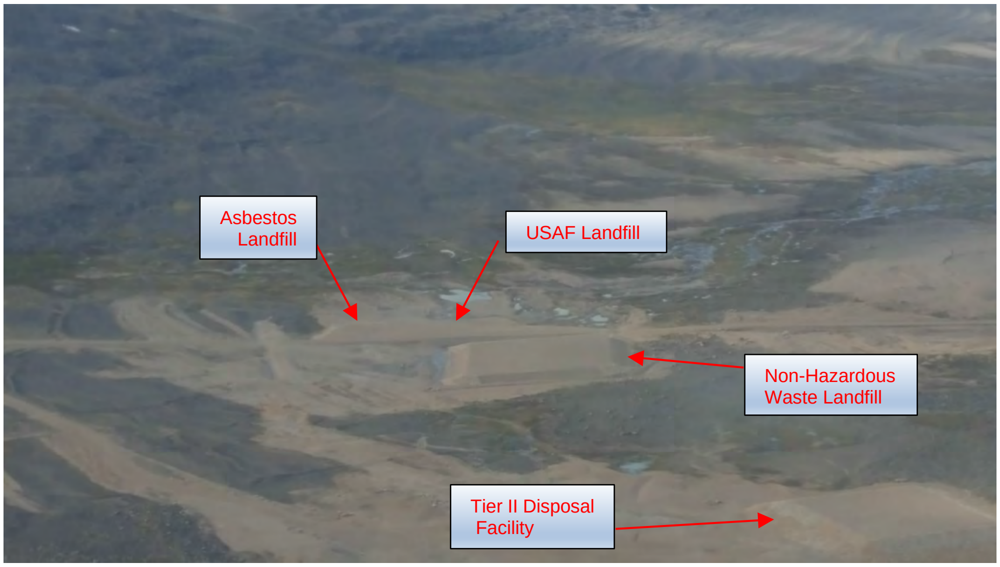

Photo 211: *Aerial Photograph, Tier II Disposal Facility (right foreground), Non-Hazardous Waste Landfill (middle ground), USAF and Asbestos Landfills (background) facing southwest (CAM-5 NHWL and Asbestos Landfill Aerial Photo.jpg)*

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