CAM-2, Gladman Point DEW Line Site Monitoring Plan – Addendum

1BR-GLA0815
Nunavut Water Board issued Water Use Licence
Pursuant to Condition Part K, Item 2

July 2015

Summary

The DEW Line Clean Up Project began with extensive site investigations; these investigations lead into the development of a risk based clean up approach. The information gathered from the site investigations fed into a risk matrix template mutually agreed upon by the multi-stakeholder group overseeing the development of this project. The scores assigned through the risk matrix led to the appropriate level of design attributed to facilities under evaluation. The purpose of this addendum is to expand upon the details considered to assess the risk potential of the West Landfill-North, West Landfill-South and the Station Landfill. The initial risk determination and the future risk potential are described in Section 1 of this document. This addendum will also document the monitoring completed for the Landfarm Facility including the criteria employed for contaminated soil and the location of remediated soil. Section 2 of this document provides the soil sampling results used to verify that the soil was remediated and requires no further remediation or monitoring.

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1.0 LANDFILL RISK POTENTIAL DETERMINATION

Pursuant to Part K, Item 2

1.1 Background

The preliminary assessment of the CAM-2 site was carried out by the Environmental Sciences Group (ESG) in 1992 (ESG 1994). In 2001 ESG conducted a detailed environmental investigation to delineate known and suspected areas of contamination, including those contaminated with hydrocarbons, as well as provide a more detailed assessment of the environmental status of existing landfill areas.

In conjunction with the environmental assessment, UMA Engineering Ltd. (UMA) carried out engineering site investigations in 1990 and 1993. The objectives of this investigation were to review and evaluate existing and proposed landfill areas from a geotechnical perspective, and complete demolition and debris inventories, as required to prepare Drawings and Specifications for the cleanup of the site.

In accordance with the DND/NTI agreement, technical and local representatives of the NTI inspected the CAM-2 site during the site investigations by ESG and UMA. The objective of this inspection was to confirm that the conclusions reached by ESG and UMA during the site investigations demonstrate an environmental standard that ensures long term preservation of the Arctic environment. A report, prepared by Vista Engineering in 2001, summarized the observations and conclusions of this inspection.

The documents, as listed below, were provided to the Environmental Working Group as reference material for the development of recommendations regarding the closure/remediation of existing landfill areas, and risk mitigation measures for hydrocarbon contaminated areas.

- CAM-Landfills and Debris Areas, Environmental Sciences Group, Royal Military College of Canada (February 2002).
- CAM-2 Contaminated Soils - Hydrocarbon Investigations, Environmental Sciences Group, Royal Military College of Canada (March 2002).
- DEW Line Site Gladman Point CAM-2, NTI Technical Representative Report to NTI, prepared by Sinnani Inc.(September 2001)
- Environmental Working Group Report (March 1998).
- Addendum to the Environmental Working Group Report (May 1999)

1.2 Environmental Risk Assessment Matrix

The DEW Line Clean-Up, Nunavut: Environmental Working Group (EWG) Report from November 2003 provides the agreed upon procedures for landfill risk evaluation matrix, post-construction landfill monitoring program, delineation protocol and confirmatory testing, hydrocarbon soils, and items for landfilling.

The assessment of potential risk has been quantified by utilizing the Environmental Risk Assessment Matrix. This matrix was develop and agreed upon by representatives of signatories of the Agreement between Nunavut Tunngavik Incorporated and The Department of National Defence for the Clean-Up and Restoration of DEW Line Sites within the Nunavut Settlement Area (Environmental Provisions). The matrix was based on the CCME National Classification System for Contaminated Sites, and adapted to address the particular concern of the Arctic environment. The matrix was divided into three categories of equal weight: contaminated source, pathways, and receptors. The interaction of these three elements results in environmental risk. Each category was assigned 50 points, which were distributed among several factors. Each factor of these factors was made as specific as possible in order to reduce the subjectivity of the matrix to a minimum. In addition, each of the three main categories was assigned a highly subjective "special considerations" factor according to the method described in the CCME Classification System. As it was unlikely that any classification system could address all possible factors, a special considerations factor allowed the user to increase or decrease the score ''to emphasize important concerns about a site and should be used as an exception rather than as a rule" (CCME 1992, p.6-7).

1.2.1 Matrix Factors

A. Contaminant Source

Five factors were considered under Contaminant Source to describe specific landfills, as follows:

- A.1 Landfill Extent
- A.2 Estimated Depth of Landfill
- A.3 Presence of Leachate
- A.4 Presence of Surface Contaminated Soil
- A.5 Presence of Surface Debris

The presence of contaminated soil was assigned the largest weighting in this category, as it is a strong indicator of potential contamination in the landfill; leachate scores slightly lower as it may not have been detected yet. The volume of a landfill is considered to be related to its potential to be contaminated – the greater the volume, the greater the risk that the landfill contains contaminants. The volume of the landfill is divided into two parameters, area and depth. The area is relatively easy to measure; the estimated depth of the landfill is given less weight in the matrix because it is difficult to measure using non-intrusive techniques.

Preliminary scores may be accorded to each landfill based on current information.
All landfills will be re-scored following the detailed field investigations that are scheduled to take place one or two years prior to actual construction. The objectives of these investigations are to delineate the extent of known contamination, and confirm existing site and landfill conditions. Specifically, additional evidence with respect to the presence or absence of leachate or contaminated soil at the landfill will be obtained.

A.1 Landfill Extent
The larger the area of the landfill, the greater the potential for contaminants to be present. The extent of landfill debris is based on the results of geotechnical/geophysical site surveys and visual observations. The value of 10 000 m2 is an area approaching the size of the largest landfills on the DEW Line; all other landfills are scored based on their areal extent relative to 10 000 m2. In cases where distinct lobes are present, the whole area encompassing the landfill will be scored rather than each lobe individually.

A.2 Estimated Depth
The estimated depth of a landfill is determined by visual inspection of surrounding topographic features. It is proposed that the average depth of the active layer be used as a qualifier for the description of landfill depth, as this is generally the maximum depth of investigation. The depth of the active layer may range from one to two meters at these sites, depending on material type; therefore an average depth of 1.5 meters was used in the rating. Landfills with estimated depths of greater than 1.5 meters were scored higher than those with estimated depths of less than 1.5 meters.

A.3 Presence of Leachate
Leachate is generated as the result of infiltration and percolation of surface water, or flow of active layer groundwater, through the landfill. Where leachable or mobile contaminants, are present in the landfill, contamination may be detected in seepage of water from the landfill, but concentrations may be so low as to be difficult to detect. The presence of leachate beyond the landfill perimeter can be better determined by the presence of contaminated soil at the toe of the landfill, indicating chronic low levels of contaminants leaching from the landfill. All types of contaminants in leachate (PCBs, (Polychlorinated Biphenyls) TPH (Total Petroleum Hydrocarbons) or inorganics) are considered to be of equal concern, as indicators of contamination within the landfill.

In the scoring, contaminated leachate beyond the landfill perimeter is considered to be either present or not; no interpolation of the score is used in this category.

A.4 Surface contaminated soil
Within each landfill, there is potentially a source of contamination. The presence of surface contaminated soil, like the presence of leachate, is an indication that the landfill contains

contamination. The volume of contaminated soil is not taken into consideration; this provides a conservative approach in that a small amount of contaminated soil can trigger a high score. The presence of Tier II soils will trigger the highest score (15). Based on the hypothesis that each landfill potentially contains contaminants, 5 points are given to this subsection, even if no surface contaminated soils were identified.

A.5 Presence of surface debris

At some landfills surface debris is very extensive, while at others there is almost no debris. Scoring needs to be quantitative; therefore the percentage of the surface area of the landfill that is covered with debris is used as the basis for scoring. A landfill that has surface debris covering more than 50% of its surface receives a full score.

B. Pathways

The primary transport mechanisms for contaminants from the DEW Line landfills are considered to be:

- aerial transport of fine particles; and
- water transport, both as surface water run-off or subsurface water flow.

B.1 Aerial Transport of Contaminants

All contaminants can be transported as particles; windblown debris is not considered in this category, as debris pickup is inherent in any cleanup. Surface contamination or surface expressions of leachate imply the potential for aerial transport.

This factor is given a low weight because the quantity of contaminated soil on the surface of a landfill is generally low relative to the quantity of contaminated soil at the site as a whole. In addition, it is anticipated that relative to the effect of water movement, aerial transport contributes less to the transport of contaminants away from a landfill.

B.2 Water Movement

Water movement includes the movement of surface water and subsurface water within the active layer. “Groundwater” is not addressed as an issue separate from surface water as the movement of water within the active layer is subject to the same driving forces as surface water. The intent of this sub-category is to examine factors that affect migration away from the landfill – slope, runoff, extent and type of cover on the landfill, annual precipitation and distance to surface water. Among these factors, topography, runoff potential and proximity to surface water are given the highest weight.

B.2.1 Topography

The degree of the slope on which the landfill is located is one of the major factors contributing to transport of contaminants; the scoring is carried out on a sliding scale. In cases where there are different slopes across the landfill, a weighted average is used.

B.2.2 Cover Material – Depth

The extent to which potential contaminants are available to transport is also dependent on the depth and type of cover material. The potential for leachate generation and correspondingly, leachate migration, is related to the infiltration of water into the landfill. Cover over the landfill helps mitigate infiltration of water into the landfill contents. As the thickness of the landfill cover increases, the likelihood that potential contaminants will be released from the landfill decreases. If the active layer is contained in the cover material above the debris, then the potential for surface water infiltration into the landfill is small; this circumstance is assigned the lowest score.

B.2.3 Cover Material – Type

The erosion potential of a landfill is partly based on the type of cover material.

Erosion can eventually lead to the exposure of the landfill contents. Some cover materials are more susceptible to erosion than others; well graded gravels are the least susceptible, and silty materials are the most susceptible. In cases where there is no cover, this factor is assigned the highest score. Where the cover materials consist of a combination of soil types, the scoring should reflect the more conservative or higher score.

B.2.4 Surface Water/Run-Off Potential

This factor aims to describe the destructive potential of water action on the landfill, which could take the form of waves; streams, rivers or lakes; or seasonal drainage. Where there is significant seasonal drainage, the run-off potential is high.

“Significant seasonal drainage” is defined as run-off that has the potential to transport large quantities and concentrations of contaminants to surface water courses over a short period of time (CCME 1992, p.23). Significant seasonal drainage also includes consideration of major snow drifting on a landfill.

B.2.5 Precipitation

The amount of precipitation received, either as rain or snowfall, affects the amount of surface water infiltration or run-off. The majority of the DEW Line sites receive less than 500 mm of precipitation annually, with the exception of Cape Dyer.

Typically, the amount of precipitation at any site is relatively low; therefore it is unlikely that any single precipitation event would cause significant runoff. This factor is therefore given a relatively low weight.

B.2.6 Distance to Downgradient Perennial Surface Water/Seasonal Drainage Channel

The distance to surface water will affect the probability of contaminants reaching the watercourse. This factor can include streams, seasonal or perennial, running directly through the landfill, or streams and lakes downgradient from the landfill, but it is intended to exclude

small ponds with no outflow. On very steep slopes this distance should consider the horizontal distance to the water body rather than the vertical drop.
The impact of drainage with respect to contaminant exposure is not considered in this category (it is considered under Receptors); this factor determines whether there is a drainage pathway from the landfill.

C. Receptors
This section addresses the potential for impact on receptors, specifically, aquatic and terrestrial habitats, as well as human exposure. Impact on humans is the primary consideration; however, it should be recognized that impact on humans is implicit in the scoring of factors addressing ecosystem impact. The scoring within each category is to be based on recorded data, as well as local knowledge of the land use in the area, and therefore requires local input.

C.1 Potential Impact on Receiving Freshwater/Marine Habitat
The water body should be selected based on the potential effects on the receiving habitat. In the selection of the receiving water body to be used in the landfill evaluation matrix, consideration must be given to the regional drainage patterns. For example, where the drainage from a landfill is overland (i.e. there is no direct connection between the landfill and the downgradient water body), water bodies beyond 2 kilometers should not be used in the evaluation. This is based on the premise that natural attenuation of any potential contamination will occur with overland flow. Where a direct connection between a landfill and a downgradient water body exists, via a stream or interconnected ponds, the two-kilometre limit should not be used.

C.1.1 Proximity to Receiving Freshwater/Marine Habitat
“Receiving habitat” is considered to be a significant body of water near the toe of the landfill where contaminants are likely to have an impact. The water body may support freshwater or marine life and/or may be used by avifauna and/or terrestrial mammals as a water source. It is not necessarily the seasonal drainage course or perennial water body closest to the landfill toe: This section’s objective is to select a habitat which support receptors rather than identify the closest body of water. It is assumed that only habitat downgradient from the landfill is to be considered (given that aerial transport of contaminants to habitat upgradient from the landfill will be addressed by the remediation of contaminated soil).

C.1.2 Estimated Habitat Usage – Freshwater/Marine
This section is scored based on the frequency of usage within the selected receiving water body: the level of biodiversity and the occurrence of calving/spawning should be considered in scoring. It is recognized that freshwater and/or marine wildlife is potentially more at risk compared with terrestrial wildlife or avifauna, which should only be exposed through water ingestion. Thus, when terrestrial wildlife or avifauna is the primary receptor, the score for this factor should fall into the moderate or low category based on the potential frequency of usage. Otherwise, when the selected water body sustains freshwater and/or marine wildlife, the level of biodiversity should be used to evaluate the score. It should be noted that the most

conservative approach - in the selection of the receiving water body - must be used when scores from section C.1.1 and C.1.2 are combined. Finally, "Biologically sensitive" areas such as bird sanctuaries and/or endangered, threatened or vulnerable populations should be considered as "special considerations".

C.2 Potential Impact on Receiving Terrestrial Habitat

C.2.1 Extent of Vegetation
Typically the area in which to consider vegetation would include an area 300 m downgradient from the toe of the landfill. The area within this distance is expected to be most susceptible to uptake of contaminants if they are leaching from the landfill, but a larger or smaller area could be considered if site specific conditions warrant it.

C.2.2 Estimated Habitat Usage – Terrestrial/Avifauna
The same criteria as for usage of aquatic habitat are to be applied.

C.3 Potential Human Exposure Through Land Use

C.3.1 Presence/Occupation
This factor addresses strictly dermal exposure and inhalation; consumption of food and water from the area is dealt with in subsequent factors. The risk of dermal exposure or inhalation is much lower when soil is frozen; therefore winter occupation of the site is assigned a low risk. "Summer" in this factor is intended to include the spring, summer and fall periods when the ground is not frozen. Within this factor, the scoring takes into account the likelihood and the duration of contact. Using this method, proximity to a community is considered (high likelihood of contact), although proximity to a community does not necessarily trigger a high score if visits are infrequent (low duration of contact).
The likelihood of contact considers proximity to community or to a camp, as well as proximity to "travel routes". The duration of contact considers full time residences (i.e. permanent community for high, summer camp for moderate, winter camp or travel routes as low). Scores may be interpolated between the allocated points, according to Table 1-1 below.

Table 1-1: Scoring Guide for Section C.3.1

	High Likelihood of Contact	Moderate Likelihood of Contact	Low Likelihood of Contact
High Duration of Contact	8	6	4
Moderate Duration of Contact	6	4	2
Low Duration of Contact	4	2	1

For large DEW Line sites, different parts of the site need to be considered individually, as some areas of the site could be quite far (more than a few kilometers) from the landfill under consideration.

C.3.2 Proximity to Drinking Water Source

Regardless of whether the source is seasonal or perennial, an established community or a summer camp water source located downgradient of the landfill is to be considered in this factor.

C.3.3 Food Consumption

Sedentary organisms are more susceptible to local inputs as their exposure is large if they are downgradient from the landfill. These organisms can include bottom-dwellers such as sculpins, mussels, sea urchins etc., as well as terrestrial vegetation, which can be used for medicinal purposes. This kind of contamination "is quite localized when considered on a broad regional scale" (DIAND 1997, pg. 5). Migratory marine animals may have body burdens of contaminants; these are not directly attributable to local contaminant sources, as the vast majority of organochlorines, for instance, arrive in the Arctic via long range transport. Caribou living in the general area of DEW Line sites do not have elevated levels of contaminants, since they feed over a very wide area. The Canadian Arctic Contaminant Assessment Report (DIAND, 1997) describes these results in more detail.

It is recognized, however, that sources such as DEW Line sites do contribute contaminants to the Arctic ecosystem. For the purpose of scoring the matrix, therefore, a high consumption of animals from the area surrounding the DEW Line sites has the potential to pose a higher risk than a low consumption, although in general the risk remains low.

This factor is divided into two sub-sections, and the score is the sum of the score for each of the two sub-sections.

1.2.2 Special Considerations

As indicated in the introduction to the matrix (section 1.1), each of the three main categories includes a "special considerations" factor. The proposed value of the special considerations factor is a maximum of ten percent of the overall score for each category.

It is intended that no circumstance will allow a user to assign a special considerations score that will cause the score for that category to exceed the maximum allotted. To avoid undue bias, it is also suggested that the user should complete the entire evaluation form and score a site before addressing special considerations in the total score.

The Environmental Working Group (EWG) based the landfill risk evaluation matrix on the CCME model, which defines three categories: contaminant source, pathways and receptors. Within those three categories, the EWG tried to address all of the possible factors contributing to risk. Recognizing that even a thorough matrix could never address all possible risk factors, special considerations were included to address specific risk factors, which are not general to all of the DEW Line sites.

As noted in the CCME document, the special considerations factor is not intended to be applied on a regular basis, as it addresses very site-specific risk factors. In fact, if the special consideration factor was being consistently applied in the scoring of landfills, it would indicate that the matrix itself was incomplete. Special considerations should be site-specific characteristics that can be documented.

1.2.3 Traditional Knowledge

The EWG developed the landfill risk evaluation matrix recognizing that local input would be relied upon in the scoring of landfills. In order to make this intention clear, the EWG has prepared a proposal outlining how it envisions traditional knowledge could be collected and incorporated into the scoring process.

1.2.4 Interpretation of Scores

The score obtained through the application of the matrix is intended to represent the potential risk posed by a given landfill in its current state. The objective of landfill remediation is to mitigate the risk associated with a landfill by preventing the migration of contaminants, which may be present in the landfill. Various engineering solutions are available to achieve these objectives.

Landfills scoring 105 points or more are classified as potentially high risk (Class A) and require excavation. The high score accorded to these landfills is generally a result of the ecological sensitivity of the area and the geometry and surrounding topography of the landfill, which precludes the development of a cost-effective and long-term design solution such as pathway intervention and/or stabilization of the landfill. Landfills with a score of 100-104 points must be considered on a case by case basis – some may require complete excavation while others may be considered Class B landfills.

Landfills with a score in the range 75 to 99 points are classified as moderate potential environmental risk (Class B). An engineered leachate containment system will be provided for these landfills to mitigate against potential environmental risks. In specific cases where an engineered leachate containment system cannot be constructed, an evaluation of excavation will be carried out with the objective of determining whether complete excavation or partial excavation with a leachate containment system is required.

Landfills with scores of 75 or less are classified as low potential environmental risk (Class C). In general, the remediation approach for these landfills includes placement of an engineered cover, following collection, sorting, and appropriate disposal of debris from the surface, and excavation and disposal of any surface contaminated soils from the area. Some of the factors to be considered in the design of the cover include: thickness and type of the existing cover materials; slopes on the landfill; surrounding topography and available granular fills. The cover

is designed to promote surface water run-off (i.e. no areas of standing water), prevent erosion, and mitigate against settlement. Where required, the slope of the landfill may be modified and/or geotextiles may be incorporated into the granular cover to provide a long-term solution. Generally, the final thickness of cover material is approximately 0.75 metres, and may be greater dependent on site specific conditions. The granular cover material is to be placed in layers and compacted before the placement of the next layer of granular fill, until the design thickness is reached.

Overall, it is to be stressed that the matrix is to be used in the assessment of potential environmental risks associated with a specific landfill. It is not intended to be used as the sole criterion in determining the remediation solution for a landfill. The results of the matrix, both total score and the score from each major category, are to be considered in conjunction with the engineering evaluation of site conditions, to determine appropriate design solutions. Review of the individual category scores relative to the total score will highlight particular areas of concern that are to be addressed during the design process.

It should be emphasized that the total score has an error associated with it of approximately 5 points; there is inevitable subjectivity in the scoring process and scores that fall near decision points should be considered on a case by case basis.

WEST LANDFILL NORTH

A. Contaminant Source

- The West Landfill North consists of 6 lobes. The sum total area for the various lobes is 5522 m2, however the area encompassing all the lobes is approximately 12,500 m2.
- Partially buried debris can be seen in a number of locations, but total debris <10%.

B. Pathways/Transport Mechanisms

- Both surface and subsurface transport of contaminants possible.
- Landfill covered with gravel/sandy material.
- Slope <25%.
- Precipitation 118 mm annually. The landfill drains overland along local drainage channels. Closest water body is hundreds of metres away.

C. Receptors

- Closest receiving aquatic environment hundreds of metres in the distance.
- Approximately 80% vegetation cover present in undisturbed areas immediately downgradient of the landfill. Native tundra surrounds the landfill downgradient.
- Habitat usage is high with evidence of grazing, lemmings (burrows), sitings of migratory birds, and evidence of nesting (suspect snow buntings, lapland longspur).
- The closest community is Gjoa Haven, 80 km to the east. The residents use the CAM-2 site as a stop over en route to their preferred hunting and fishing grounds. Rangers also stop occasionally to check the SRR site.
- No official drinking water sources are in the vicinity.

WEST LANDFILL SOUTH

A. Contaminant Source

- The West Landfill South consists of 2 lobes. The sum total of the lobe areas is 2923 m2, however the area encompassed by the two lobes is approximately 5385 m.
- Minor surface debris seen in lobe J, no visible debris in lobe K.

B. Pathways/Transport Mechanisms

- Surface contamination has been identified, therefore potential for aerial transport is provided in evaluation.
- Slope 25%.
- Landfill covered with gravel/sandy material.
- Precipitation 118 mm annually.
- The landfill drains overland. Closest water body is hundreds of metres away.

C. Receptors

- Closest receiving aquatic environment hundreds of metres in the distance.
- Approximately 80% vegetation cover present in undisturbed areas near the landfill.
- Native tundra surrounds the landfill downgradient.
- Habitat usage is high with evidence of grazing, lemmings (burrows), sitings of migratory birds, and evidence of nesting birds (suspect snow buntings, lapland longspur).
- The closest community is Gjoa Haven, 80 km to the east. The residents use the CAM-2 site as a stop over en route to their preferred hunting and fishing grounds. Rangers also stop occasionally to check the SRR site.
- No official drinking water sources are in the vicinity.

STATION LANDFILL

A. Contaminant Source

- The Station Landfill consists of two lobes. The sum total of these areas is 3419 m2, however the total area encompassing these lobes is approximately 7000 m .
- One elevated result in upgradient samples (4.8 ppm As at 01-1574) and one elevated result in downgradient samples (9.1 ppm Cu at 01-1746).
- No surface contamination identified.
- Lobe O: misc. scattered loose debris visible in the area (wood pieces, steel bars, rebar), partially buried barrels visible at the centre of the lobe.
- Lobe P: large pieces of metal debris protrude from the fill.
- Total debris <10%.

B. Pathways/Transport Mechanisms

- No leachate identified.
- Slope is relatively steep along the landfill (>25%).
- Majority of the landfill covered with gravel and sandy material.
- Piles of sand were common, likely remnants of the old beach ridge or added fill.
- Precipitation 118 mm annually.
- The landfill drains overland. Small ponds approx. 100-200 m downgradient.

C. Receptors

- Receiving aquatic environment are small ponds. Likely vegetated but not supporting fish.
- Approximately 80% vegetation cover present in undisturbed areas immediately downgradient of the landfill.
- Habitat usage is high with evidence of grazing, lemmings (burrows), sightings of migratory birds (snow geese), evidence of nesting birds (suspect snow buntings, lapland longspur).
- The closest community is Gjoa Haven, 80 km to the east. The residents use the CAM-2 site as a stop over en route to their preferred hunting and fishing grounds.
- Rangers also stop occasionally to check the SRR site.
- No official drinking water sources are in the vicinity.

	PROPOSED ENVIRONMENTAL RISK EVALUATION MATRIX LANDFILLS IN THE NUNAVUT REGION			CAM-2 West Landfill - North	CAM-2 West-Landfill South	CAM-2 Station Landfill
A.	**CONTAMINANT SOURCE**		**Maximum Score**			
A.1	**LANDFILL EXTENT**		**10**	6	3	4
	>10,000 m2	10				
	For areas less than 10,000 = Area of Landfill X 10 / 10 000	2-9				
	Minimum Score	1				
A.2	**ESTIMATED DEPTH OF LANDFILL**		**5**	5	5	5
	greater than 1.5 m	5				
	less than 1.5 m	2-4				
A.3	**PRESENCE OF LEACHATE**		**10**	10	10	0
	Evidence of Leachate	10				
	No Evidence of Leachate	0				
A.4	**PRESENCE OF SURFACE CONTAMINATED SOIL**		**15**	10	5	5
	> DCC Tier II Stains	15				
	> DCC Tier I < DCC Tier II, Stains	10				
	Contaminated suspected, no surface contamination noted	5				
A.5	**PRESENCE OF SURFACE DEBRIS AT LANDFILL**		**10**	2	2	4
	>50% of surface area	10				
	<50% of surface area, pro-rated	1-9				
	No debris observed	0				
	SPECIAL CONSIDERATIONS					
		+/- 5				
	TOTAL SCORE - CONTAMINANT SOURCE		***50***	***33***	***25***	***18***

PROPOSED ENVIRONMENTAL RISK EVALUATION MATRIX LANDFILLS IN THE NUNAVUT REGION				CAM-2 West Landfill - North	CAM-2 West-Landfill South	CAM-2 Station Landfill
B.	**PATHWAY/TRANSPORT MECHANISMS**		**Maximum Score**			
B.1	**AERIAL TRANSPORT OF CONTAMINANTS**					
	All Landfills Scored as 2		**2**	2	0	0
B.2	**WATER MOVEMENT**					
B.2.1	**TOPOGRAPHY**					
	Steeply Slope (>40 % Grade)	12				
	Sloping (10% to 40% Grade)	4-11	**12**	6	6	11
	Subdued to 10% Slope	2-3				
	Flat (< 3%)	1				
B.2.2	**COVER MATERIALS -DEPTH**					
	No to little existing cover	4				
	Greater than 50% exposed/surface debris	3				
	Occasional exposed/surface debris	2	**4**	2	1	3
	Existing cover, minimal debris,	1				
	Cover thickness > average active layer thickness	0				
B.2.3	**COVER MATERIAL - TYPE**					
	No cover	5				
	Silty/Sandy Material	4	**5**	3	3	3
	Sandy/Gravel Material	3				
	Gravel Material	1-2				
B.2.4	**SURFACE WATER/RUN-OFF POTENTIAL**					
	Very High - evidence of erosion, continuing run-off, or wave action	12				
	High - evidence of erosion, seasonal, widespread, storm waves	10	**12**	3	3	3
	Moderate - % area affected by erosion	3-9				
	Low - no evidence of erosion, slight slopes	1-2				
B.2.5	**PRECIPITATION**					
	> 500 mm annual precipitation	5	**5**	1	1	1
	< 500 mm annual precipitation (pro-rated)	1-4				
B.2.6	**DISTANCE TO DOWNGRADIENT PERENNIAL SURFACE/L**					
	0 to 100 m	10				
	100 to 300 m	7-9				
	300 to 1 km	2-6	**10**	4	4	8
	greater than 1 km	1				
	SPECIAL CONSIDERATIONS					
		+/- 5				
	TOTAL SCORE - PATHWAYS		***50***	***21***	***18***	***29***

PROPOSED ENVIRONMENTAL RISK EVALUATION MATRIX LANDFILLS IN THE NUNAVUT REGION						CAM-2 West Landfill - North	CAM-2 West-Landfill South	CAM-2 Station Landfill
C.	RECEPTORS				Maximum Score			
C.1	POTENTIAL IMPACT ON RECEIVING FRESHWATER/MARINE HABITAT							
C.1.1	PROXIMITY TO RECEIVING FRESHWATER/MARINE HABITAT							
	0 to 100 m			6				
	100 to 300 m			4-5	6	1	1	1
	300 to 1 km			2-3				
	greater than 1 km			1				
C.1.2	ESTIMATED HABITAT USAGE - FRESHWATER/MARINE							
	High; High Biodiversity/ High Occurrence/Calving or Spawning Area			5-6				
	Moderate: Moderate Biodiversity, Migratory			3-4	6	3	3	3
	Low: Low biodiversity; rare sightings			1-2				
C.2	POTENTIAL IMPACT ON RECEIVING TERRESTRIAL HABITAT							
C.2.1	Extent of Vegetation							
	Extensive vegetation growth, (80 to 100 % ground cover)			6				
	Moderate vegetation growth (40 to 80% ground cover)			4-5	6	6	6	6
	Low vegetation growth (20 to 40% ground cover)			2-3				
	Sparse vegetation (<20% ground cover)			1				
C.2.2	ESTIMATED HABITAT USAGE - TERRESTRIAL/AVIFAUNA							
	High; High Biodiversity/ High Occurrence/Calving, Denning or Nesting Area			5-6				
	Moderate: Moderate Biodiversity, Migratory			3-4	6	5	5	5
	Low: Low biodiversity; rare sightings			1-2				
C.3	POTENTIAL HUMAN EXPOSURE THROUGH LAND USE							
C.3.1	Presence/Occupation	*likehood of contact*						
	Duration of contact	high	modera	low				
	High - Numerous visits, summer camp	8	6	4	8	1	1	1
	Moderate - occasional summer camp	6	4	2				
	Low - Infrequent visits or winter camp	4	2	1				
C.3.2	Proximity to Drinking Water Source							
	0 to 100 m			8				
	100 to 300 m			5-7	8	1	1	1
	300 to 1 km			2-4				
	greater than 1 km			1				
C.3.3	Food Consumption							
	High quantity of sedentary organisms - marine & plant life			8				
	Moderate quantity of sedentary organisms - marine & plant life			6	8	0	0	0
	Low quantity of sedentary organisms - marine & plant life			4				
	No consumption			0				
	High quantity of migratory organisms			2				
	Moderate quantity of migratory organisms			1				
	Low quantity of migratory organisms			0.5				
	No consumption			0	2	2	2	2
	SPECIAL CONSIDERATIONS							
				+/-5				
	TOTAL SCORE - RECEPTORS				*50*	*19*	*19*	*19*
	TOTAL SCORE				150	73	62	66
	RECOMMENDATION					Remove TPH contaminated soil, regrade	Regrade	Regrade

CAM-2 Summary of Landfill Scoring for Regraded Landfills

Landfill Scoring	West Landfill-North	West Landfill-South	Station Landfill
A. Contaminant Source	33	25	18
B. Pathways	21	18	29
C. Receptors	19	19	19
Total Score	73	62	66
Classification	Low to Moderate Potential Environmental Risk	Low Potential Environmental Risk	Low Potential Environmental Risk
Recommendations	Regrade[1]	Regrade	Regrade

Notes: 1 TPH contaminated soil in lobe F to be removed

References:

- CAM-2, GLADMAN POINT, ENVIRONMENTAL DISCLOSURE REPORT, 2013
- CAM-2, GEOTECHNICAL INVESTIGATION AND PRELIMINARY LANDFILL DESIGN REPORT, UMA 2002
- CAM-2, ENVIRONMENTAL WORKING GROUP REPORT FOR NUNAVUT 2003
- CAM-2 LANDFILLS AND DEBRIS AREAS, ESG, FEBRUARY 2002
- CAM-2 CONTAMINATED SOILS - HYDROCARBON INVESTIGATIONS, ESG MARCH 2002
- CAM-LANDFILLS AND DEBRIS AREAS, ESG, RMC, 2002
- CAM-2 CONFIRMATORY SAMPLING REPORT, ESG 2005
- DEW LINE SITE GLADMAN POINT CAM-2, NTI TECHNICAL REPRESENTATIVE REPORT TO NTI, SINNANI, 2001
- DND/NTI COOPERATION AGREEMENT, 1998
- ENVIRONMENTAL CLEAN-UP STUDY OF 21 DEW LINE SITES IN CANADA, ESG 1991
- ENVIRONMENTAL STUDY OF ELEVEN DEW LINE SITES, VOLUME ONE, ESG 1993
- ENVIRONMENTAL WORKING GROUP REPORT, 1998
- ADDENDUM TO THE ENVIRONMENTAL WORKING GROUP REPORT, 1999
- NTI/DND ENVIRONMENTAL WORKING GROUP RECORD OF RECOMMENDATIONS – GLADMAN POINT (CAM-2) LANDFILLS AND HYDROCARBON CONTAMINATED AREAS, EWG 2002

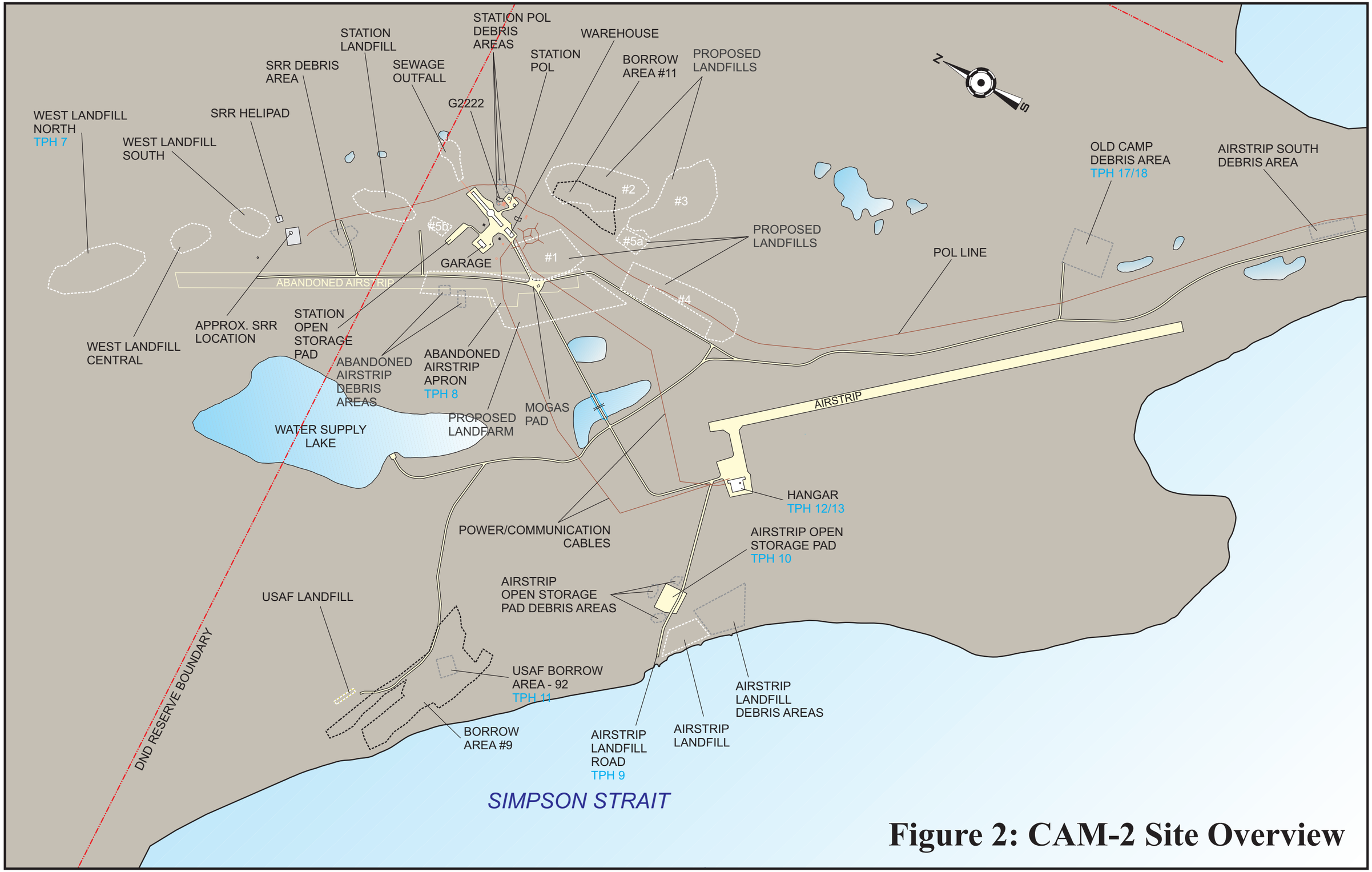


Figure 2: CAM-2 Site Overview

2.0 LANDFARM FACILITY

Pursuant to Part K, Item 2

The DEW Line Clean Up Project Landfarm Facilities operations are in accordance with the NTI/DND Agreement, Section 12.0 to 12.4:

'12.1 Petroleum Hydrocarbons (TPH) where the TPH value is greater than or equal to 2500 ppm. Should the soils contain Tier I or Tier II contamination, they will be treated in accordance with the relevant sections of this Agreement These hydrocarbon areas will be identified on site as part of the pre-construction delineation testing.

12.2 Each contaminated area will be evaluated qualitatively by the EWG using the checklist outlined in Appendix 1 of this Agreement.

12.3 Where remediation is required, one of the following options will be used:

- *aerating the hydrocarbon contaminated soil in place to reduce hydrocarbon contaminant concentrations*
- *use of hydrocarbon contaminated soil as intermediate fill within an engineered landfill*
- *landfilling in a Tier II Disposal facility*
- *bioremediation using a landfarming or bio-pile processes*
- *soil washing*
- *other equivalent technologies recommended by the EWG*

12.4 Based on site specific conditions, the EWG will recommend the most appropriate of the remediation options outlined in clause 12.3 in accordance with section 4.3 of this Agreement. The appropriateness of the options will take into consideration the environmental sensitivity of the area. Factors which will be considered in the selection of the method are:

- *type of contaminant (ie fuel or lubricating oil)*
- *total volume of hydrocarbon contaminated soils on site (mobilization costs, ability to treat the soil)*
- *concentration of hydrocarbons within the soil (effectiveness of treatment process)*
- *type of soil'*

2.1 Background

2.1.1 Assessment of Potential Locations for the CAM-2 Landfarm

During the CAM-2 site investigation, potential areas were examined and evaluated for the development of the landfarm, and location was chosen. Factors assessed when determining potential locations for an on-site landfarm include: accessibility, proximity to work areas and geotechnical and environmental suitability. Geotechnical suitability of a location considers topography, soil conditions, natural drainage in the area, depth to bedrock or permafrost, and groundwater and soil conditions that may affect permafrost and containment. Considerations for environmental suitability include the presence of existing contamination and the sensitivity of the receiving environment. Samples are collected from all potential locations and analyzed to determine whether any contaminated soils are present. A survey of the area was also completed.

2.1.2 Development of the Landfarm Facility

When the location of the landfarm was selected, its design was based on the estimated volume of Type B hydrocarbon-contaminated soil to be excavated and treated. Definition of Type B hydrocarbon contaminated soil - where the primary hydrocarbon product in the soil consists of diesel, fuel oil, or gasoline as determined by laboratory analyses. The design had to ensure that the facility would have the appropriate capacity, in terms of area and berm height, to treat the hydrocarbon-impacted soils. The areas and depths of contaminated soil at CAM-2 were determined through the detailed sampling program and associated analytical results generated as part of the site investigation program.

Guidelines used to evaluate hydrocarbon contamination are based on the criterion of 2,500 ppm for TPH. However, each instance of hydrocarbon contamination is considered individually and is evaluated using a risk-management approach. If it is determined, based on the assessment of risk, that remediation of hydrocarbon contaminated soil is required; soil that contains primarily Type B hydrocarbons is treated in the on-site landfarm facility to reduce the hydrocarbon concentration to less than 2,500 ppm or to a level of acceptable environmental risk.

The construction of the CAM-2 landfarm began in 2004 and was completed that same year. The landfarm operated from July 2004 until August 2005, and was closed at the end of the 2005 season. Landfarm operations consisted of: placement of contaminated soils, addition of nutrients, moisture conditioning and tilling during treatment as required, installation of monitoring equipment around the perimeter of the landfarm, and closure of the landfarm on completion of treatment of 10,775 m^3 of contaminated soils.

The CAM-2 remediation specifications included a requirement for monitoring of soil and groundwater monitoring during operation of the landfarm. To meet this requirement, landfarm soil and groundwater samples were collected mid-June to mid-September in 2005. Since the landfarm was closed at the end of the 2005 field season, further soil and groundwater monitoring of the landfarm was not required, and the monitoring wells surrounding the landfarm were decommissioned when it was closed.

2.1.3 Closure of the Landfarm Facility

Once soils have been remediated to 2500 ppm or below, no further work is required and the soils are left in place. Because the soils have met the remediation criteria, no further monitoring is conducted. The current landfarm evaluation protocol follows a stratified random sampling approach, with statistical analysis of results obtained from an accredited southern laboratory. The protocol aims to characterize the average concentration and distribution of TPH in the landfarm soil, and have been accepted for evaluating compliance with the Environmental Agreement (DGE, 1998). Under the 2005 protocol, in order for the landfarm to be recommended for closure; the Upper 95% Confidence Limit (UCL) of the mean of all results are required to be below 2500 ppm with no individual sample result exceeding 5000 ppm. Statistical analysis to determine the UCL was performed using Pro UCL Statistical Analysis Software (USEPA, 2005).

Following closure, the groundwater monitoring wells were decommissioned. At beginning of 2005 season, 27 samples collected and analyzed for soil nutrients. Results indicated that

nutrient application was not necessary. 17 tilling events occurred during 2005 season. Four rounds of confirmatory sampling took place; total of 527 samples collected. Of these, 506 samples analyzed for Type B HC in off-site laboratory. Remediation of Type B HC soil in landfarm was completed and facility was closed. The closure included leveling the berms and placing the berm material over the treated soil area. Additional cover was placed over the area as required to provide positive drainage and a minimum depth of 0.3 m over the treated soil.

View of the contractor tilling the landfarm during operation. Photograph is taken facing southwest.

ANNEX A: CONFIRMATORY SAMPLING RESULTS

Table B-5: Landfarm Soil Sample Analytical Results, cont'd

Sample #	Surface/ Reference Tag	Depth	TPH	TPH Identity		Conductivity	Moisture Content	Hydrocarbon Degraders	Total P	TKN	Ammonia	
		[cm]	[ppm]	% Fuel Oil	% Lube Oil &	uS/cm	%	cfu's/g	ug/g	mg/kg	mg/kg	pH
Tier I Criterion												
Tier II Criterion			***2,500***									
CEPA												
1. Confirmatory Samples cont'd												
05-10652		10	520	97	3.0							
05-10653		10	45	96	4							
05-10654		10	390	100	0							
05-10655		10	< 40	97	3							
05-10656		10	< 40									
05-10657		10	< 40									
05-10658		10	330	98	2							
05-10659		10	< 40									
05-10660/61		10	< 40									
05-10662		10	240	95	5.0							
05-10663		10	56	95	5.0							
05-10664		10	240									
05-10665		10	160	92	8.0							
05-10736		10	160	91	9.0							
05-10737		10	< 40									
05-10738		10	280	100	0.0							
05-10739		10	110	100	0.0							

Table B-5: Landfarm Soil Sample Analytical Results, cont'd

Sample #	Surface/ Reference Tag	Depth	TPH	TPH Identity		Conductivity	Moisture Content	Hydrocarbon Degraders	Total P	TKN	Ammonia	
		[cm]	[ppm]	% Fuel Oil	% Lube Oil &	uS/cm	%	cfu's/g	ug/g	mg/kg	mg/kg	pH
Tier I Criterion												
Tier II Criterion			***2,500***									
CEPA												
1. Confirmatory Samples cont'd												
05-9944		40	1,400	100	0.0							
05-9946		40	500	100	0.0							
05-9947		40	510	100	0.0							
05-9948		40	430	100	0.0							
05-9949		40	370	100	0.0							
05-9950/51		40	140	100	0.0							
05-9952		40	99	100	0.0							
05-9953		40	250	100	0.0							
05-9954		40	71	100	0.0							
05-10068		10	620	100	0.0							
05-10069		10	910	100	0.0							
05-10070/71		10	180	100	0.0							
05-10072		10	1,700	100	0.0							
05-10073		10	1,200	100	0.0							
05-10074		10	2,400	100	0.0							
05-10075		10	840	100	0.0							
05-10076		10	490	100	0.0							
05-10077		10	430	100	0.0							
05-10078		10	640	100	0.0							
05-10079		10	1,800	100	0.0							
05-10166		10	560	100	0.0							
05-10167		10	1,400	100	0.0							
05-10168		10	700	100	0.0							
05-10169		10	***2,500***	100	0.0							
05-10170/71		10	2,400	100	0.0							
05-10172		10	870	100	0.0							
05-10173		10	1,100	100	0.0							
05-10174		10	980	100	0.0							
05-10175		10	750	100	0.0							
05-10176		10	720	100	0.0							
05-10177		10	200	100	0.0							
05-10178		10	290	100	0.0							
05-10179		10	< 40	100	0.0							
05-10180/81		10	1,040	100	0.0							
05-10182		10	680	100	0.0							
05-10183		10	470	100	0.0							
05-10184		10	350	100	0.0							
05-10186		10	650	100	0.0							
05-10187		10	300	100	0.0							
05-10188		10	520	100	0.0							
05-10189		10	310	100	0.0							
05-10190/91		10	540	100	0.0							
05-10637		10	81	91	9.0							
05-10638		10	46	100	0.0							
05-10639		10	< 40	n/a	n/a							
05-10640/41		10	320	97	3.0							
05-10642		10	42	100	0.0							
05-10643		10	< 40	n/a	n/a							
05-10644		10	< 40	n/a	n/a							
05-10646		10	130	99	1.0							
05-10647		10	450	100	0							
05-10648		10	< 40	95	5							
05-10649		10	690									
05-10650/51		10	510	97	4.0							

Table B-5: Landfarm Soil Sample Analytical Results, cont'd

Sample #	Surface/ Reference Tag	Depth	TPH	TPH Identity		Conductivity	Moisture Content	Hydrocarbon Degraders	Total P	TKN	Ammonia	
				% Fuel Oil	% Lube Oil &							
		[cm]	[ppm]			uS/cm	%	cfu's/g	ug/g	mg/kg	mg/kg	pH
Tier I Criterion												
Tier II Criterion			***2,500***									
CEPA												
1. Confirmatory Samples cont'd												
05-9882		40	670	100	0.0							
05-9883		40	110	100	0.0							
05-9884		40	240	100	0.0							
05-9886		40	140	100	0.0							
05-9887		40	2,400	100	0.0							
05-9888		40	550	100	0.0							
05-9889		40	550	100	0.0							
05-9890/91		40	1,600	100	0.0							
05-9892		40	2,000	100	0.0							
05-9893		40	1,800	100	0.0							
05-9894		40	930	100	0.0							
05-9895		40	700	100	0.0							
05-9896		40	1,700	100	0.0							
05-9897		40	2,200	100	0.0							
05-9898		40	**8,500**	100	0.0							
05-9899		40	750	100	0.0							
05-9900/01		40	600	100	0.0							
05-9902		40	1,800	100	0.0							
05-9903		40	940	100	0.0							
05-9904		40	680	100	0.0							
05-9906		40	1,200	100	0.0							
05-9907		40	1,600	100	0.0							
05-9908		40	830	100	0.0							
05-9909		40	1,600	100	0.0							
05-9910/11		40	***4,400***	100	0.0							
05-9912		40	1,100	100	0.0							
05-9913		40	1,400	100	0.0							
05-9914		40	***3,900***	100	0.0							
05-9915		40	1,500	100	0.0							
05-9916		40	1,300	100	0.0							
05-9917		40	1,800	100	0.0							
05-9918		40	1,400	100	0.0							
05-9919		40	750	100	0.0							
05-9920/21		40	1,090	100	0.0							
05-9922		40	1,600	100	0.0							
05-9923		40	150	100	0.0							
05-9924		40	550	100	0.0							
05-9926		40	370	100	0.0							
05-9927		40	290	100	0.0							
05-9928		40	570	100	0.0							
05-9929		40	2,400	100	0.0							
05-9930/31		40	325	100	0.0							
05-9932		40	810	100	0.0							
05-9933		40	***2,700***	100	0.0							
05-9934		40	390	100	0.0							
05-9935		40	260	100	0.0							
05-9936		40	350	100	0.0							
05-9937		40	240	100	0.0							
05-9938		40	190	100	0.0							
05-9939		40	220	100	0.0							
05-9940		40	270	100	0.0							
05-9941		40	240	100	0.0							
05-9942		40	310	100	0.0							
05-9943		40	480	100	0.0							

Table B-5: Landfarm Soil Sample Analytical Results, cont'd

Sample #	Surface/ Reference Tag	Depth	TPH	TPH Identity		Conductivity	Moisture Content	Hydrocarbon Degraders	Total P	TKN	Ammonia	
		[cm]	[ppm]	% Fuel Oil	% Lube Oil &	uS/cm	%	cfu's/g	ug/g	mg/kg	mg/kg	pH
Tier I Criterion												
Tier II Criterion			***2,500***									
CEPA												
1. Confirmatory Samples cont'd												
05-9819		40	830	100	0.0							
05-9820/21		40	330	100	0.0							
05-9822		40	930	100	0.0							
05-9823		40	1,100	100	0.0							
05-9824		40	***3,500***	100	0.0							
05-9826		40	***3,200***	100	0.0							
05-9827		40	2,200	100	0.0							
05-9828		40	330	100	0.0							
05-9829		40	580	100	0.0							
05-9830/31		40	2,000	100	0.0							
05-9832		40	190	100	0.0							
05-9833		40	230	100	0.0							
05-9834		40	600	100	0.0							
05-9835		40	2,300	100	0.0							
05-9836		40	1,800	100	0.0							
05-9837		40	2,000	100	0.0							
05-9838		40	320	100	0.0							
05-9839		40	990	100	0.0							
05-9840/41		40	250	100	0.0							
05-9842		40	1,100	100	0.0							
05-9843		40	670	100	0.0							
05-9844		40	160	100	0.0							
05-9846		40	720	100	0.0							
05-9847		40	690	100	0.0							
05-9848		40	190	100	0.0							
05-9849		40	270	100	0.0							
05-9850/51		40	250	100	0.0							
05-9852		40	310	100	0.0							
05-9853		40	260	100	0.0							
05-9854		40	290	100	0.0							
05-9855		40	1,900	100	0.0							
05-9856		40	930	100	0.0							
05-9857		40	1,400	100	0.0							
05-9858		40	430	100	0.0							
05-9859		40	1,000	100	0.0							
05-9860/61		40	645	100	0.0							
05-9862		40	170	100	0.0							
05-9863		40	1,100	100	0.0							
05-9864		40	530	100	0.0							
05-9866		40	130	100	0.0							
05-9867		40	410	100	0.0							
05-9868		40	***3,200***	100	0.0							
05-9869		40	2,100	100	0.0							
05-9870/71		40	2,300	100	0.0							
05-9872		40	1,300	100	0.0							
05-9873		40	300	100	0.0							
05-9874		40	1,000	100	0.0							
05-9875		40	2,400	100	0.0							
05-9876		40	420	100	0.0							
05-9877		40	190	100	0.0							
05-9878		40	260	100	0.0							
05-9879		40	380	100	0.0							
05-9880		40	350	100	0.0							
05-9881		40	95	100	0.0							

Table B-5: Landfarm Soil Sample Analytical Results, cont'd

Sample #	Surface/ Reference Tag	Depth	TPH	TPH Identity		Conductivity	Moisture Content	Hydrocarbon Degraders	Total P	TKN	Ammonia	
				% Fuel Oil	% Lube Oil &							
		[cm]	[ppm]			uS/cm	%	cfu's/g	ug/g	mg/kg	mg/kg	pH
Tier I Criterion												
Tier II Criterion			***2,500***									
CEPA												
1. Confirmatory Samples cont'd												
05-9497		40	***2,500***	100	0.0							
05-9498		40	530	95	5.0							
05-9499		40	1,000	100	0.0							
05-9500/01		40	940	100	0.0							
05-9502		40	1,800	99	1.0							
05-9503		40	1,700	100	0.0							
05-9504		40	1,900	100	0.0							
05-9506		40	***2,700***	100	0.0							
05-9507		40	< 40	N/A	N/A							
05-9508		40	< 40	N/A	N/A							
05-9509		40	370	100	0.0							
05-9510/11		40	510	93	7.5							
05-9512		40	750	94	6.0							
05-9513		40	1,900	98	2.0							
05-9514		40	640	100	0.0							
05-9515		40	890	100	0.0							
05-9516		40	640	100	0.0							
05-9517		40	810	100	0.0							
05-9518		40	***4,100***	100	0.0							
05-9519		40	1,900	100	0.0							
05-9520/21		40	1,400	100	0.0							
05-9522		40	***3,500***	99	1.0							
05-9523		40	***3,200***	100	0.0							
05-9524		40	48	100	0.0							
05-9526		40	350	94	6.0							
05-9527		40	400	97	3.0							
05-9528		40	330	100	0.0							
05-9529		40	170	100	0.0							
05-9530/31		40	160	100	0.0							
05-9532		40	140	95	5.0							
05-9533		40	290	100	0.0							
05-9534		40	180	100	0.0							
05-9535		40	380	100	0.0							
05-9536		40	690	100	0.0							
05-9537		40	730	100	0.0							
05-9538		40	390	100	0.0							
05-9539		40	600	100	0.0							
05-9540/41		40	270	100	0.0							
05-9542		40	840	100	0.0							
05-9543		40	930	100	0.0							
05-9544		40	360	100	0.0							
05-9546		40	100	100	0.0							
05-9547		40	170	100	0.0							
05-9548		40	190	100	0.0							
05-9549		40	230	100	0.0							
05-9550/51		40	290	100	0.0							
05-9552		40	83	100	0.0							
05-9553		40	280	100	0.0							
05-9554		40	520	100	0.0							
05-9555		40	560	100	0.0							
05-9556		40	160	100	0.0							
05-9557		40	730	100	0.0							
05-9817		40	780	100	0.0							
05-9818		40	490	100	0.0							

Table B-5: Landfarm Soil Sample Analytical Results, cont'd

Sample #	Surface/ Reference Tag	Depth	TPH	TPH Identity		Conductivity	Moisture Content	Hydrocarbon Degraders	Total P	TKN	Ammonia	
		[cm]	[ppm]	% Fuel Oil	% Lube Oil &	uS/cm	%	cfu's/g	ug/g	mg/kg	mg/kg	pH
Tier I Criterion												
Tier II Criterion			***2,500***									
CEPA												
1. Confirmatory Samples cont'd												
05-9437		40	***2,700***	100	0.0							
05-9438		40	2,300	100	0.0							
05-9439		40	***2,700***	100	0.0							
05-9440		40	43	100	0.0							
05-9441		40	44	100	0.0							
05-9442		40	< 40	N/A	N/A							
05-9443		40	450	100	0.0							
05-9444		40	550	100	0.0							
05-9446		40	800	100	0.0							
05-9447		40	***3,600***	100	0.0							
05-9448		40	1,500	100	0.0							
05-9449		40	540	100	0.0							
05-9450/51		40	1,025	100	0.0							
05-9452		40	350	25	75							
05-9453		40	600	41	59							
05-9454		40	2,300	43	57							
05-9455		40	2,100	62	38							
05-9456		40	680	5	95							
05-9457		40	85	100	0.0							
05-9458		40	< 40	N/A	N/A							
05-9459		40	430	100	0.0							
05-9460/61		40	1,700	100	0.0							
05-9462		40	***3,100***	100	0.0							
05-9463		40	840	92	8.0							
05-9464		40	2,400	95	5.0							
05-9465		40	<26									
05-9466		40	630	95	5.0							
05-9467		40	1,300	100	0.0							
05-9468		40	620	100	0.0							
05-9469		40	1,700	100	0.0							
05-9470/71		40	1,100	100	0.0							
05-9471		40	490	94	6.0							
05-9472		40	***2,600***	97	3.0							
05-9473		40	***4,200***	97	3.0							
05-9474		40	< 40	N/A	N/A							
05-9475		40	760	100	0.0							
05-9476		40	***5,500***	100	0.0							
05-9477		40	510	100	0.0							
05-9478		40	1,400	100	0.0							
05-9479		40	1,100	100	0.0							
05-9480/81		40	660	100	0.0							
05-9482		40	***7,300***	100	0.0							
05-9483		40	900	97	3.0							
05-9484		40	670	100	0.0							
05-9486		40	1,200	100	0.0							
05-9487		40	1,400	98	2.0							
05-9488		40	1,300	100	0.0							
05-9489		40	1,000	100	0.0							
05-9490/91		40	110	100	0.0							
05-9492		40	42	100	0.0							
05-9493		40	1,900	100	0.0							
05-9494		40	990	100	0.0							
05-9495		40	1,700	100	0.0							
05-9496		40	***2,500***	100	0.0							

Table B-5: Landfarm Soil Sample Analytical Results, cont'd

Sample #	Surface/ Reference Tag	Depth	TPH	TPH Identity		Conductivity	Moisture Content	Hydrocarbon Degraders	Total P	TKN	Ammonia	
		[cm]	[ppm]	% Fuel Oil	% Lube Oil &	uS/cm	%	cfu's/g	ug/g	mg/kg	mg/kg	pH
Tier I Criterion												
Tier II Criterion			***2,500***									
CEPA												
1. Confirmatory Samples cont'd												
05-9374		40	220	100	0.0							
05-9375		40	150	100	0.0							
05-9376		40	600	100	0.0							
05-9377		40	250	100	0.0							
05-9378		40	150	100	0.0							
05-9379		40	250	100	0.0							
05-9380/81		40	520	99	1.0							
05-9382		40	550	98	2.0							
05-9383		40	63	100	0.0							
05-9384		40	140	100	0.0							
05-9386		40	1,200	100	0.0							
05-9387		40	2,400	100	0.0							
05-9388		40	***2,500***	100	0.0							
05-9389		40	930	100	0.0							
05-9390/91		40	1,050	100	0.0							
05-9392		40	2,100	100	0.0							
05-9393		40	1,700	100	0.0							
05-9394		40	600	100	0.0							
05-9395		40	1,200	100	0.0							
05-9396		40	830	100	0.0							
05-9397		40	< 40	N/A	N/A							
05-9398		40	310	100	0.0							
05-9399		40	350	100	0.0							
05-9400/01		40	190	100	0.0							
05-9402		40	380	100	0.0							
05-9403		40	***3,000***	100	0.0							
05-9404		40	1,200	100	0.0							
05-9406		40	340	100	0.0							
05-9407		40	76	100	0.0							
05-9408		40	< 40	N/A	N/A							
05-9409		40	850	100	0.0							
05-9410/11		40	200	100	0.0							
05-9412		40	1,800	100	0.0							
05-9413		40	1,700	100	0.0							
05-9414		40	61	100	0.0							
05-9415		40	***2,900***	100	0.0							
05-9416		40	< 40	N/A	N/A							
05-9417		40	430	100	0.0							
05-9418		40	1,300	100	0.0							
05-9419		40	1,500	100	0.0							
05-9420/21		40	***2,600***	100	0.0							
05-9422		40	760	96	4.0							
05-9423		40	170	100	0.0							
05-9424		40	260	100	0.0							
05-9426		40	920	100	0.0							
05-9427		40	< 40	N/A	N/A							
05-9428		40	120	100	0.0							
05-9429		40	2,200	100	0.0							
05-9430/31		40	2,000	100	0.0							
05-9432		40	***3,000***	100	0.0							
05-9433		40	***5,100***	100	0.0							
05-9434		40	260	100	0.0							
05-9435		40	400	100	0.0							
05-9436		40	1,400	100	0.0							

Table B-5: Landfarm Soil Sample Analytical Results, cont'd

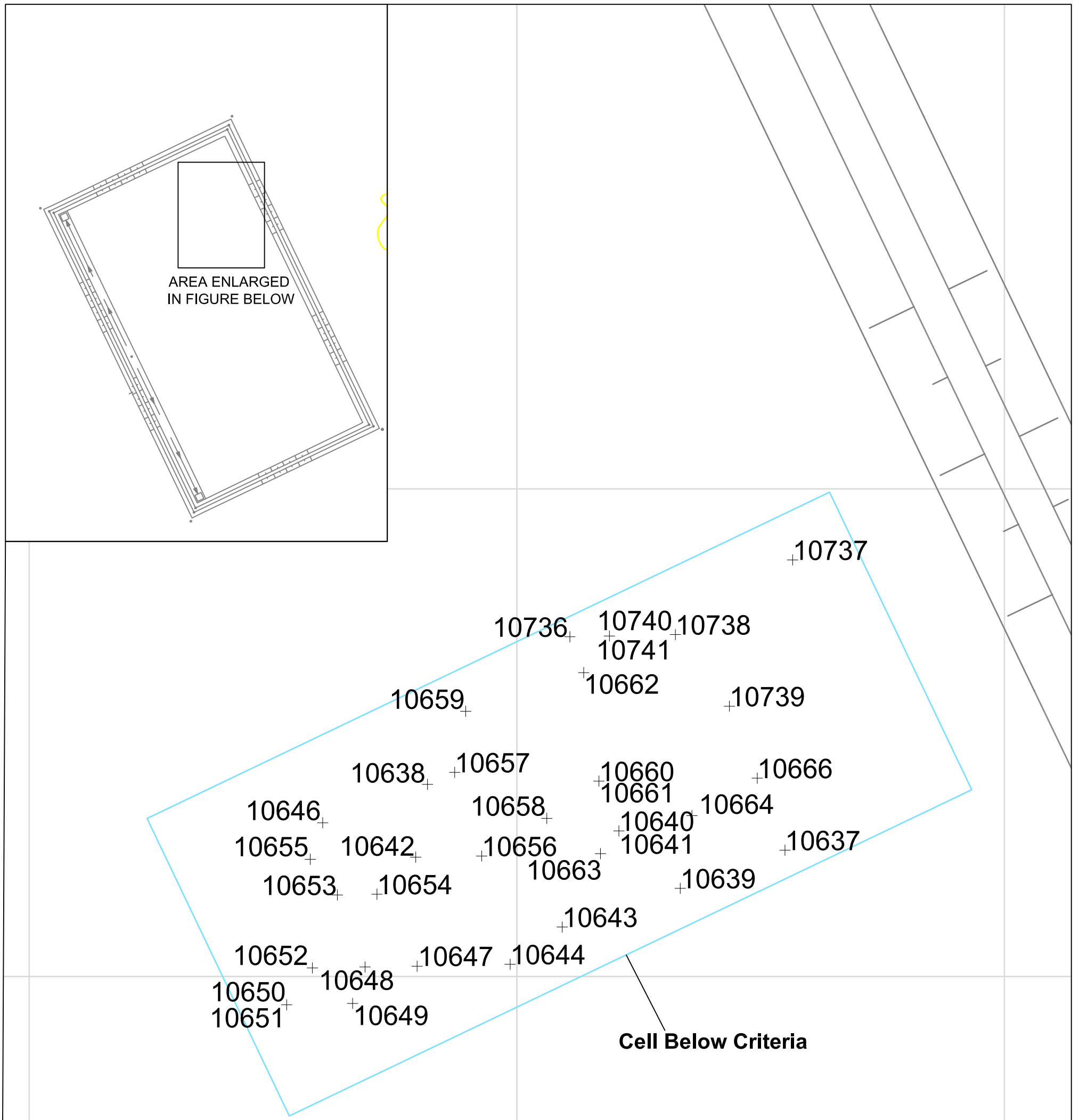
Sample #	Surface/ Reference Tag	Depth	TPH	TPH Identity		Conductivity	Moisture Content	Hydrocarbon Degraders	Total P	TKN	Ammonia	
		[cm]	[ppm]	% Fuel Oil	% Lube Oil &	uS/cm	%	cfu's/g	ug/g	mg/kg	mg/kg	pH
Tier I Criterion												
Tier II Criterion			***2,500***									
CEPA												
1. Confirmatory Samples cont'd												
05-9312		20	130	100	0.0							
05-9313		20	190	100	0.0							
05-9314		20	590	100	0.0							
05-9315		20	1,400	100	0.0							
05-9316		20	470	100	0.0							
05-9317		20	380	100	0.0							
05-9318		20	250	100	0.0							
05-9319		20	1,600	100	0.0							
05-9320/21		20	360	100	0.0							
05-9322		20	820	100	0.0							
05-9323		20	1,000	100	0.0							
05-9324		20	460	100	0.0							
05-9326		20	95	100	0.0							
05-9327		20	2,400	100	0.0							
05-9328		20	780	100	0.0							
05-9329		20	91	100	0.0							
05-9330/31		20	440	100	0.0							
05-9331		20	66	100	0.0							
05-9332		20	430	100	0.0							
05-9333		20	150	100	0.0							
05-9334		20	100	100	0.0							
05-9335		20	120	100	0.0							
05-9336		20	560	100	0.0							
05-9337		20	210	100	0.0							
05-9338		20	290	100	0.0							
05-9339		20	120	100	0.0							
05-9340/41		20	370	100	0.0							
05-9342		20	180	100	0.0							
05-9343		20	< 40	N/A	N/A							
05-9344		40	180	100	0.0							
05-9346		40	150	100	0.0							
05-9347		40	1,700	100	0.0							
05-9348		40	1,300	100	0.0							
05-9349		40	230	100	0.0							
05-9350/51		40	***5,600***	97	3.5							
05-9352		40	1,700	100	0.0							
05-9353		40	**8,700**	76	24							
05-9354		40	590	100	0.0							
05-9355		40	2,100	100	0.0							
05-9356		40	< 40	N/A	N/A							
05-9357		40	390	100	0.0							
05-9358		40	60	100	0.0							
05-9359		40	95	100	0.0							
05-9360/61		40	520	100	0.0							
05-9362		40	46	100	0.0							
05-9363		40	95	100	0.0							
05-9364		40	300	100	0.0							
05-9366		40	160	100	0.0							
05-9367		40	230	100	0.0							
05-9368		40	1,300	99	1.0							
05-9369		40	1,500	100	0.0							
05-9370/71		40	2,400	100	0.0							
05-9372		40	730	100	0.0							
05-9373		40	1,400	100	0.0							

Table B-5: Landfarm Soil Sample Analytical Results, cont'd

Sample #	Surface/ Reference Tag	Depth	TPH	TPH Identity		Conductivity	Moisture Content	Hydrocarbon Degraders	Total P	TKN	Ammonia	
		[cm]	[ppm]	% Fuel Oil	% Lube Oil &	uS/cm	%	cfu's/g	ug/g	mg/kg	mg/kg	pH
Tier I Criterion												
Tier II Criterion			***2,500***									
CEPA												
1. Confirmatory Samples cont'd												
05-9248		20	600	100	0.0							
05-9249		20	190	100	0.0							
05-9250/51		20	375	100	0.0							
05-9252		20	330	100	0.0							
05-9253		20	420	100	0.0							
05-9254		20	1,000	100	0.0							
05-9255		20	760	100	0.0							
05-9256		20	590	100	0.0							
05-9257		20	1,000	100	0.0							
05-9258		20	150	100	0.0							
05-9259		20	370	100	0.0							
05-9260/61		20	930	100	0.0							
05-9262		20	1,300	100	0.0							
05-9263		20	740	100	0.0							
05-9264		20	670	100	0.0							
05-9266		20	220	100	0.0							
05-9267		20	600	100	0.0							
05-9268		20	350	100	0.0							
05-9269		20	420	100	0.0							
05-9270		20	840	100	0.0							
05-9272		20	2,000	100	0.0							
05-9273		20	2,200	100	0.0							
05-9274		20	1,400	100	0.0							
05-9275		20	***2,800***	100	0.0							
05-9276		20	***4,700***	100	0.0							
05-9277		20	2,000	100	0.0							
05-9278		20	< 40	N/A	N/A							
05-9279		20	150	100	0.0							
05-9280/81		20	1,500	100	0.0							
05-9282		20	2100	100	0.0							
05-9283		20	580	100	0.0							
05-9284		20	2,200	100	0.0							
05-9286		20	***3,300***	100	0.0							
05-9287		20	1,400	100	0.0							
05-9288		20	***2,600***	100	0.0							
05-9289		20	500	100	0.0							
05-9290/91		20	240	100	0.0							
05-9292		20	< 40	N/A	N/A							
05-9293		20	590	93	7.0							
05-9294		20	840	100	0.0							
05-9295		20	810	100	0.0							
05-9296		20	200	100	0.0							
05-9297		20	330	100	0.0							
05-9298		20	80	100	0.0							
05-9299		20	370	100	0.0							
05-9300/01		20	< 40	N/A	N/A							
05-9302		20	91	100	0.0							
05-9303		20	470	94	6.0							
05-9304		20	1,100	100	0.0							
05-9306		20	520	100	0.0							
05-9307		20	800	100	0.0							
05-9308		20	350	100	0.0							
05-9309		20	280	100	0.0							
05-9310/11		20	780	100	0.0							

Table B-5: Landfarm Soil Sample Analytical Results

Sample #	Surface/ ReferenceTag	Depth	TPH	TPH Identity		Conductivity	Moisture	HC Degraders	Total P	TKN	Ammonia	
		[cm]	[ppm]	% Fuel Oil	% Lube Oil &	uS/cm	%	cfu's/g	ug/g	mg/kg	mg/kg	pH
Tier I Criterion												
Tier II Criterion			***2,500***									
CEPA												
1. Confirmatory Samples												
05-8906		45	***5,000***	100	0.0	381	12.5	2.70E+05	150	370	< 1	7.08
05-8907		40	860	100	0.0	203	9.4	<100	150	90	< 1	8.53
05-8908		25	***2,800***	100	0.0	204	12.4	8.00E+04	210	160	< 1	8.52
05-8909		40	< 40	N/A	N/A	381	9.8	6.50E+04	280	460	< 1	8.38
05-8910/11		40	230	100	0.0	245	11	3.15E+05	190	210	< 1	8.43
05-8912		45	1,600	96	4.0	439	9.1	1.50E+05	190	70	< 1	8.5
05-8913		40	930	100	0.0	371	3	1.20E+03	210	130	< 1	4.33
05-8914		40	230	100	0.0	362	9.2	2.00E+03	210	200	< 1	8.53
05-8915		50	***3,700***	98	2.0	407	11.3	1.60E+03	140	180	< 1	7.62
05-8916		50	1,500	100	0.0	461	13.1	5.40E+05	150	250	< 1	7.93
05-8917		50	1,500	100	0.0	906	9.3	1.50E+05	120	60	< 1	8.37
05-8918		50	400	98	2.0	620	10.6	1.10E+05	170	80	< 1	8.52
05-8919		45	330	100	0.0	333	9.2	2.20E+05	180	520	< 1	7.88
05-8920/21		50	440	100	0.0	395	8.9	1.35E+05	190	130	< 1	8.56
05-8922		40	470	100	0.0	538	9.7	3.80E+05	160	110	< 1	8.44
05-8923		50	120	100	0.0	466	6.9	1.60E+05	130	160	< 1	8.55
05-8924		45	630	99	1.0	568	8	2.20E+05	100	80	< 1	8.67
05-8925		30	270	100	0.0	303	8.4	8.40E+03	200	170	< 1	8.37
05-8926		55	2,200	100	0.0	466	11.4	4.80E+05	150	70	< 1	8.33
05-8927		40	240	100	0.0	356.5	9.4	1.70E+05	94	70	< 1	8.75
05-8928		52	520	100	0.0	298	10.7	1.80E+04	140	70	< 1	8.76
05-8929		30	110	100	0.0	314	8.7	8.90E+05	200	220	< 1	8.17
05-8930/31		50	380	100	0.0	440	9.1	8.53E+04	130	< 20	< 1	8.75
05-8932		50	170	100	0.0	360	9.5	3.00E+05	120	70	< 1	8.56
05-9215		20	220	100	0.0							
05-9216		20	1,000	100	0.0							
05-9217		20	370	100	0.0							
05-9218		20	370	100	0.0							
05-9219		20	250	100	0.0							
05-9220/21		20	310	100	0.0							
05-9222		20	700	100	0.0							
05-9223		20	510	100	0.0							
05-9224		20	1,100	100	0.0							
05-9226		20	650	100	0.0							
05-9227		20	< 40	N/A	N/A							
05-9228		20	920	100	0.0							
05-9229		20	180	100	0.0							
05-9230		20	1,400	100	0.0							
05-9231		20	1,200	100	0.0							
05-9232		20	480	100	0.0							
05-9233		20	480	100	0.0							
05-9234		20	230	100	0.0							
05-9235		20	1,800	100	0.0							
05-9236		20	1,200	100	0.0							
05-9237		20	510	100	0.0							
05-9238		20	270	100	0.0							
05-9239		20	650	100	0.0							
05-9240/41		20	310	100	0.0							
05-9242		20	720	100	0.0							
05-9243		20	1,300	100	0.0							
05-9244		20	670	100	0.0							
05-9246		20	1,100	100	0.0							
05-9247		20	***3,000***	91	9.0							

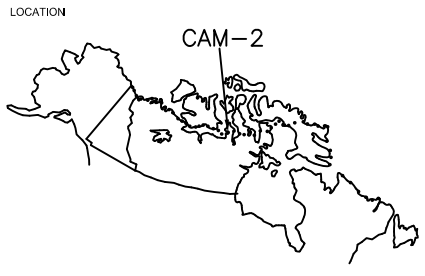


Sample & Area Definitions		
	Tag Number	Area
Background Clean		
Not Analyzed		
CEPA		
Tier II		
Tier II & TPH Type A		
Tier II & TPH Type B		
Tier I		
Tier I & TPH Type A		
Tier I & TPH Type B		
TPH Type A		
TPH Type B		
Other		
Primary Landfill Excavation		

Remediated Area Definitions	Area
CEPA Remediated	
Tier II Remediated	
Tier II & TPH Type A Remediated	
Tier II & TPH Type B Remediated	
Tier I Remediated	
Tier I & TPH Type A Remediated	
Tier I & TPH Type B Remediated	
TPH Type A Remediated	
TPH Type B Remediated	
Primary Landfill Excavation Remediated	

Map A-11: Landfarm Confirmatory Sampling Round 4

LOCATION



NOTES:

Refer to memo ESG-CAM-2-126

N
W E
S

Grid Scale: 25m

UPDATED: OCT. 13/2010
PRINTED: OCT. 13/2010

Original Source:
UMA Engineering Ltd.

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AREA ENLARGED
IN FIGURE BELOW

Cell Below Criteria

10188
10187
10074
10186
10072
10073
10189
10166
10184
10079
10070
10071
10078
10069
10173
10183
10190
10191
10068
10077
10172
10170
10171
10179
10076
10182
10169
10075
10168
10178
10167
10177
10180
10181
10176
10175
10174
9954
9943

Sample & Area Definitions

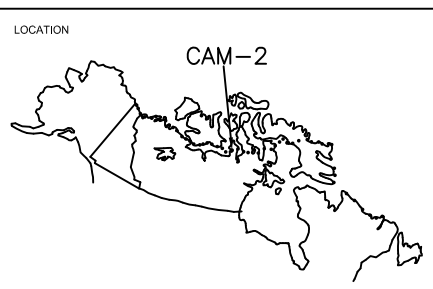
	Tag Number	Area
Background Clean		
Not Analyzed		
CEPA		
Tier II		
Tier II & TPH Type A		
Tier II & TPH Type B		
Tier I		
Tier I & TPH Type A		
Tier I & TPH Type B		
TPH Type A		
TPH Type B		
Other		
Primary Landfill Excavation		

Remediated Area Definitions

	Area
CEPA Remediated	
Tier II Remediated	
Tier II & TPH Type A Remediated	
Tier II & TPH Type B Remediated	
Tier I Remediated	
Tier I & TPH Type A Remediated	
Tier I & TPH Type B Remediated	
TPH Type A Remediated	
TPH Type B Remediated	
Primary Landfill Excavation Remediated	

Map A-10: Landfarm Confirmatory Sampling Round 3

LOCATION



NOTES:

Refer to memo ESG-CAM-2-107

N
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S

Grid Scale: 25m

Original Source:
UMA Engineering Ltd.

UPDATED: OCT. 13/2010
PRINTED: OCT. 13/2010

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AREA ENLARGED
IN FIGURE BELOW

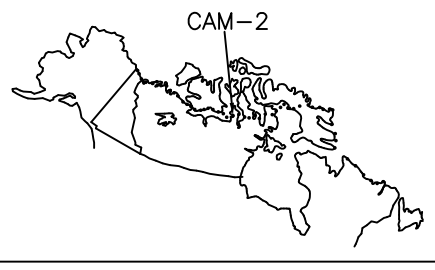
Cell Above Criteria

Sample & Area Definitions	Tag Number	Area
Background Clean		
Not Analyzed		
CEPA		
Tier II		
Tier II & TPH Type A		
Tier II & TPH Type B		
Tier I		
Tier I & TPH Type A		
Tier I & TPH Type B		
TPH Type A		
TPH Type B		
Other		
Primary Landfill Excavation		

Remediated Area Definitions	Area
CEPA Remediated	
Tier II Remediated	
Tier II & TPH Type A Remediated	
Tier II & TPH Type B Remediated	
Tier I Remediated	
Tier I & TPH Type A Remediated	
Tier I & TPH Type B Remediated	
TPH Type A Remediated	
TPH Type B Remediated	
Primary Landfill Excavation Remediated	

Map A-9: Landfarm Confirmatory Sampling Round 2

LOCATION



NOTES:

Refer to memo ESG-CAM-2-104

N
W E
S

Grid Scale: 25m

UPDATED: OCT. 13/2010
PRINTED: OCT. 13/2010

Original Source:
UMA Engineering Ltd.

A. LESLIE
ESG

PATH: J:\PROJECTS\CAM-2\AutoCAD\CAM-2_Confirmatory_Post-Season_2005_Oct8_2010.dwg

Environmental Sciences Group
The Royal Military College of Canada
PO Box 17000 Stn Forces
Kingston, Ontario K7K 7B4
Tel: (613) 541-6000 Ext: 6745
Fax: (613) 541-6596

Cell 1: Below Criteria

Cell 2.1: Above Criteria

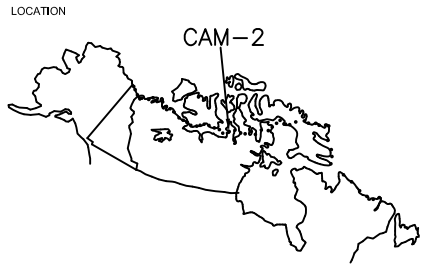
Cell 2.2: Below Criteria

Sample & Area Definitions	Tag Number	Area
Background Clean		
Not Analyzed		
CEPA		
Tier II		
Tier II & TPH Type A		
Tier II & TPH Type B		
Tier I		
Tier I & TPH Type A		
Tier I & TPH Type B		
TPH Type A		
TPH Type B		
Other		
Primary Landfill Excavation		

Remediated Area Definitions	Area
CEPA Remediated	
Tier II Remediated	
Tier II & TPH Type A Remediated	
Tier II & TPH Type B Remediated	
Tier I Remediated	
Tier I & TPH Type A Remediated	
Tier I & TPH Type B Remediated	
TPH Type A Remediated	
TPH Type B Remediated	
Primary Landfill Excavation Remediated	

Map A-8: Landfarm Confirmatory Sampling Round 1

LOCATION



NOTES:

Refer to memo ESG-CAM-2-087

N W E S

Grid Scale: 100m

Original Source: UMA Engineering Ltd.

UPDATED: OCT. 13/2010 A. LESLIE

PRINTED: OCT. 13/2010 ESG

PATH: J:\PROJECTS\CAM-2\AutoCAD\CAM-2_Confirmatory_Post-Season_2005_Oct8_2010.dwg

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MEMO

From: Anna Charbonneau
PO Box 17,000 Stn Forces
Kingston, ON
Tel: (613) 541-6000 ext. 3790
Email: Anna.Charbonneau@rmc.ca

Date: Friday, September 30, 2005
ESG-CAM-2-126

To: Alain Dufresne
From: Anna Charbonneau

Re: **Landfarm Round 4 Confirmatory Sampling Results**

The ESG has received and processed data for soil samples collected from the Landfarm. In Round 4, samples were taken from a 600 m^2 area where Type B soil from a secondary excavation of Area B5 at the Module Train (ESG-CAM-2-111) was spread. The Samples were collected at a depth of 0.1 m. A total of 36 samples were collected, including duplicates and scoop blanks. All samples were analyzed for TPH in a southern laboratory.

Sample results were used to determine the 95% upper confidence limit (UCL) for each cell. In order for a cell to be considered clean, the UCL had to be below 2500 ppm. In other words, there had to be 95% certainty that the average TPH concentration in the cell was below 2500 ppm. In addition, a cell could only be deemed clean if no individual sample concentration was above 5000 ppm.

Table 1 summarizes the results of Round 4. Sample locations are presented on the attached map. All samples had concentrations below the 2500 ppm criteria.

Table 1. Landfarm Summary Statistics

Cell	Area (m^2)	Number of Sample Locations	UCL (ppm)	Mean Concentration (ppm)	Maximum Concentration (ppm)	Cleanup Status
1	600	30	677	219	1300	Below criteria

Should you have any questions or concerns, please do not hesitate to contact me.

Anna Charbonneau

MEMO

From: Anna Charbonneau
Gladman Point (CAM-2), NU
Tel: (613) 482-6557
Email: Anna.Charbonneau@rmc.ca

Date: Tuesday, August 23, 2005
ESG-CAM-2-107

To: Alain Dufresne
From: Anna Charbonneau

Re: **Landfarm Round 3 Confirmatory Sampling Results**

The ESG has received and processed data for soil samples collected from the Landfarm. The Landfarm was divided into three cells based on Round 1 Landfarm sampling results. In Round 3, samples were collected from Cell 1 at a depth of 0.1 m. A total of 33 samples were collected, including duplicates and scoop blanks. All samples were analyzed for TPH in a southern laboratory.

Sample results were used to determine the 95% upper confidence limit (UCL) for each cell. In order for a cell to be considered clean, the UCL had to be below 2500 ppm. In other words, there had to be 95% certainty that the average TPH concentration in the cell was below 2500 ppm. In addition, a cell could only be deemed clean if no individual sample concentration was above 5000 ppm.

Table 1 summarizes the results of Round 2. Cell layout and sample locations are presented on the attached map. Samples that had concentrations over the 2500 ppm criteria are depicted in blue and those under criteria in black.

Table 1. Landfarm Summary Statistics

Cell	Area (m^2)	Number of Sample Locations	UCL (ppm)	Mean Concentration (ppm)	Maximum Concentration (ppm)	Cleanup Status
1	9623	33	1095	837	2500	Below criteria

Should you have any questions or concerns, please do not hesitate to contact me.

Anna Charbonneau

MEMO

From: Anna Charbonneau
Gladman Point (CAM-2), NU
Tel: (613) 482-6557
Email: Anna.Charbonneau@rmc.ca

Date: Saturday, August 20, 2005
ESG-CAM-2-104

To: Alain Dufresne
From: Anna Charbonneau

Re: **Landfarm Round 2 Confirmatory Sampling Results**

The ESG has received and processed data for soil samples collected from the Landfarm. The Landfarm was divided into three cells based on Round 1 Landfarm sampling results. In Round 2, samples were collected from Cell 2.1 at a depth of 0.4 m. A total of 117 samples were collected, including duplicates and scoop blanks. All samples were analyzed for TPH in a southern laboratory.

Sample results were used to determine the 95% upper confidence limit (UCL) for each cell. In order for a cell to be considered clean, the UCL had to be below 2500 ppm. In other words, there had to be 95% certainty that the average TPH concentration in the cell was below 2500 ppm. In addition, a cell could only be deemed clean if no individual sample concentration was above 5000 ppm.

Table 1 summarizes the results of Round 2. Cell layout and sample locations are presented on the attached map. Samples that had concentrations over the 2500 ppm criteria are depicted in blue and those under criteria in black. One sample, 9898, had a concentration greater than 5000 ppm.

Table 1. Landfarm Summary Statistics

Cell	Area (m^2)	Number of Sample Locations	UCL (ppm)	Mean Concentration (ppm)	Maximum Concentration (ppm)	Cleanup Status
2.1	6723	117	1197	1019	8500	Above criteria

Should you have any questions or concerns, please do not hesitate to contact me.

Anna Charbonneau

Table 1. Landfarm Summary Statistics

Cell	Area (m^2)	Number of Sample Locations	UCL (ppm)	Mean Concentration (ppm)	Maximum Concentration (ppm)	Cleanup Status
1	9514	110	888	760	4700	Below criteria
2.1	6723	105	1355	1127	8700	Above criteria
2.2	3447	77	1398	1116	4200	Below criteria

Should you have any questions or concerns, please do not hesitate to contact me.

Claire Kaufman

MEMO

From: Claire Kaufman
Gladman Point (CAM-2), NU
Tel: (600) 701-0484
Fax: (600) 700- 9132
Email: Claire.Kaufman@rmc.ca

Date: Monday, July 25, 2005
ESG-CAM-2-087

To: Alain Dufresne and Gord Beehler
From: Claire Kaufman

Re: **Landfarm: Round One Confirmatory Sample Results**

The ESG has received and processed data for soil samples collected from the Landfarm. A total of 267 samples were collected, including duplicates and scoop blanks. All samples were analyzed for TPH in a southern laboratory.

The Landfarm was divided into two cells based on average soil depths. Cell one had an average soil depth of 0.4 m, while cell two had an average soil depth of 0.6 m. Samples were collected at a depth of 0.2 m in cell one and 0.4 m in cell two.

Sample results were used to determine the 95% upper confidence limit (UCL) for each cell. In order for a cell to be considered clean, the UCL had to be below 2500 ppm. In other words, there had to be 95% certainty that the average TPH concentration in the cell was below 2500 ppm. In addition, a cell could only be deemed clean if no individual sample concentration was above 5000 ppm.

Table 1 summarizes the results for each cell. Cell 2 was divided into two sub-cells in order to decrease the Landfarm area requiring additional remediation. Sample locations, concentrations, and cell layout are presented on the attached maps. Samples that had concentrations over the 2500 ppm criteria are depicted in blue and those under criteria in black. Samples with greater than 5000 ppm TPH are outlined with a rectangle.

Table 1. Landfarm Summary Statistics

Cell	Area (m^2)	Number of Sample Locations	UCL (ppm)	Mean Concentration (ppm)	Maximum Concentration (ppm)	Cleanup Status
1	9514	110	888	760	4700	Below criteria
2.1	6723	105	1355	1127	8700	Above criteria
2.2	3447	77	1398	1116	4200	Below criteria

Should you have any questions or concerns, please do not hesitate to contact me.

Claire Kaufman