

Public Works and Government Services Canada
Northern Contaminated Sites Program

Remedial Action Plan Aklavik, Northwest Territories RCMP Housing Unit – Fuel Spill

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Project Number:

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Date:

March 23, 2012

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March 23, 2012

David Hango, P.Eng.
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Dear Mr. Hango:

Project No: 60223458

Regarding: Remedial Action Plan, Aklavik RCMP Housing Unit – Fuel Spill

AECOM Canada Ltd. is pleased to submit the draft Remedial Action Plan to address a fuel oil spill that occurred at a RCMP residential property in Aklavik, Northwest Territories. We thank you for the opportunity to complete this work on behalf of Public Works and Government Services Canada.

Should you have any questions or require additional information, please do not hesitate to contact the undersigned at (780) 486-7000.

Sincerely,
AECOM Canada Ltd.



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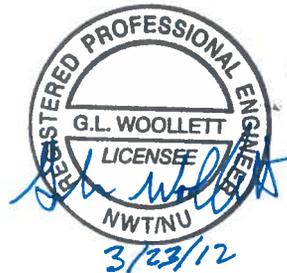
Revision Log

Revision #	Revised By	Date	Issue / Revision Description
1	Jennifer McCallum	October 13, 2011	Draft
2	Gordon Woollett	March 17, 2012	Final

AECOM Signatures

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1. Introduction

AECOM was retained by Public Works and Government Services Canada (PWGSC), on behalf of the Royal Canadian Mounted Police (RCMP), to complete a Remedial Action Plan (RAP) for a residential property within the Aklavik RCMP residential compound.

This report discusses remedial options for site issues identified during the previous site investigation and provides recommendations for the preferred remedial options.

AECOM completed this RAP with the information presented in the previous environmental assessment as well as from interviews with the house occupant and the local contractor who laid the tarps.

Appendices with supporting information are enclosed at the end of the report.

2. Background

The subject property is an RCMP owned residential home located within a residential compound operated by the Aklavik RCMP. It is House Number G037, with Hansen Road to the east and Tornow Avenue to the north. The house is situated between the Aklavik RCMP detachment and another house within the RCMP Housing Unit; the specific location of the Site is presented in Appendix A. The home is located approximately 143 metres (m) from the closest water body the Peel Channel of the MacKenzie River, which is within the MacKenzie Delta. Peel Channel is a known fish-bearing water body (Government of NWT, 2011). As the site is owned by the RCMP, it is under federal jurisdiction. A map of the location is enclosed in Appendix A.

It is understood that that the property sat vacant for a year, but is currently occupied by RCMP staff. It is further understood that in May 2011; a connecting pipe between the heating oil tank and the house broke, spilling approximately 500 litres (L) of heating oil onto the ground. The south side of the house is in a topographical low for the region and the heating oil pooled in the back yard, beneath the deck. The initial spill response utilized a spill kit including sorbent cloths and Microsorb® oil absorbent material. During the initial clean up, the deck was removed and an area where fuel accumulated was excavated, leaving behind a shallow pit of approximate dimensions: 1.82 m (north-south) by 2.05 m (east-west) and approximately 0.2 metres below ground surface (mBGS).

The current occupant moved into the house in July, and noticed strong petroleum odours inside the home. The occupant reported that they could not open their windows as the hydrocarbon fumes would enter the building. It was also reported that the children of the neighbouring house were not allowed to play outside near the house because the odours were so strong. To help mitigate the odours, a local contractor placed tarps over the spill area.

The surrounding land of the subject property is residential properties within the Hamlet of Aklavik, as well as the RCMP detachment, which is directly east of the subject property. The local soil type is dominated by a silty composition. Discontinuous permafrost is expected in the area.

Drinking water is supplied from Peel Channel and treated at a water treatment plant prior to human consumption (Government of NWT, 2010). Potable water is distributed to houses by truck and is stored in holding tanks at each occupied building.

No previous investigations or reports have been completed in relation to the heating oil spill incident at this property.

3. Remedial Protocols

3.1 Assessment Criteria

The general standard for environmental guidelines in the Northwest Territories is the Canadian Council of Ministers of the Environment (CCME) Environmental Quality Guidelines (Soil and Water), updated 2010, as well as the CCME Canada-Wide Standard for Petroleum Hydrocarbons in Soil, 2001.

Based on field observations, the most conservative parameters were selected, residential land use and fine-grained soil (clayey silt).

The applicable water (surface water and groundwater) guidelines are the CCME Canadian Water Quality *Guidelines for the Protection of Aquatic Life* (CCME, 2007). These standards are consistent with those selected for this report.

No pathway exclusions were considered at the time of this report.

Potential exposure receptors on the site include: the occupant of the house, the neighbouring RCMP officers and their families living in the adjacent buildings on the site, the officers and temporary occupants and visitors to the adjacent RCMP detachment, and the residents of Aklavik living in close proximity to the site.

The closest fish-bearing water is the same location as the drinking water source, Peel Channel, which is located approximately 143 m south and east of the site.

Prior to temporary remediation measures, potential exposure pathways were assumed to be: incidental soil ingestion, soil dermal contact, soil particulate inhalation, indoor/outdoor vapour inhalation, potable water, aquatic life, and wildlife water.

No groundwater monitoring wells were installed at the sites, but surface and groundwater samples were obtained during soil sampling.

3.2 Site Specific Remedial Considerations

The following sections provide site specific considerations that have been applied in the development of this remedial action plan.

3.2.1 Site Access

Aklavik is situated on the MacKenzie Delta, and has air-access only in the summer and winter road access in the winter.

3.2.2 Physical Environment Considerations

The key aspects of the environment of the site that could potentially affect remediation strategy are outlined below.

By air, Aklavik is located approximately 60 kilometres (km) southwest of Inuvik, Northwest Territories.

No climate data was available for Aklavik from Environment Canada, but the climate data from Inuvik indicates that the temperatures can fluctuate between 32.8 degrees Celsius ($^{\circ}\text{C}$) in the summer (June and July) to -56.7°C in the winter (February). Precipitation is approximately 248.4 millimeters (mm) per year with 117 mm per year of rain and 1,679 mm of snow annually. Wind is generally from the east or the northeast and the average speed is 9.7 kilometres per hour. (Environment Canada, 2000)

Aklavik is situated on the MacKenzie delta, which is a complex network of peat-covered deltas and fluvial marine deposits between a multitude of lakes and flowing channels (Environment Canada, 1999). The vegetation is typical of the transition between Boreal Forest and Arctic Tundra: open lichen and black spruce forests. (Agriculture and Agri-Food Canada, 2008). According to the system of Canadian Ecological Framework of Canada, Aklavik lies within the MacKenzie Delta of the Taiga Plains Ecozone. (Environment Canada, 1999)

Although the dominant vegetation is listed as open, stunted stands of black spruce and tamarack, the dominant tree species in the Aklavik town site are healthy, deciduous trees (aspen and poplar). Some white spruce are found in the area, and a ground cover mixture of dwarf birch, willow, berry-producing shrubs that prefer acidic soil (bearberry, cranberry, blueberry, etc.), cottongrass, along with a variety of lichens and mosses are commonly found. (Environment Canada, 1999)

Because of the extensive coverage by wetlands and water channels, Regosolic Static and Gleysolic Static Cryosols with Organic Cryosols are the dominant soils, with fairly level topography. The soil parent material, as previously mentioned, consists of fluvioglacial, organic, and marine deposits, due to the delta and watercourse patchwork. Extensive discontinuous permafrost is present through the ecoregion, generally exhibiting low to medium ice content, characterized by sparse ice wedges. (Environment Canada, 1999)

The general ecozone description for wildlife in the region includes muskrat, beaver, mink, and waterfowl, but local sources also indicate that caribou (woodland and barren-ground), muskox, grizzly bear, black bear, polar bear, arctic fox, red fox, coyote, cougar, Canadian lynx, wolverine, grey wolf, wood bison, moose, wapiti (elk), deer (mule and white-tailed), Dall's sheep, snowshoe hare, Arctic hare, North American river otter, woodchuck, marten, fisher, striped skunk, voles (singing, tundra, meadow, Taiga, northern/southern red-backed, eastern heather), ermine, least weasel, bats (little brown, northern myotis, hoary), lemmings (nearctic collared, brown Richardson's collared, northern bog), shrews (Arctic, masked, American pigmy, dusky, American water, Tundra), squirrels (Arctic ground, red, northern flying), least chipmunk, collared pika, mice (American meadow jumping, North American deer), North American porcupine, and northern fur seal. (Government of NWT, 2011)

Birds and reptiles include: owls (Boreal, short-eared, long-eared, great horned, great grey, northern hawk, barred), northern goshawk, golden eagle, hawks (sharp-shinned, red-tailed, rough-legged, Swainson's, broad winged), merlin, peregrine falcon, gyrfalcon, grouse (ruffed, spruce, dusky, sharp-tailed), American crow, common raven, yellow rail, trumpeter swan, pileated woodpecker, ptarmigan (willow, white-tailed, rock), various gulls, woodpeckers (black-backed, American three-toed, downy, hairy), various blackbirds, various waterfowl (ducks, geese, sandpipers, etc.), various songbirds. (Government of NWT, 2011)

Local fish include: suckers (longnose, white, largescale), cisco (lake, Arctic, bering, least, shortjaw), whitefish (lake, broad, mountain, round), sculpin (slimy, spoonhead, deepwater), lake chub, flathead chub brook stickleback, Northern pike, pond smelt, rainbow smelt, American brook lamprey, arctic lamprey, burbot, peamouth, emerald shiner, spottail shiner, salmon (pink, chum, coho, sockeye, Chinook), trout (rainbow, lake, bull), yellow perch, trout-perch, finescale dace, ninespine stickleback, longnose dace, Arctic char, dolly varden, walleye, inconnu, and Arctic grayling. (Government of NWT, 2011)

Expected reptiles in the ecoregion include: wandering garter snake, long-toed salamander, western toad, wood frog, and Boreal Chorus frog. (Government of NWT, 2011)

Land uses are: trapping, hunting, recreation, and tourism.

According to the 2006 census, the Hamlet of Aklavik is occupied by approximately 594 people (Hamlet of Aklavik, 2009). The RCMP site is situated in the southwest end of Cape Dorset. Residential subdivisions are located to the north/northwest, west and the south; while the staging area for the local contractor's borrow material is directly across the street to the east, sitting on the shoreline of Peel Channel.

The local people in Aklavik use the local flora and fauna as sources of traditional food, clothing and art, so the protection of the natural environment (land and water) is of utmost importance.

3.2.3 Archaeological Features

No research into archeological resources has been identified in previous investigations, and the duration of the operation of the facility and length of time that existing buildings have been in place has not been established. It is anticipated that remediation efforts required will be restricted to the existing disturbed footprint, so no additional investigation of potential archaeological resources will be required.

4. Phase II Environmental Site Investigation

AECOM completed an environmental assessment of the spill area; the draft results from this assessment were presented in an AECOM correspondence letter dated October 13, 2011. A copy of the final version of this assessment report is included in Appendix B of this document. Findings from this assessment are re-produced in the following sections. Figures 1-3 in Appendix A show the study site as well as the contaminated area.

Beneath the House

Samples from beneath the house were analyzed for petroleum hydrocarbons (PHC) concentrations and the shallow sample from TH11-22 (immediately southwest of the tank) exhibited exceedances of ethylbenzene and F2 above the CCME guidelines for fine-grained soil on residential properties. The sample from TH11-22 collected at a depth of 0.3 mBGS was below CCME guidelines. For the remainder of the samples from beneath the house, BTEX parameters were below detectable limits, but detectable concentrations for F2 to F4 were noted. It should be noted that due to the limited space beneath the house, soil samples could not be obtained at the level of permafrost.

Beneath the Tank/SE Corner of Site

Although odours were detected from TH11-01 at both depths and a PHC sheen was noted on groundwater, the soil results indicated exceedances of toluene and ethylbenzene only from the sample at 1.35 mBGS. The sample from 0.4 mBGS was within CCME guidelines. It is understood that the near surface materials below the tank may have been removed and replaced with clean fill after the spill occurred.

Samples from both the surface and permafrost depths at TH11-02 exceeded CCME guidelines for toluene, ethylbenzene, xylenes and F2 PHC, while only the deep sample (1.3 mBGS) had an exceedance for benzene and F1 PHC. Due to the depth of contamination extending to permafrost in TH11-01 and TH11-02, it is conservatively assumed that the depth of contamination in the impacted area extends to permafrost across the entire impacted area. Based on the location of the delineation boreholes, there is approximately 180 cubic metres (m³) of contaminated soils at this location. Figure 3 in Appendix A shows the approximate extent of soil contamination above CCME criteria.

During the completion of the field program, very wet and soft conditions were noted in the impacted areas located south of the building.

Indoor Air Quality

Noticeable hydrocarbon odours were observed outside the residential home and laboratory results indicated that detectable concentrations of petroleum hydrocarbons were noted in the indoor air quality samples. This data cannot be conclusively linked to the heating oil spill, but are a likely contributing factor. An assessment of the potential human health risk associated with the analytical results was not within the scope of this assessment.

Implementation of Temporary Exposure Mitigation Measures

To assist in reducing the level of hydrocarbon odours present outside of the residential homes, a local contractor was hired to import and place fill on top of the existing liner as well as extending into areas further to the east and south. Approximately 11 m³ of fill was placed over the south end of the site. The entire suspected contamination zone was eventually completely covered by material.

Conclusion

Residual contamination from the heating oil spill is evident at the south end of the residential property. Petroleum hydrocarbon concentrations exceeding CCME guidelines were noted beneath the house at 0.3 mBGS. The contamination appears to be concentrated off the southeast corner of the Site and within the property boundary. Contamination in the southern yard of the house extends vertically from the surface to the depth of permafrost. The extent of vertical delineation efforts terminated at the depth of the permafrost. Based on the results of this investigation there is approximately 180 m³ of contaminated soil at this location. The investigation also identified that hydrocarbons were present in the water located in the contaminated soils and that detectable hydrocarbon constituents were identified in air samples collected inside the residential home. Based on the results of this investigation, it was recommended that the contaminated material at this Site be remediated to residential standards.

5. Project Assumptions and Challenges

The following table is a list of assumptions made in the completion of this Remedial Action Plan for the Aklavik RCMP Property.

Table 1. Project Assumptions

Assumption	Potential Issue
Permafrost is extent of depth of contamination	No samples were obtained below the depth to the permafrost since the soil sampling program was completed with hand tools. The permafrost layer would be a likely boundary, but the potential for fracturing was not investigated.
Local site groundwater flows to the southwest	Groundwater is assumed to be following the topographical pattern of the site. The presence of impacted groundwater and soil southwest of the tank is the premise for the assumption that groundwater flows southwest. Impact was not identified in the testholes southeast or south of the tank. This assumption is based on the limited observations obtained during one site visit.
Residual contamination is a result of the heating oil spill	Documentation has not been provided indicating as much, but a fuel tank farm was apparently formerly located north of the subject property.
Sufficient borrow material is locally available	Material to fill excavations or suitable cover material may be required for remediation at this site, depending on the selected strategy. Based on the discussions with a local contractor, it will be assumed that a source of suitable borrow material will readily available, if required.
Surface water pathway not considered	Because the heating spill issues appeared to be limited to the local site, the relative small size of the spill, and the assumption that local groundwater flows to the southwest, no water samples were obtained from the closest surface water body, Peel Channel.
Excavation of soil to permafrost will not lead to melting of permafrost or destabilization of adjacent buildings	House pillars have been installed into the permafrost layer (depth unknown) Fill will need to be placed immediately following excavation to facilitate maintaining the stability of the residence. Provided that this work is completed during cool (but not solidly frozen) temperatures, house destabilization should not be an issue.

The following table is a list of potential challenges facing remediation work required for this project

Table 2. Project Challenges

Project Challenges	Proposed Mitigation Strategy
Overhead power lines may restrict access	The site has several access points. Contractors will need to be aware of overhead power line locations. Utilities should be located and every person driving equipment on the site should be warned of this safety hazard.
The silty soil and the location of the site in a saturated topographical low will make the mobilization of heavy equipment on this site extremely difficult.	Local contractors who are aware of the challenges with the local soil conditions should be used for this project. Any excavation and soil placement will need to occur when the soil is not at its most saturated point, nor if frozen, and smaller equipment may be required.

6. Discussion of Proposed Remediation Strategies

Potential remedial strategies include:

1. Excavation
2. Risk Management Plan
3. In-situ treatment

Due to the remoteness and northern latitude of the site, limited remediation options are feasible to mitigate contamination issues at the subject property. The primary remediation option for consideration at the subject property would be to excavate the contaminated soil and re-fill the excavation with clean, local fill material. The two sub-options for consideration would be whether to excavate beside the house only or to including the portion beneath the house.

Consideration to leaving the impacted material as is and formally capping the contamination were dismissed because, of the proximity to human exposure pathways, the potential for ongoing issues and complaints with the presence of fuel odours around the home and the fact that the contamination has been spreading (not localized to the location of the heating oil tank) due to flooding, through both soil and groundwater. In-situ treatment, such as through an oxidation process (treating the site with hydrogen peroxide) is another potential remedial option; however due to location of the contaminated material below the building, not all of the impacted materials may be accessible or quickly treatable in an in-situ process.

The impact at the subject property has been demonstrated to continue from the surface to the permafrost layer beneath the property. Approximate dimensions of the area outside the house affected are:

- Depth: 1.3 m (approximated – 1.35 was deepest part – most was 1.2-1.3 - to permafrost)
- Length: 15 m
- Width: 9 m (the south line of confirmatory samples was approximately 9 m south of the house)

Estimated Volume of Contamination Beside the House: 170 m³

The area beneath the house potentially affected is:

- Depth: Two scenarios: 0.3 m, 1.3 m (Unknown; possibly surficial, possibly to permafrost).
- Length: 8 m
- Width: 1 m (between 0.65 m to 1.19 m from the end of the house)

Estimated Volume of Contamination Beneath the House: 2 m³ to 10 m³.

Total Conservative Estimate of Contaminated Soil at the RCMP Residence: 180 m³.

Excavation immediately adjacent to the building would be possible, but the effect of excavating below the building is unknown. It is also unknown whether the pilings of the house would remain stable with the silty soil conditions if the excavation is completed adjacent to the house. In the event the piles below the house were not installed to a sufficient depth, there is the potential that the south side of the house could slump if material was excavated beside or beneath the building. Prior to recommending excavation as a strategy beneath the building, it would be prudent to determine the depth of the piles, the structural stability, and overall extent of impact beneath the building. Assuming that the contamination below the building is limited to the surficial soil, excavating the surficial material within the zone of contamination would not be much of a challenge, but if contamination extends to permafrost, structural issues could potentially occur.

Since the excavated area may not be backfilled with the same material that is removed, it is recommended that rigid insulation be installed in the excavated areas to help provide thermal protection to the underlying permafrost. The provision of shade screens during the excavation program will also help prevent the underlying permafrost from melting after the excavation of the impacted materials is completed and prior to backfilling.

The presence of PHC in the wooden pillar and cribbing on the southeast corner of the house will not likely pose enough of an exposure risk to be worth mitigating (no strong odours from pillar) and can be left as is.

Contaminated soil and residual materials from the spill response would be packaged and hauled off-site on the winter road to be disposed at a southern landfill.

7. Assessment of Remedial Options

A general discussion of the pros/cons of the remediation strategy is outlined below.

Table 3. Assessment of Excavation and Removal from Beside and Beneath the House

Pros	Cons
A permanent solution to exposure hazards.	Excavation, hauling and disposal costs will be high.
Potential for involvement of local contractors, as required equipment exists in Aklavik.	Could result in the generation of contaminated water, which will also require disposal.
Community perception that RCMP is addressing issues.	Still a potential issue that the house foundation will not remain stable; occupant may need to vacate property prior to work.
Temporary disruption of RCMP residences (noisy for less than one week).	Backfill material will be required, of which the geotechnical conditions have not been assessed (have to use what is readily available).
	Excavation may be a temporary safety hazard.
	Results of confirmatory sampling required prior to backfilling excavation.
	Costs may be higher than estimated, due to lack of vertical delineation beneath the house.
	May not be able to get all of the contaminated material from beneath the house, due to stability issues.
	Fill material may settle over time and require maintenance and additional fill over several years.

While a straightforward response is recommended, the strategy is not without its challenges. Soil stability may be an issue, but excavation could be completed in stages, in order to minimize the amount of permafrost uncovered below the building. The permafrost layer does provide a natural vertical boundary to the material (frozen soil inhibits infiltration), so the depth of excavation should be well-defined and backfill could begin immediately. The water table is shallow (at 0.6 mBGS the soil was wet), so the infilling of contaminated water may be a potential issue. Depending on the amount of water that flows into the open excavation, pumps may need to be on hand and the water would have to be placed in barrels and shipped off-site.

The volatile nature of the contaminating constituents makes delineation easier, as the soil odours are indicators of the presence of contamination. Thus, vertical delineation can be completed beneath the southeast corner of the house quite easily and the estimated zone of contamination is conservative, so if a qualified Environmental Specialist is monitoring the progress, delineation should be quick and backfilling can commence shortly.

Due to the remote location of Aklavik and the offsite trucking limited to the winter road, consideration should also be given for the separation of the remedial program into two separate phases or contracts. These two phases include:

- Excavation of contaminated soils, containerization of the waste, supply and place backfill material
- Transport containers of contaminated soils offsite.

The excavation and backfilling portion could be completed by Aklavik based contractors; however, they would need to supply suitable storage containers for the storage and hauling of the contaminated soils. It is recommended that bulk storage bags (1 m³ capacity) designed for handling contaminated soils be utilized. The offsite hauling could be completed by a separate contractor.

8. Summary

The heating oil spill on the subject property is considered to be the most probable source of the PHC odours evident at the property; soil and water testing results indicate that benzene, toluene, ethylbenzene, xylenes, F1-F2 PHC impact is evident on the property.

From the indoor air quality monitoring results, VOC vapours were detected in samples obtained from the main floor living room area and upper floor living room area. It should be noted that these results capture the site conditions of the air quality at a single point in time.

The selection of the remedial strategy to address contaminated soils was formulated based on information obtained from one site visit and a limited sampling program. Despite the limited investigation, horizontal delineation south of the house has been achieved and the issue appears to be limited to the immediate vicinity of the source of the heating oil spill. Contaminated soil and groundwater were documented at the site location, from surface to the permafrost layer, which is 0.9 to 1.62 mBGS. Shallow soil contamination was noted beneath the house at the southeast corner, but no samples below 0.5 m were obtained or field screened, due to limited range of motion beneath the house. The testhole pattern indicates that contamination appears to have migrated to the southwest, and therefore the area beneath the house is not likely to be heavily contaminated, but this cannot be completely ruled out.

The estimated volume of impacted soil was determined to be approximately 170 m³ beside the house, and up to 10 m³ beneath the house, depending on whether or not contamination extends to the permafrost beneath the house.

Based on the estimated volumes of contaminated soils, constituents of concern, and the disposal facilities available, it is recommended that the contaminated soil beneath and beside the house be removed (excavated) and transported off-site for disposal. This strategy will fully mitigate the exposure issues affiliated with the contamination. Due to the absence of a year round highway connection, the contaminated soils may need to be stored onsite and hauled to an approved facility once the winter road to Aklavik opens.

9. References

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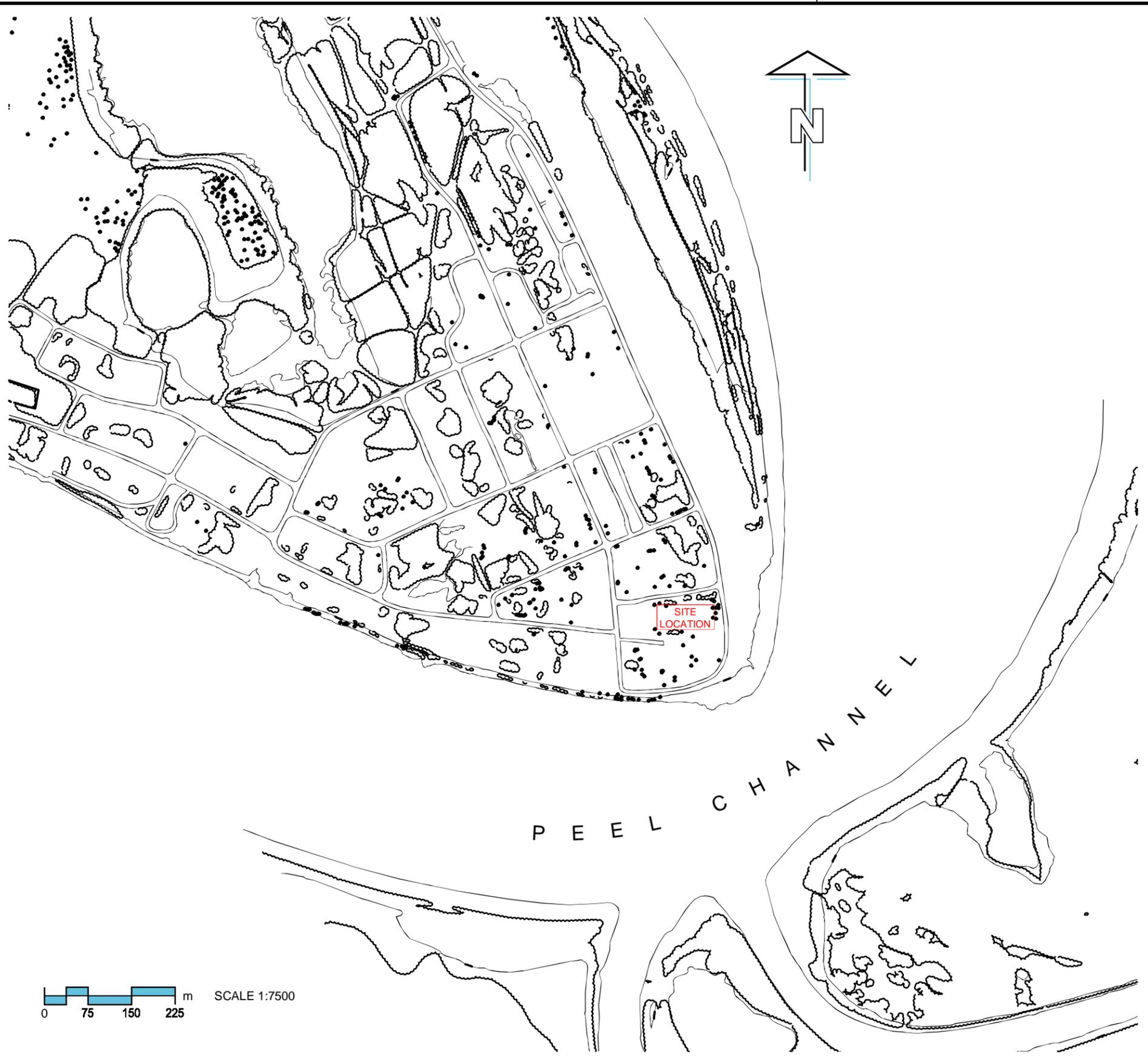
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Government of Northwest Territories, Environment and Natural Resources. *Species at Risk in the Northwest Territories*, 2011. Available online: <http://www.nwt-species-at-risk.ca>

Appendix A

Figures

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KEY PLAN
SCALE: NTS

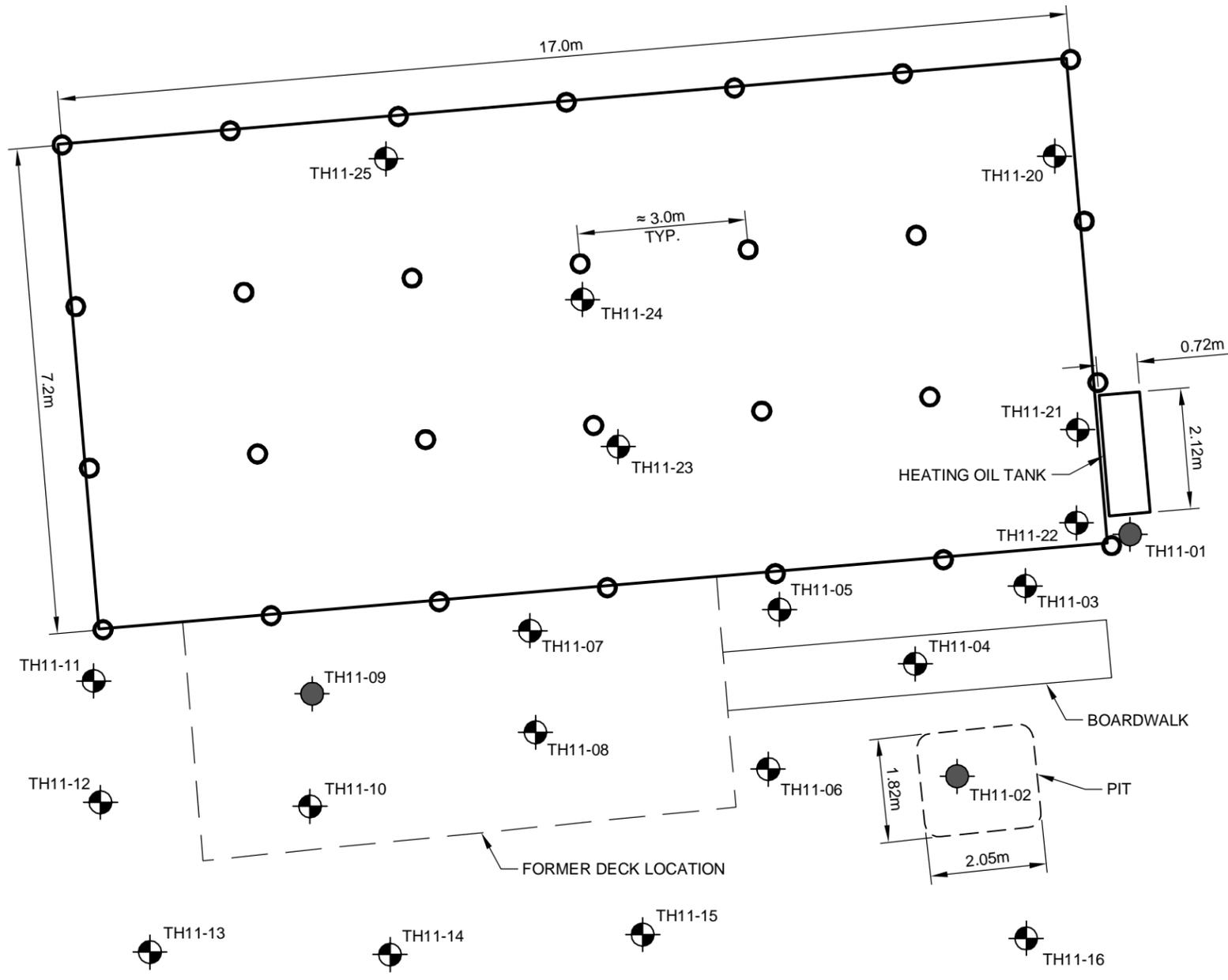
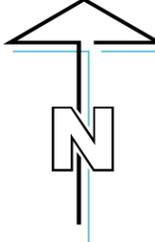
Public Works Government Services Canada
Aklavik RCMP Housing Unit - Fuel Spill

Site Location Plan



Figure 1.0

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LEGEND:

- TH11-XX TESTHOLE LOCATION
- TH11-XX WATER SAMPLED TESTHOLE
- HOUSE PILLAR LOCATION

NOTE:

NOT TO SCALE

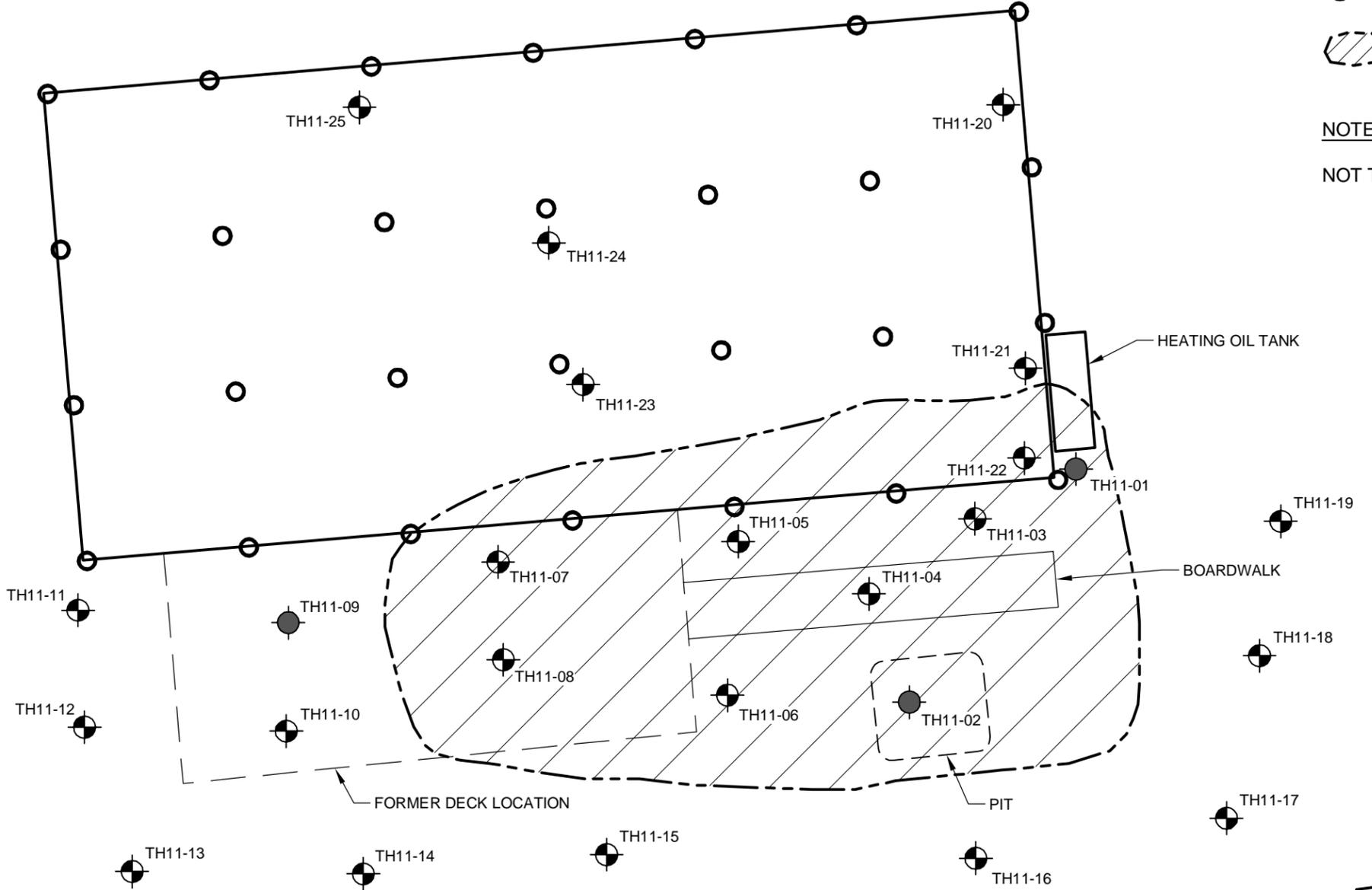
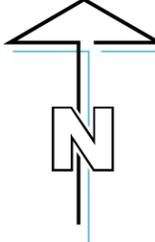
Public Works Government Services Canada
Aklavik RCMP Housing Unit - Fuel Spill

Testhole Location Plan



Figure 2.0

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LEGEND:

- TH11-XX TESTHOLE LOCATION
- TH11-XX WATER SAMPLED TESTHOLE
- HOUSE PILLAR LOCATION
- ▨ ESTIMATED ZONE OF CONTAMINATION

NOTE:

NOT TO SCALE

Public Works Government Services Canada
Aklavik RCMP Housing Unit - Fuel Spill

**Estimated Zone Of
Soil Contamination Plan
Figure 3.0**



Appendix B

AECOM Site Assessment Report

March 23, 2012

David Hango, P.Eng.
Environmental Engineer
Public Works and Government Services Canada
5th Floor, Telus Tower North
10025 Jasper Avenue
Edmonton, AB T5J 1S6

Dear Mr. Hango:

**Regarding: RCMP Housing Unit – Heating Oil Spill, Aklavik, NT
Site Assessment Report**

Introduction

The purpose of this letter is to present the results of a Phase II Environmental Site Assessment (ESA) completed at the RCMP Housing Unit in Aklavik, Northwest Territories. The purpose of the assessment was to assess the impacts from a heating oil spill and to delineate subsurface hydrocarbon contamination as well as to monitor indoor air quality inside the adjacent residential home owned by the RCMP (Site). The house is situated between the Aklavik RCMP detachment and another house within the RCMP Housing Unit; the specific location of the Site is presented in Appendix A.

Background Information

It is understood that a heating oil spill had occurred in May, 2011 due to a break in a heating oil line between a heating oil tank and the adjacent house. It was estimated that approximately 500 litres (L) of heating oil spilled onto the ground. Attempts were made to collect as much of the heating oil as possible; however, heating oil apparently flowed along the topography to a low-lying area on the south side of the house. Observations indicated that the spill flowed beneath a deck along the south end of the house, particularly in the southeast corner. Following the spill, the deck was removed and the largest puddle of heating oil was scooped out and removed from the site, leaving a shallow pit.

The current occupant moved into the house in July, but the hydrocarbon odour was strong and due to the odours, the occupants were unable to keep their windows open. The occupants of the house to the west of the Site also found the odours intolerable and kept their windows closed and children inside. Occupants of the home have complained of the presence of heating oil odours inside the house. Due to the location of the spill, it is possible that the heating oil may have migrated below the home. It is understood that after the spill occurred the area flooded during the spring snow melt. This flooding helped to spread the remaining heating oil to other areas surrounding the Site.

It is understood that a local contractor (K&D Contracting) was hired to cover the spill area with two tarps over the former deck area to help mitigate the odours originating from the heating oil spill and contaminated soils. A spill kit had been mobilized around the time of the spill and the sorbent material was placed in soil bags, along with the contaminated soil that had been removed; these soil bags were later moved to a storage area on the RCMP property (away from residences). Photographs indicating the site condition were also provided for review by AECOM. It is our understanding that no significant investigation or remedial action has been completed on the site at this time.

Potential Issues

- An undetermined amount of heating oil remains on the property, possibly having infiltrated the soil and groundwater
- The spill potentially extends beneath the house, which creates challenges and limitations for remediation options and increases the potential for human health hazards
- Area of spill has been flooded, which has in turn potentially dispersed or increased the impacted area
- Field program needs to be completed as soon as possible in order to complete the remedial program this calendar year

Scope of Investigation

The scope of work of this investigation included:

A) Phase III ESA

- Confirm if any underground utilities are present in the study area.
- Collect sufficient soil samples in order to delineate (both vertically and horizontally) the hydrocarbon contamination on the site. Soil samples will be analyzed for BTEX and F1-F4 hydrocarbon fractions.
- Soil samples will be screened for hydrocarbon vapours using an Eagle 2 hydrocarbon surveyor.
- If present collect surface water samples to determine if water located in the active layer has been impacted from the release.
- While onsite, the field team would evaluate remedial technologies that would be suitable in the Community, identify potential local borrow sources and potential remedial contractors/heavy equipment.
- Make field observations to determine how the home is structurally supported and if there are any structures/tanks that may require relocation as part of a future remedial program.
- Determine if the structural supports have been impacted by the release of heating oil.
- While onsite determine if any mitigative measures could be implemented in order to help reduce the hydrocarbon odours that present around the site.

B) Indoor Air Quality Monitoring

- The air vapour sampling program will consist of air quality samples collected over a 24 hour period. Two sample locations will be monitored in the living area. The field program will also include the collection of one field duplicate and one trip blank for quality assurance and quality control (QA/QC) purposes. Samples will be collected in Summa canisters and analyzed for speciated volatile organic compounds (VOC). A PID monitor will be used to determine the key areas within the house that samplers should be stationed.
- This scope of work is a screening air quality assessment. Only the results will be provided, and no conclusions based on human health risk assessments are included in the scope. If any results are found to be above the non-detectable levels, an additional scope and budget can be provided for

further assessment of the results, a human health risk assessment with appropriate calculations and/or any additional monitoring requirements.

This letter presents the results of the Phase III ESA, the indoor air quality assessment will be submitted under separate cover. The field component for this assessment was completed between Sept 9 and Sept 11, 2011.

Methodology

A) Phase III ESA

The following paragraphs present a summary of the methodologies used to collect the field data in the Phase III ESA assessment.

Samples were obtained from each testhole location using a hand auger, shovel and/or trowel. Clean disposable gloves were used when handling soil from each testhole. Samples were placed from the hand auger/shovel at given depths into clean bags and were jarred immediately. The remaining material was sealed in bags, from which organic vapour compound (OVC) readings were obtained after samples were heated in the cab of the rented vehicle. OVC readings were obtained using an Eagle 2 multi-gas detector, calibrated to hexane. The maximum reading was recorded for comparison.

Soil samples from beneath the house were obtained through crawlspace access (approximately 0.6 to 1.0 metres (m) high) and a trowel was used to dig samples from the surface and just below the surface at several locations along the east side of the house north of, adjacent to, and south of the heating oil tank location.

Three locations were testpitted to the permafrost and samples were obtained from the groundwater. Groundwater (water in active layer) samples were obtained by collecting water that seeped into the testpits from two locations and one sample of surface seep was obtained from the water sitting in the excavated pit. Monitoring wells were not installed in this assessment.

A table outlining the results of the soil sampling event is enclosed at the end of this letter.

B) Indoor Air Quality Monitoring

The method to collect the indoor air samples included the following tasks:

- Collection of a 24 hour time weighted average sample in two locations
- Sample collection started on September 9th, 2011 at 6:45 pm and finished on September 10th, 2011 at 6:45 pm
- Collection of air monitoring samples at two indoor air monitoring locations: main floor living room area and upper floor living room area
- Implementation of the EPA TO-15 reference method using summa canisters with low flow controllers
- Analysis of TO-15 listed compounds and naphthalene
- Implementation of the following QA/QC measures:
 - Collection of one field blank and one field duplicate sample
 - Handling of field air samples with disposable, powder-free nitrile gloves
 - Temporarily storing samples and media inside dedicated coolers, in a contaminant-free environment, void of all chemical substances
 - Transporting samples in a well-maintained, smoke-free vehicle
 - Documentation of all sample data and environmental conditions observed during the setup and collection

Sampling locations were selected based on proximity to the fuel spill and discussions with the residential property occupant. Impacted soil was noted to be on the south side of the property. Main floor and upper floor windows on the south side of the house provide direct route of entrance for petroleum hydrocarbon (PHC) odours. Therefore, the main floor living room area in the southwest corner of the house closest to the location of the impacted soil was chosen as a monitoring location. A duplicate sample as part of the QA/QC measures was also obtained at this location. In addition, a second monitoring location was selected in the upper floor living room area, which is directly above the main floor living room.

It should be noted that certain household cleaning products (i.e. Pledge, Lysol disinfecting spray, spot removers, floor cleaners/polishes, toilet bowl cleaners, and deodorizers) may contain VOCs and naphthalene that could contribute to a false positive for air monitoring results. Therefore, such products are not to be used within 24 hours prior to sampling of indoor air. The house occupant was notified in advance not to carry out any house cleaning activities that may result in using such products. However, one of the bedrooms on the upper floor had a wooden frame bed that had the varnish smell. The door for this room was kept closed for the entire sampling period.

Summary of Results

The following sections provide a summary of the field observations and analytical data for the items that were assessed in this assessment. Figure 1 in Appendix A presents the location of the testpits. Table 1-3 presented in Appendix B presents a summary of the analytical results. A copy of the Maxxam lab results is presented in Appendix C.

Soil

A total of 25 testpits/hand auger testpits were excavated around the heating oil tank, spill area as well as below the adjacent building. Table 1 presents a summary of the analytical test results.

Soil samples TH11-01 – TH11-06 were collected in the area of the heating oil tank as well as in area where the heating oil was reported to have pooled (of SE corner of house). Testhole TH11-01 was located from directly beneath the tank, while TH11-02 samples were obtained from the pit remaining following the excavation of the pooled heating oil at the low point in the yard.

Testholes TH11-07-TH11-10 were collected below the area where the deck was formerly located. Testholes TH11-11- TH11-13 were situated to help provide delineation to the west (along the property line), Testholes TH11-14- TH11-17, delineation to the south and TH11-17-TH11-19 were collected to delineate to the east. Soil samples TH11-20 through TH11-25 were collected from the crawl space below the residence.

Field observations indicated that the contamination was strongest just below the surface (0.3 to 0.5 metres below ground surface (mBGS)) and at the depth of the permafrost (0.9 to 1.62 mBGS). The outer ring of delineation samples were obtained at the level of the permafrost. Field observations did not indicate that the plume continued west of the property line towards the adjacent house, so sampling terminated at the property boundary (field marker indicated boundary, as well as an elevational difference).

Soil samples were obtained beneath the house through crawlspace access (approximately 0.6 to 1.0 m high) and a trowel was used to dig samples from the surface and just below the surface at several locations along the east side of the house north of, adjacent to, and south of the heating oil tank location.

The soil beneath the house was slightly lower in elevation than the soil around the heating oil tank; therefore, there is the potential that heating oil may have pooled around the base of the house. Due to the height restrictions in the crawl space as well as the presence of permafrost beneath the house, sampling was limited to the top 0.3 m of material. Field observations consisting of hydrocarbon odours were made below the home, particularly around the house support pillar wells (indentations in soil around pillars). Cracks were noted in the soil beneath the house, particularly on the west side of the house, but PHC odours were not indicated along the centre and west ends of the house.

A fuel tank was noted affiliated with the adjacent RCMP detachment east of the subject property. Samples in the vicinity of this tank (TH11-17 and TH11-19) did not lead to any field observations of suspected impact relating to either the heating oil spill or the fuel tank.

Soils around the site consisted of the following:

- Very dense compacted gravel (parking area) on the east side of the house
- Clayey to sandy silt over the majority of the site (and below the compacted gravel on the east side of the house).and organic-y silt below the house

As indicated in Table 1, exceedances above Canadian Council of Ministers of the Environment (CCME) Residential criteria (fine grained) soils were identified in TH11-02, 03, 04, 05, 06, 07, and 08. Delineation was achieved in TH11-09, 20, 21 and 24. It should be noted that hydrocarbon contamination was identified down to the depth of permafrost in TH11-01 and TH11-02.

Water

Three water samples were obtained from the property; two from the water that seeped into testpits (TH11-01 and TH11-09) and one from the surface water that was located in the existing pit (location of TH11-02). Observations indicated the water seeped into the test pits at approximately 1 to 1.3 mBGS (elevation of permafrost). The water samples were recovered in laboratory-supplied bottles. Table 2 in Appendix B presents the data from the analyzed water samples. As indicated in this table, exceedances of CCME criteria for Aquatic Life were identified in sample from the groundwater at TH11-01.

Building Materials

The structural supports for the residential home consist of wooden timber piles. Four parallel rows of piles are located below the building; these piles consist of wooden logs of an approximate diameter of 0.3 m. The logs were bolted to the wooden cribbing supporting the house. Upon visual inspection, the cribbing was in reasonable shape; piles looked stable and the cribbing was not buckling at any location. Additional reinforcing wood did not appear to be sufficient in the event that the piles failed (thin lumber), but the requirement for this back-up was not likely any time in the near future. Along the west and northeast corners of the house, wire mesh covered the access to the crawlspace, but the remainder of the area beneath the house was easily accessible (domestic dog noted under the house at one point). A portion of the area beneath the house was used for storage of building materials.

Field observations below the building identified that some piles were observed to have potentially adsorbed some of the heating oil (inconsistent colouration – i.e. not all creosote treated). Wood shavings from one pile and the wooden cribbing located near the heating oil tank were collected and analyzed for BTEX and F1-F4 hydrocarbon fractions. Table 3 in Appendix C presents that analytical data from the analyzed wood samples.

As indicated in this table, high levels of hydrocarbons including: toluene, PHC fraction 2 (F2), and fraction 3 (F3) were identified in the analyzed wood sample.

Indoor Air Quality

During the sampling event, hydrocarbon odours were persistent at the contaminated area outside the house. However, no such odours were detected inside the house. Meteorological conditions for the Inuvik Airport meteorological station were downloaded from the Environment Canada website. During the 24 hour sampling period, average ambient temperature was 4.2 degrees Celsius (°C) and ranged from 1.4 °C to 7.5 °C. Average wind speed was observed to be 8.6 kilometres per hour (km/h) and predominantly from the northeast and southeast quadrants.

Table B4 in Appendix B presents the air quality results; copies of the laboratory reports are included in Appendix E. Table 1, provides a summary of the monitoring results for the parameters that were detected.

Table 1 - Indoor Air Quality Monitoring Results

Parameter	Sample	24 Hour Average Concentration ($\mu\text{g}/\text{m}^3$)
1,2,4-Trimethylbenzene	Main Floor Living Room	LDL
	Upper Floor Living Room	5.7
2,2,4-Trimethylpentane	Main Floor Living Room	1.7
	Upper Floor Living Room	1.6
2-Propanone	Main Floor Living Room	8.7
	Upper Floor Living Room	20.5
Chloroform	Main Floor Living Room	LDL
	Upper Floor Living Room	1.8
Chloromethane	Main Floor Living Room	0.9
	Upper Floor Living Room	1.1
Dichlorodifluoromethane (Freon 12)	Main Floor Living Room	5.0
	Upper Floor Living Room	6.3
Ethanol	Main Floor Living Room	96.0
	Upper Floor Living Room	835.0
Ethylbenzene	Main Floor Living Room	LDL
	Upper Floor Living Room	1.6
Heptane	Main Floor Living Room	LDL
	Upper Floor Living Room	1.3
Toluene	Main Floor Living Room	1.2
	Upper Floor Living Room	3.5
Trichlorofluoromethane (Freon 11)	Main Floor Living Room	10.3
	Upper Floor Living Room	22.3
Xylenes	Main Floor Living Room	LDL
	Upper Floor Living Room	6.5

'LDL' – Lower than detection limit

Discussion

Beneath the House

Samples from beneath the house were analyzed for PHC concentrations and the shallow sample from TH11-22 (immediately southwest of the tank) exhibited exceedances of ethylbenzene and F2 under the guidelines for the CCME guidelines for fine-grained soil on residential properties. The sample from 0.3 mBGS came back within CCME guidelines. For the remainder of the samples from beneath the house, volatile PHC constituents were below detectable limits, but detectable concentrations for F2 to F4 were noted. It should be noted that the soil beneath the house had a high organic content, which could account for a portion of the F3 values.

Beneath the Tank

Although odours were detected from TH11-01 at both depths and a PHC sheen was noted on groundwater, the soil results indicated exceedances of toluene and ethylbenzene only from the sample at 1.35 mBGS. The sample from 0.4 mBGS was within CCME guidelines.

Samples from both the surface and permafrost depths at TH11-02 (the pit) exceeded CCME guidelines for toluene, ethylbenzene, xylenes and F2 PHC, while only the deep sample (1.3 mBGS) had an exceedance for benzene and F1 PHC.

Samples exhibiting impact were noted almost across the southern end of the site. Samples from testpit TH11-09 came back clean, so somewhere between TH11-08 and TH11-04 would be the western extent of the contamination. Samples from TH11-04 to TH11-16 (all below guidelines) confirm the southern extent of the plume. Samples from TH11-17 and TH11-19 clarify delineation of issues to the east.

Knowledge Gap

Because of the limited space beneath the house, samples were not obtained at the level of permafrost. It is unknown whether the groundwater has been impacted by the PHC spill beneath the house.

Implementation of Temporary Exposure Mitigation Measures

To keep odours down and protect human health from PHC vapour exposure, the tarps were returned to the ground surface at the south end of the property and then backfilled with a mix of borrow material: cobbles, gravel and sand. The final depth was approximately 0.3 m and approximately 11 cubic metres (m³) were spread over the south end of the site. A finer layer could not be spread because of the wet and silty nature of the ground surface not being conducive to supporting heavy equipment; fill could be dumped but not handled much or equipment would get stuck. The entire suspected contamination zone was eventually completely covered by material.

Summary of Disposal Options

The soil sample with the greatest criteria exceedances (TH11-02 PIT at 1.3 mBGS) was submitted for analysis of metals and BTEX leachability as well as flashpoint. The only metal parameter above the detection limit was iron. Toluene, Ethylbenzene and Xylenes were above detectable concentrations in the laboratory samples, while benzene was non-detectable. The flashpoint was greater than 61°C. In all, the results of the landfill disposal package indicated that many transportation and disposal options should be available for addressing the petroleum impacted soil at this site. The landfill disposal results are presented in Table B5.

Summary and Recommendations

Residual contamination from the heating oil spill is evident at the south end of the property at the RCMP-owned house in Aklavik. No PHC concentrations exceeding CCME guidelines were noted beneath the house at 0.3 mBGS, but surficial issues were identified; it is unknown whether the contamination reaches the depth of the groundwater or permafrost beneath the house. The contamination appears to be limited to the property boundary, with the most contaminated area being the southeast portion of the back yard, with the surficial extension of the plume beneath the southeast corner of the house. Contamination in the southern yard of the house extends vertically from the surface to the depth of permafrost. The extent of vertical delineation efforts terminated at the depth of the permafrost. Based on the information obtained from this investigation, there may be approximately 180 m³ of petroleum impacted soils at this location.

Thank you for the opportunity to complete this work for Public Works and Government Services Canada. Please do not hesitate to contact us if you have any further questions or comments regarding this information.

Sincerely,
AECOM Canada Ltd.



Jennifer McCallum, B.Sc., A.I.T.
Environmental Scientist



Gordon Woollett, P.Eng.
Senior Environmental Engineer
gordon.woollett@aecom.com

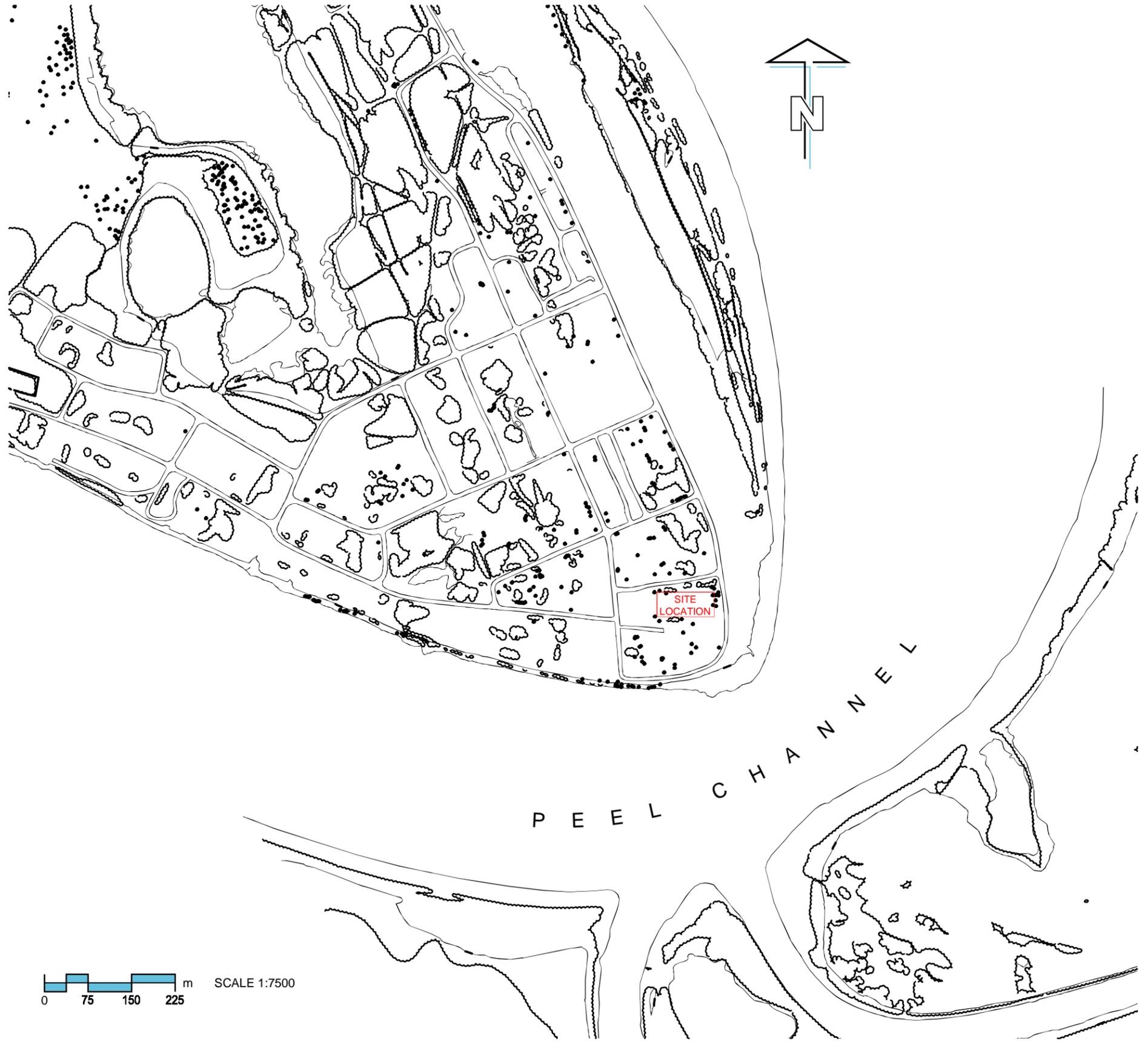
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Encl. Appendix A – Figures
 Appendix B – Tables of Results
 Appendix C – Testhole Logs
 Appendix D – Site Photographs
 Appendix E – Raw Laboratory Data

Appendix A

Figures

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KEY PLAN
SCALE: NTS

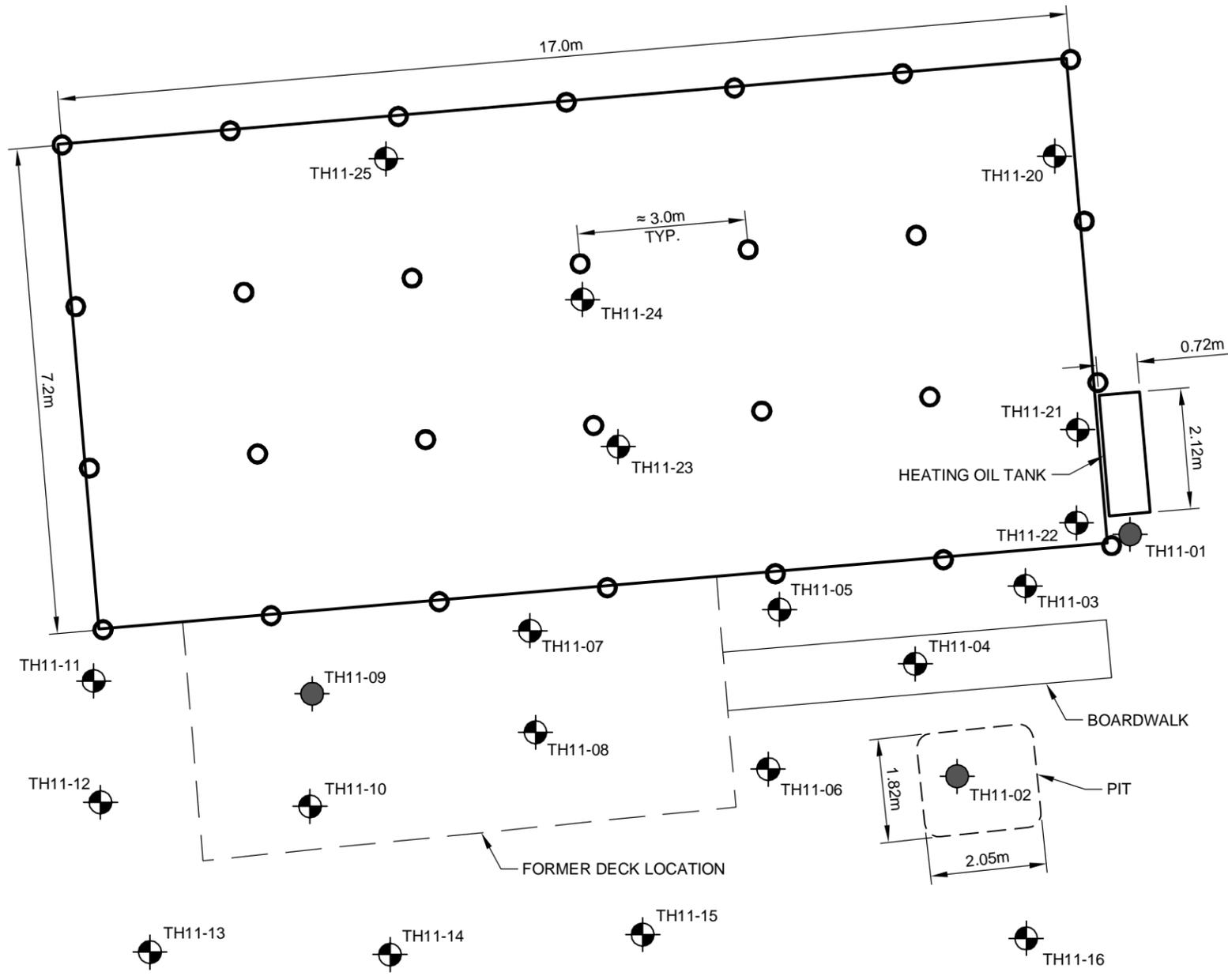
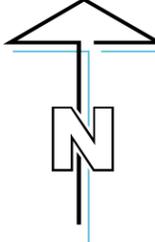
Public Works Government Services Canada
Aklavik RCMP Housing Unit - Fuel Spill

Site Location Plan



Figure 1.0

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LEGEND:

-  TH11-XX TESTHOLE LOCATION
-  TH11-XX WATER SAMPLED TESTHOLE
-  HOUSE PILLAR LOCATION

NOTE:

NOT TO SCALE

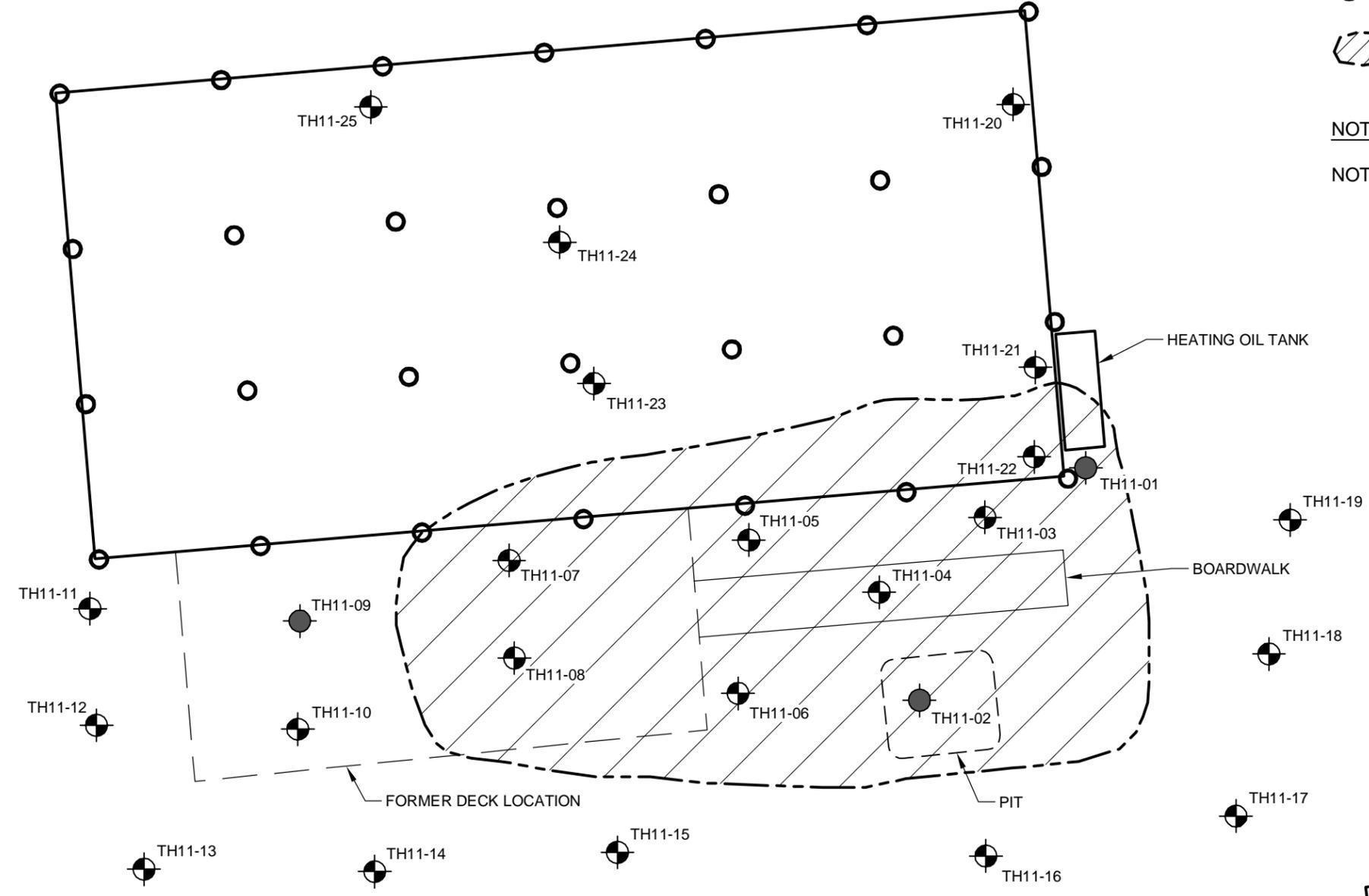
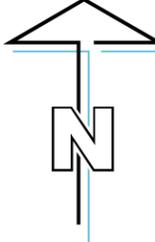
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Aklavik RCMP Housing Unit - Fuel Spill

Testhole Location Plan



Figure 2.0

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LEGEND:

-  TH11-XX TESTHOLE LOCATION
-  TH11-XX WATER SAMPLED TESTHOLE
-  HOUSE PILLAR LOCATION
-  ESTIMATED ZONE OF CONTAMINATION

NOTE:

NOT TO SCALE

Public Works Government Services Canada
Aklavik RCMP Housing Unit - Fuel Spill

**Estimated Zone Of
Soil Contamination Plan
Figure 3.0**



Appendix B

Tables of Results

**Aklavik RCMP Housing Unit
Soil Results
Sampling Sept. 10/11, 2011**

Table B.1 - Soil Sampling Results

Parameter	Units	Detection Limit	CCME Residential/ Fine-Grained Guidelines	TH11-01 TANK 0.4 mBGS	TH11-01 TANK 0.4 mBGS Lab- Dup	TH11-01 TANK 1.35 mBGS	TH11-01 TANK 1.35 mBGS (B)	TH11-02 PIT SURFACE	TH11-02 PIT 1.3 mBGS	TH11-03 0.5 mBGS	TH11-04 0.5 mBGS	TH11-05 0.5 mBGS	TH11-06 0.5 mBGS	TH11-07 0.5 mBGS	TH11-08 0.5 mBGS	TH11-09 1.4 mBGS	TH11-10 0.5 mBGS
Physical Properties																	
Moisture	%	0.3	-	24	N/A	32	32	30	31	25	24	25	27	35	31	33	28
Volatiles																	
Benzene	mg/kg	0.0050	0.0068	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.49	0.033	0.1	0.04	0.04	0.025	0.075	<0.0050	<0.0050
Toluene	mg/kg	0.020	0.08	<0.020	<0.020	0.1	0.056	0.050	4.6	0.98	0.13	0.049	0.15	0.16	0.64	<0.020	<0.020
Ethylbenzene	mg/kg	0.010	0.018	<0.010	<0.010	0.087	0.048	0.056	4.5	2.3	0.25	0.24	0.24	0.17	0.96	<0.010	<0.010
Xylenes (Total)	mg/kg	0.040	2.4	<0.040	<0.040	0.66	0.36	0.37	30	17	1.8	0.95	1.5	1.7	10	<0.040	<0.040
F1 (C6-C10) - BTEX	mg/kg	12	210	<12	<12	15	<12	<12	560	410	28	<12	18	13	170	<12	<12
(C6-C10)	mg/kg	12	210	<12	<12	16	<12	<12	600	430	31	<12	20	15	180	<12	<12
F2 (C10-C16 Hydrocarbons)	mg/kg	10	150	21	23	79	70	2,600	4,000	2,800	170	270	110	910	1,500	12	21
F3 (C16-C34 Hydrocarbons)	mg/kg	10	1,300	100	110	72	76	550	180	140	78	95	85	180	150	66	89
F4 (C34-C50 Hydrocarbons)	mg/kg	10	3,300	41	28	18	<10	38	17	17	19	23	20	48	28	16	23
Reached Baseline at C50	mg/kg	N/A	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Parameter	Units	Detection Limit	CCME Residential/ Fine-Grained Guidelines	TH11-14 1.25 mBGS	TH11-15 1.20 mBGS	TH11-16 1.20 mBGS	TH11-16 1.20 mBGS Lab- Dup	TH11-17 1.20 mBGS	TH11-17 1.20 mBGS (B)	TH11-19 1.62 mBGS	TH11-20 SURFACE	TH11-21 SURFACE	TH11-22 SURFACE	TH11-22 SURFACE (B)	TH11-22 0.3 mBGS	TH11-23 SURFACE	TH11-24 SURFACE
Physical Properties																	
Moisture	%	0.3	-	36	29	30	30	27	27	26	30	27	31	28	24	28	30
Volatiles																	
Benzene	mg/kg	0.0050	0.0068	<0.0050	<0.0050	<0.0050	N/A	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Toluene	mg/kg	0.020	0.08	<0.020	<0.020	<0.020	N/A	<0.020	<0.020	<0.020	<0.020	<0.020	0.041	<0.020	<0.020	<0.020	<0.020
Ethylbenzene	mg/kg	0.010	0.018	<0.010	<0.010	<0.010	N/A	<0.010	<0.010	<0.010	<0.010	<0.010	0.034	0.032	<0.010	<0.010	<0.010
Xylenes (Total)	mg/kg	0.040	2.4	<0.040	<0.040	<0.040	N/A	<0.040	<0.040	<0.040	<0.040	<0.040	0.19	0.19	<0.040	<0.040	<0.040
F1 (C6-C10) - BTEX	mg/kg	12	210	<12	<12	<12	N/A	<12	<12	<12	<12	<12	<12	<12	<12	<12	<12
(C6-C10)	mg/kg	12	210	<12	<12	<12	N/A	<12	<12	<12	<12	<12	<12	<12	<12	<12	<12
F2 (C10-C16 Hydrocarbons)	mg/kg	10	150	16	12	12	N/A	23	<10	17	19	12	240	220	14	32	18
F3 (C16-C34 Hydrocarbons)	mg/kg	10	1,300	130	61	100	N/A	91	70	81	850	150	190	110	76	230	670
F4 (C34-C50 Hydrocarbons)	mg/kg	10	3,300	40	<10	29	N/A	27	12	19	180	38	29	18	21	58	130
Reached Baseline at C50	mg/kg	N/A	-	Yes	Yes	Yes	N/A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Shaded cell indicates exceedance of Canadian Council of Ministers of the Environment (CCME), *Canada-Wide Standards for Petroleum Hydrocarbons* (Residential land use, fine-grained soil), 2001.

(B) - Sample re-run upon request to confirm results.

Aklavik RCMP
Surface Water/Groundwater Results
Sampling Sept. 10/11, 2011

Table B.2 - Water Sampling Results

Parameter	Units	Detection Limit	CCME Aquatic Life Guidelines	TH11-01 TANK SEEP	TH11-02 PIT SEEP	TH11-09 SEEP
Volatiles						
Benzene	ug/L	0.4	370	0.9	<0.4	<0.4
Toluene	ug/L	0.4	2	9.3	<0.4	<0.4
Ethylbenzene	ug/L	0.4	90	9.4	<0.4	<0.4
Xylenes (Total)	ug/L	0.8	-	80	<0.8	<0.8
F1 (C6-C10) - BTEX	ug/L	100	-	750	<100	<100
(C6-C10)	ug/L	100	-	850	<100	<100
Hydrocarbons						
F2 (C10-C16 Hydrocarbons)	mg/L	0.1	-	62	15	0.9

Shaded cell indicates exceedance of Canadian Council of Ministers of the Environment (CCME), *Water Quality Guidelines for the Protection of Aquatic Life*, 1999 (most recent update to specific parameters).

Aklavik RCMP
House Wood Cribbing Results
Sampling Sept. 11, 2011

Table B.3 - Petroleum Hydrocarbon Content in Wood Sampling Results

Parameter	Units	Detection Limit	WOOD SHAVINGS
Volatiles			
Benzene	mg/kg	0.010	<0.010 (1)
Toluene	mg/kg	0.040	0.057 (1)
Ethylbenzene	mg/kg	0.020	<0.020 (1)
Xylenes (Total)	mg/kg	0.080	<0.080 (1)
F1 (C6-C10) - BTEX	mg/kg	24	<24 (1)
(C6-C10)	mg/kg	24	<24 (1)
Ext. Pet. Hydrocarbon			
F2 (C10-C16 Hydrocarbons)	mg/kg	20	2600 (1)
F3 (C16-C34 Hydrocarbons)	mg/kg	20	2300 (1)
F4 (C34-C50 Hydrocarbons)	mg/kg	20	100 (1)
Reached Baseline at C50	mg/kg	N/A	Yes

(1) Detection limit raised due to reduced sample volume.

**Aklavik RCMP Housing Unit
Air Sampling Results
Sampling Sept. 10/11, 2011**

Table B.4 - Air Sampling Results

Parameter	Sample Location	24 Hour Average Concentration ($\mu\text{g}/\text{m}^3$)
1,2,4-Trimethylbenzene	Main Floor Living Room	LDL
	Upper Floor Living Room	5.7
2,2,4-Trimethylpentane	Main Floor Living Room	1.7
	Upper Floor Living Room	1.6
2-Propanone	Main Floor Living Room	8.7
	Upper Floor Living Room	20.5
Chloroform	Main Floor Living Room	LDL
	Upper Floor Living Room	1.8
Chloromethane	Main Floor Living Room	0.9
	Upper Floor Living Room	1.1
Dichlorodifluoromethane (Freon 12)	Main Floor Living Room	5
	Upper Floor Living Room	6.3
Ethanol	Main Floor Living Room	96
	Upper Floor Living Room	835
Ethylbenzene	Main Floor Living Room	LDL
	Upper Floor Living Room	1.6
Heptane	Main Floor Living Room	LDL
	Upper Floor Living Room	1.3
Toluene	Main Floor Living Room	1.2
	Upper Floor Living Room	3.5
Trichlorofluoromethane (Freon 11)	Main Floor Living Room	10.3
	Upper Floor Living Room	22.3
Xylenes	Main Floor Living Room	LDL
	Upper Floor Living Room	6.5

Note: LDL: Value is less than lower detection limit

**Aklavik RCMP Housing Unit
Landfill Disposal Sampling Results
Sampling Sept. 10/11, 2011**

Table B.5 - Basic Class II Landfill Package Sampling Results

Parameter	Units	Detection Limit	TH11-02 PIT 1.3 mBGS	Transportation of Dangerous Goods		NWT Standards for Solid Waste/Process Residuals Suitable for Landfill
				Class	Packing Group	
Elements						
Leachable Antimony (Sb)	mg/L	1	<1			
Leachable Arsenic (As)	mg/L	0.5	<0.5			2.5
Leachable Barium (Ba)	mg/L	1	<1			100
Leachable Beryllium (Be)	mg/L	0.5	<0.5			
Leachable Boron (B)	mg/L	1	<1			
Leachable Cadmium (Cd)	mg/L	0.1	<0.1			0.5
Leachable Chromium (Cr)	mg/L	0.5	<0.5			5
Leachable Cobalt (Co)	mg/L	1	<1			
Leachable Copper (Cu)	mg/L	1	<1			
Leachable Iron (Fe)	mg/L	1	3			
Leachable Lead (Pb)	mg/L	0.5	<0.5			600**
Leachable Mercury (Hg)	mg/L	0.02	<0.02			0.1***
Leachable Nickel (Ni)	mg/L	0.5	<0.5			
Leachable Selenium (Se)	mg/L	0.1	<0.1			1
Leachable Silver (Ag)	mg/L	0.5	<0.5			5
Leachable Thallium (Tl)	mg/L	0.5	<0.5			
Leachable Uranium (U)	mg/L	0.2	<0.2			
Leachable Vanadium (V)	mg/L	1	<1			
Leachable Zinc (Zn)	mg/L	1	<1			500
Leachable Zirconium (Zr)	mg/L	1	<1			
Volatiles						
Leachable (ZH) Benzene	ug/L	10	<10	3	II	
Leachable (ZH) Toluene	ug/L	10	49	3	II	
Leachable (ZH) Ethylbenzene	ug/L	10	41	3	II	
Leachable (ZH) o-Xylene	ug/L	10	120	-	-	
Leachable (ZH) m & p-Xylene	ug/L	20	210	-	-	
Leachable (ZH) Xylenes (Total)	ug/L	20	330	3	II	
Soluble Parameters						
Soluble (1:1) pH	n/a	n/a	6.95	none		
Physical Properties						
Closed Cup Flash point	degrees C	n/a	>61 *			
Free Liquid	n/a	n/a	PASS			

* Sample was analyzed after holding time expired.

** Guideline is for Total Lead, not just 'Leachable Lead.

*** Analyte detection limit was below guideline.

Canadian Council of Ministers of the Environment (CCME), *Canada-Wide Standards for Petroleum Hydrocarbons* (Residential land use, fine-grained soil), 2001.

Government of Northwest Territories (Environmental Protection Services), *Guidelines for Industrial Waste Discharges in the NWT*, April 2004.

Appendix C

Testhole Logs

PROJECT: Aklavik RCMP Phase II ESA	CLIENT: PWGSC	TESTHOLE NO: TH11-01
LOCATION: Beneath tank. N 7,567,103.0 E 499,894.0		PROJECT NO.: 60223458
CONTRACTOR: n/a	METHOD: Hand Auger	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE

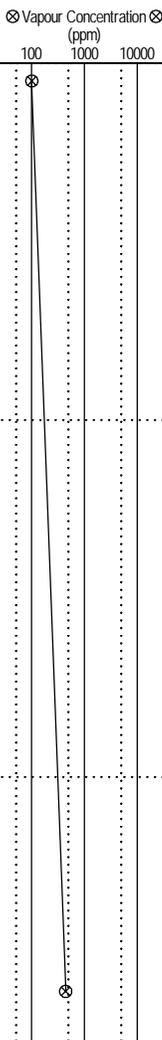
DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	Vapour Concentration (ppm)	COMMENTS	DEPTH (m)
					100 1000 10000		
0		Cobbles and sand, damp, strong petroleum hydrocarbon odour.					
		Clayey Silt - moist, soft, few rootlets and decaying wood pieces, grey, petroleum hydrocarbon odour.	<input checked="" type="checkbox"/>		⊗	145 ppm	
1		Wet; water noted to have a petroleum hydrocarbon sheen at 1.16 m.				Groundwater sample.	
		Permafrost: Clayey Silt, grey, petroleum hydrocarbon odour.	<input checked="" type="checkbox"/>		⊗	100 ppm	
2		Hole dug using hand tools. End of Hole at 1.35 mBGS.					

ENVIRONMENTAL 60223458-AKLAVIK RCMP ENV-110910.GPJ UMA.GDT PRINT: 3/23/12 By:



LOGGED BY: JM	COMPLETION DEPTH: 1.35 m
REVIEWED BY: GW	COMPLETION DATE: 10/9/11
PROJECT MANAGER: Gord Woollett	Page 1 of 1

PROJECT: Aklavik RCMP Phase II ESA	CLIENT: PWGSC	TESTHOLE NO: TH11-02
LOCATION: Centre of pit on S side of house. N 7,567,102.0 E 499,893.0		PROJECT NO.: 60223458
CONTRACTOR: n/a	METHOD: Hand Auger	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	Vapour Concentration (ppm)	COMMENTS	DEPTH (m)
0		Clayey Silt - moist, soft, some organics, grey, petroleum hydrocarbon odour.	<input checked="" type="checkbox"/>		 <p>⊗ Vapour Concentration (ppm)</p> <p>100 1000 10000</p>	100 ppm	
		Wet; water noted to have a petroleum hydrocarbon sheen at 0.65 m.				Surface Water Sample.	
1		Permafrost: Clayey Silt, grey, petroleum hydrocarbon odour.	<input checked="" type="checkbox"/>			440 ppm	
2		Hole dug using hand tools. End of Hole at 1.3 mBGS.					

ENVIRONMENTAL 60223458-AKLAVIK RCMP ENV-110910.GPJ UMA.GDT PRINT: 3/23/12 By:



LOGGED BY: JM	COMPLETION DEPTH: 1.30 m
REVIEWED BY: GW	COMPLETION DATE: 10/9/11
PROJECT MANAGER: Gord Woollett	Page 1 of 1

PROJECT: Aklavik RCMP Phase II ESA	CLIENT: PWGSC	TESTHOLE NO: TH11-03
LOCATION: Diagonally placed between pit and tank. N 7,567,105.0 E 499,892.0		PROJECT NO.: 60223458
CONTRACTOR: n/a	METHOD: Hand Auger	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm)			COMMENTS	DEPTH (m)
					100	1000	10000		
0		Clayey Silt - moist, soft, few rootlets and decaying wood pieces, grey, petroleum hydrocarbon odour.							
		Hole dug using hand tools. End of Hole at 0.5 mBGS.					⊗	165 ppm	
1									1
2									2

ENVIRONMENTAL 60223458-AKLAVIK RCMP ENV-110910.GPJ UMA.GDT PRINT: 3/23/12 By:



LOGGED BY: JM	COMPLETION DEPTH: 0.50 m
REVIEWED BY: GW	COMPLETION DATE: 10/9/11
PROJECT MANAGER: Gord Woollett	Page 1 of 1

PROJECT: Aklavik RCMP Phase II ESA	CLIENT: PWGSC	TESTHOLE NO: TH11-04
LOCATION: Under Boardwalk on S side of house. N 7,567,103.0 E 499,891.0		PROJECT NO.: 60223458
CONTRACTOR: n/a	METHOD: Hand Auger	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm)			COMMENTS	DEPTH (m)
					100	1000	10000		
0		Clayey Silt - moist, soft, few rootlets and decaying wood pieces, grey, petroleum hydrocarbon odour.							
		Hole dug using hand tools. End of Hole at 0.5 mBGS.	<input checked="" type="checkbox"/>				⊗	110 ppm	
1									1
2									2

ENVIRONMENTAL 60223458-AKLAVIK RCMP ENV-110910.GPJ UMA.GDT PRINT: 3/23/12 By:



LOGGED BY: JM	COMPLETION DEPTH: 0.50 m
REVIEWED BY: GW	COMPLETION DATE: 10/9/11
PROJECT MANAGER: Gord Woollett	Page 1 of 1

PROJECT: Aklavik RCMP Phase II ESA	CLIENT: PWGSC	TESTHOLE NO: TH11-05
LOCATION: Beside S side of house on E side of stairs. N 7,567,097.0 E 499,888.0		PROJECT NO.: 60223458
CONTRACTOR: n/a	METHOD: Hand Auger	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm)			COMMENTS	DEPTH (m)
					100	1000	10000		
0		Clayey Silt - moist, soft, few rootlets and decaying wood pieces, grey, petroleum hydrocarbon odour.							
		Hole dug using hand tools. End of Hole at 0.5 mBGS.					⊗	160 ppm	
1									1
2									2

ENVIRONMENTAL 60223458-AKLAVIK RCMP ENV-110910.GPJ UMA.GDT PRINT: 3/23/12 By:



LOGGED BY: JM	COMPLETION DEPTH: 0.50 m
REVIEWED BY: GW	COMPLETION DATE: 10/9/11
PROJECT MANAGER: Gord Woollett	Page 1 of 1

PROJECT: Aklavik RCMP Phase II ESA	CLIENT: PWGSC	TESTHOLE NO: TH11-06
LOCATION: South of TH11-05. N 7,567,092.0 E 499,887.0		PROJECT NO.: 60223458
CONTRACTOR: n/a	METHOD: Hand Auger	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm)			COMMENTS	DEPTH (m)
					100	1000	10000		
0		Clayey Silt - moist, soft, few rootlets and decaying wood pieces, grey, petroleum hydrocarbon odour.							
		Hole dug using hand tools. End of Hole at 0.5 mBGS.	<input checked="" type="checkbox"/>				⊗	115 ppm	
1									1
2									2

ENVIRONMENTAL 60223458-AKLAVIK RCMP ENV-110910.GPJ UMA.GDT PRINT: 3/23/12 By:



LOGGED BY: JM	COMPLETION DEPTH: 0.50 m
REVIEWED BY: GW	COMPLETION DATE: 10/9/11
PROJECT MANAGER: Gord Woollett	Page 1 of 1

PROJECT: Aklavik RCMP Phase II ESA	CLIENT: PWGSC	TESTHOLE NO: TH11-07
LOCATION: Beside S side of house on W side of stairs. N 7,567,097.0 E 499,889.0		PROJECT NO.: 60223458
CONTRACTOR: n/a	METHOD: Hand Auger	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	Vapour Concentration (ppm)	COMMENTS	DEPTH (m)
					100 1000 10000		
0		Clayey Silt - moist, soft, few rootlets and decaying wood pieces, grey, petroleum hydrocarbon odour.					
		Hole dug using hand tools. End of Hole at 0.5 mBGS.	<input checked="" type="checkbox"/>		⊗	240 ppm	
1							1
2							2

ENVIRONMENTAL 60223458-AKLAVIK RCMP ENV-110910.GPJ UMA.GDT PRINT: 3/23/12 By:



LOGGED BY: JM	COMPLETION DEPTH: 0.50 m
REVIEWED BY: GW	COMPLETION DATE: 10/9/11
PROJECT MANAGER: Gord Woollett	Page 1 of 1

PROJECT: Aklavik RCMP Phase II ESA	CLIENT: PWGSC	TESTHOLE NO: TH11-08
LOCATION: South of TH11-07. N 7,567,097.0 E 499,886.0		PROJECT NO.: 60223458
CONTRACTOR: n/a	METHOD: Hand Auger	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm)			COMMENTS	DEPTH (m)
					100	1000	10000		
0		Clayey Silt - moist, soft, some decaying wood (possibly former deck material), grey, petroleum hydrocarbon odour.							
		Hole dug using hand tools. End of Hole at 0.5 mBGS.	<input checked="" type="checkbox"/>				⊗	190 ppm	
1									1
2									2

ENVIRONMENTAL 60223458-AKLAVIK RCMP ENV-110910.GPJ UMA.GDT PRINT: 3/23/12 By:



LOGGED BY: JM	COMPLETION DEPTH: 0.50 m
REVIEWED BY: GW	COMPLETION DATE: 10/9/11
PROJECT MANAGER: Gord Woollett	Page 1 of 1

PROJECT: Aklavik RCMP Phase II ESA	CLIENT: PWGSC	TESTHOLE NO: TH11-09
LOCATION: West of TH11-07 through grassed lawn. N 7,567,103.0 E 499,876.0		PROJECT NO.: 60223458
CONTRACTOR: n/a	METHOD: Hand Auger	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	Vapour Concentration (ppm)			COMMENTS	DEPTH (m)
					100	1000	10000		
0		Clayey Silt - moist, soft, some decaying wood (possibly former deck material), grey, petroleum hydrocarbon odour.							
		Wet and sandy; water noted to have a petroleum hydrocarbon sheen at 0.6 m.					85 ppm	Groundwater sample.	
1		Permafrost: Clayey Silt, grey, petroleum hydrocarbon odour.					80 ppm		1
2		Hole dug using hand tools. End of Hole at 1.4 mBGS.						OVC reading had a flash maximum of 190 ppm, which may have been an instrument anomaly, as the reading stabilized immediately at 80 ppm.	

ENVIRONMENTAL 60223458-AKLAVIK RCMP ENV-110910.GPJ UMA.GDT PRINT: 3/23/12 By:



LOGGED BY: JM	COMPLETION DEPTH: 1.40 m
REVIEWED BY: GW	COMPLETION DATE: 10/9/11
PROJECT MANAGER: Gord Woollett	Page 1 of 1

PROJECT: Aklavik RCMP Phase II ESA	CLIENT: PWGSC	TESTHOLE NO: TH11-10
LOCATION: South of TH11-09. N 7,567,090.0 E 499,878.0		PROJECT NO.: 60223458
CONTRACTOR: n/a	METHOD: Hand Auger	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm)			COMMENTS	DEPTH (m)
					100	1000	10000		
0		Clayey Silt - moist, soft, some rootlets and decaying wood pieces, grey, slight petroleum hydrocarbon odour.							
		Hole dug using hand tools. End of Hole at 0.5 mBGS.					⊗ 220 ppm		
1									1
2									2

ENVIRONMENTAL 60223458-AKLAVIK RCMP ENV-110910.GPJ UMA.GDT PRINT: 3/23/12 By:



LOGGED BY: JM	COMPLETION DEPTH: 0.50 m
REVIEWED BY: GW	COMPLETION DATE: 10/9/11
PROJECT MANAGER: Gord Woollett	Page 1 of 1

PROJECT: Aklavik RCMP Phase II ESA	CLIENT: PWGSC	TESTHOLE NO: TH11-11
LOCATION: At SW corner of house. N 7,567,101.0 E 499,873.0	PROJECT NO.: 60223458	
CONTRACTOR: n/a	METHOD: Hand Auger	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0		Clayey Silt - moist, soft, few rootlets and decaying wood pieces.					
1		Permafrost: Clayey Silt, grey.					1
		Hole dug using hand tools. End of Hole at 1.1 mBGS.			⊗	85 ppm	
2							

ENVIRONMENTAL 60223458-AKLAVIK RCMP ENV-110910.GPJ UMA.GDT PRINT: 3/23/12 By:



LOGGED BY: JM	COMPLETION DEPTH: 1.10 m
REVIEWED BY: GW	COMPLETION DATE: 10/9/11
PROJECT MANAGER: Gord Woollett	Page 1 of 1

PROJECT: Aklavik RCMP Phase II ESA	CLIENT: PWGSC	TESTHOLE NO: TH11-12
LOCATION: South of TH11-11. N 7,567,099.0 E 499,874.0		PROJECT NO.: 60223458
CONTRACTOR: n/a	METHOD: Hand Auger	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm)			COMMENTS	DEPTH (m)
					100	1000	10000		
0		Clayey Silt - moist, soft, few rootlets and decaying wood pieces.							
1		Permafrost: Clayey Silt, grey.							1
		Hole dug using hand tools. End of Hole at 1.12 mBGS.	<input checked="" type="checkbox"/>				80 ppm		
2									

ENVIRONMENTAL 60223458-AKLAVIK RCMP ENV-110910.GPJ UMA.GDT PRINT: 3/23/12 By:



LOGGED BY: JM	COMPLETION DEPTH: 1.12 m
REVIEWED BY: GW	COMPLETION DATE: 10/9/11
PROJECT MANAGER: Gord Woollett	Page 1 of 1

PROJECT: Aklavik RCMP Phase II ESA	CLIENT: PWGSC	TESTHOLE NO: TH11-13
LOCATION: SW end of property; SE of TH11-12. N 7,567,100.0 E 499,879.0	PROJECT NO.: 60223458	
CONTRACTOR: n/a	METHOD: Hand Auger	ELEVATION (m):
SAMPLE TYPE <input checked="" type="checkbox"/> GRAB	<input type="checkbox"/> SHELBY TUBE	<input checked="" type="checkbox"/> SPLIT SPOON
<input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY	
<input type="checkbox"/> CORE		

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	☉ Vapour Concentration ☉ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0		Clayey Silt - moist, soft, few rootlets and decaying wood pieces.					
1		Permafrost: Clayey Silt, grey.	<input checked="" type="checkbox"/>				
		Hole dug using hand tools. End of Hole at 1.04 mBGS.			☉	90 ppm	
2							

ENVIRONMENTAL 60223458-AKLAVIK RCMP ENV-110910.GPJ UMA.GDT PRINT: 3/23/12 By:



LOGGED BY: JM	COMPLETION DEPTH: 1.04 m
REVIEWED BY: GW	COMPLETION DATE: 10/9/11
PROJECT MANAGER: Gord Woollett	Page 1 of 1

PROJECT: Aklavik RCMP Phase II ESA	CLIENT: PWGSC	TESTHOLE NO: TH11-14
LOCATION: East of TH11-13. N 7,567,097.0 E 499,883.0		PROJECT NO.: 60223458
CONTRACTOR: n/a	METHOD: Hand Auger	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm)			COMMENTS	DEPTH (m)
					100	1000	10000		
0		Clayey Silt - moist, soft, few rootlets and decaying wood pieces.							
		Permafrost: Clayey Silt, grey.	<input checked="" type="checkbox"/>						
		Hole dug using hand tools. End of Hole at 1.25 mBGS.					⊗	65 ppm	
2									

ENVIRONMENTAL 60223458-AKLAVIK RCMP ENV-110910.GPJ UMA.GDT PRINT: 3/23/12 By:



LOGGED BY: JM	COMPLETION DEPTH: 1.25 m
REVIEWED BY: GW	COMPLETION DATE: 10/9/11
PROJECT MANAGER: Gord Woollett	Page 1 of 1

PROJECT: Aklavik RCMP Phase II ESA	CLIENT: PWGSC	TESTHOLE NO: TH11-15
LOCATION: East of TH11-14. N 7,567,102.0 E 499,884.0		PROJECT NO.: 60223458
CONTRACTOR: n/a	METHOD: Hand Auger	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm)			COMMENTS	DEPTH (m)
					100	1000	10000		
0		Clayey Silt - moist, firm (more clay), few rootlets and decaying wood pieces.							
		Permafrost: Clayey Silt, grey.	<input checked="" type="checkbox"/>						
		Hole dug using hand tools. End of Hole at 1.2 mBGS.			⊗			50 ppm	
2									

ENVIRONMENTAL 60223458-AKLAVIK RCMP ENV-110910.GPJ UMA.GDT PRINT: 3/23/12 By:



LOGGED BY: JM	COMPLETION DEPTH: 1.20 m
REVIEWED BY: GW	COMPLETION DATE: 10/9/11
PROJECT MANAGER: Gord Woollett	Page 1 of 1

PROJECT: Aklavik RCMP Phase II ESA	CLIENT: PWGSC	TESTHOLE NO: TH11-16
LOCATION: South of TH11-02 (pit). N 7,567,100.0 E 499,889.0		PROJECT NO.: 60223458
CONTRACTOR: n/a	METHOD: Hand Auger	ELEVATION (m):
SAMPLE TYPE <input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK <input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE		

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm)			COMMENTS	DEPTH (m)
					100	1000	10000		
0		Clayey Silt - moist, soft, few rootlets and decaying wood pieces.							
		Permafrost: Clayey Silt, grey.	<input checked="" type="checkbox"/>						
		Hole dug using hand tools. End of Hole at 1.2 MBGS.			⊗			50 ppm	
2									

ENVIRONMENTAL 60223458-AKLAVIK RCMP ENV-110910.GPJ UMA.GDT PRINT: 3/23/12 By:



LOGGED BY: JM	COMPLETION DEPTH: 1.20 m
REVIEWED BY: GW	COMPLETION DATE: 10/9/11
PROJECT MANAGER: Gord Woollett	Page 1 of 1

PROJECT: Aklavik RCMP Phase II ESA	CLIENT: PWGSC	TESTHOLE NO: TH11-17
LOCATION: SE corner of property. N 7,567,097.0 E 499,898.0	PROJECT NO.: 60223458	
CONTRACTOR: n/a	METHOD: Hand Auger	ELEVATION (m):
SAMPLE TYPE <input checked="" type="checkbox"/> GRAB	<input type="checkbox"/> SHELBY TUBE	<input checked="" type="checkbox"/> SPLIT SPOON
<input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY	<input type="checkbox"/> CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0		Cobbles and sand, damp.					
		Clayey Silt - moist, soft, grey.					
		Wet.					
1		Permafrost: Clayey Silt, grey.	<input checked="" type="checkbox"/>				
		Hole dug using hand tools. End of Hole at 1.2 MBGS.			⊗	35 ppm	
2							

ENVIRONMENTAL 60223458-AKLAVIK RCMP ENV-110910.GPJ UMA.GDT PRINT: 3/23/12 By:



LOGGED BY: JM	COMPLETION DEPTH: 1.20 m
REVIEWED BY: GW	COMPLETION DATE: 10/9/11
PROJECT MANAGER: Gord Woollett	Page 1 of 1

PROJECT: Aklavik RCMP Phase II ESA	CLIENT: PWGSC	TESTHOLE NO: TH11-18
LOCATION: North of TH11-17. N 7,567,101.0 E 499,899.0		PROJECT NO.: 60223458
CONTRACTOR: n/a	METHOD: Hand Auger	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm)			COMMENTS	DEPTH (m)
					100	1000	10000		
0		Cobbles and sand, damp.							
		Organic - thin layer of decayed deciduous/coniferous tree leaves, few stones, black.							
		Clayey Silt - moist, soft, grey.							
		Permafrost: Clayey Silt, grey.	<input checked="" type="checkbox"/>						
1		Hole dug using hand tools. End of Hole at 0.9 mBGS.					⊗	40 ppm	1
2									

ENVIRONMENTAL 60223458-AKLAVIK RCMP ENV-110910.GPJ UMA.GDT PRINT: 3/23/12 By:



LOGGED BY: JM	COMPLETION DEPTH: 0.90 m
REVIEWED BY: GW	COMPLETION DATE: 10/9/11
PROJECT MANAGER: Gord Woollett	Page 1 of 1

PROJECT: Aklavik RCMP Phase II ESA	CLIENT: PWGSC	TESTHOLE NO: TH11-19
LOCATION: Slightly SE of tank; north of TH11-18. N 7,567,102.0 E 499,902.0		PROJECT NO.: 60223458
CONTRACTOR: n/a	METHOD: Hand Auger	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm)			COMMENTS	DEPTH (m)
					100	1000	10000		
0		Cobbles and sand, damp.							
		Organic - thin layer of decayed deciduous/coniferous tree leaves, black with a few stones.							
		Clayey Silt - moist, soft, grey.							
1		Permafrost: Clayey Silt, grey.							
		Hole dug using hand tools. End of Hole at 1.62 mBGS.	<input checked="" type="checkbox"/>				⊗	80 ppm	
2									

ENVIRONMENTAL 60223458-AKLAVIK RCMP ENV-110910.GPJ UMA.GDT PRINT: 3/23/12 By:



LOGGED BY: JM	COMPLETION DEPTH: 1.62 m
REVIEWED BY: GW	COMPLETION DATE: 10/9/11
PROJECT MANAGER: Gord Woollett	Page 1 of 1

PROJECT: Aklavik RCMP Phase II ESA	CLIENT: PWGSC	TESTHOLE NO: TH11-20
LOCATION: NE corner of house N of tank.		PROJECT NO.: 60223458
CONTRACTOR: n/a	METHOD: Trowel	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000			COMMENTS	DEPTH (m)
0		Organic material integrated into clayey silt base, damp, black.	<input checked="" type="checkbox"/>	⊗			< 25 ppm		
		Scoop sample from surface.							
1								1	
2								2	

ENVIRONMENTAL 60223458-AKLAVIK RCMP ENV-110910.GPJ UMA.GDT PRINT: 3/23/12 By:



LOGGED BY: JM	COMPLETION DEPTH: 0.10 m
REVIEWED BY: GW	COMPLETION DATE: 10/9/11
PROJECT MANAGER: Gord Woollett	Page 1 of 1

PROJECT: Aklavik RCMP Phase II ESA	CLIENT: PWGSC	TESTHOLE NO: TH11-21
LOCATION: E side of house beside tank.		PROJECT NO.: 60223458
CONTRACTOR: n/a	METHOD: Trowel	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000			COMMENTS	DEPTH (m)
0		Organic material integrated into clayey silt base, damp, black, slight petroleum hydrocarbon odour. Scoop sample from surface.	<input checked="" type="checkbox"/>	⊗				< 25 ppm	
1									1
2									2

ENVIRONMENTAL 60223458-AKLAVIK RCMP ENV-110910.GPJ UMA.GDT PRINT: 3/23/12 By:



LOGGED BY: JM	COMPLETION DEPTH: 0.30 m
REVIEWED BY: GW	COMPLETION DATE: 10/9/11
PROJECT MANAGER: Gord Woollett	Page 1 of 1

PROJECT: Aklavik RCMP Phase II ESA	CLIENT: PWGSC	TESTHOLE NO: TH11-22
LOCATION: SE corner of house.		PROJECT NO.: 60223458
CONTRACTOR: n/a	METHOD: Trowel	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB	<input type="checkbox"/> SHELBY TUBE
	<input checked="" type="checkbox"/> SPLIT SPOON	<input type="checkbox"/> BULK
	<input checked="" type="checkbox"/> NO RECOVERY	<input type="checkbox"/> CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000			COMMENTS	DEPTH (m)
0		Organic material integrated into clayey silt base, damp, black, fair petroleum hydrocarbon odour noted to approximately 1.1 m in from east side of the building. Odour lacking by 0.15 m. Dug to 0.3 m with Trowel.	<input checked="" type="checkbox"/>	⊗				< 25 ppm	
1									1
2									2

ENVIRONMENTAL 60223458-AKLAVIK RCMP ENV-110910.GPJ UMA.GDT PRINT: 3/23/12 By:



LOGGED BY: JM	COMPLETION DEPTH: 0.10 m
REVIEWED BY: GW	COMPLETION DATE: 10/9/11
PROJECT MANAGER: Gord Woollett	Page 1 of 1

PROJECT: Aklavik RCMP Phase II ESA	CLIENT: PWGSC	TESTHOLE NO: TH11-23
LOCATION: Centre of W side of house.		PROJECT NO.: 60223458
CONTRACTOR: n/a	METHOD: Trowel	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000			COMMENTS	DEPTH (m)
0		Organic material integrated into clayey silt base, damp, black, slight petroleum hydrocarbon odour from pillar well. Soil cracked at surface. Odour no longer detected at 0.08 m. Scoop sample from surface.	<input checked="" type="checkbox"/>		⊗			35 ppm	
1									1
2									2

ENVIRONMENTAL 60223458-AKLAVIK RCMP ENV-110910.GPJ UMA.GDT PRINT: 3/23/12 By:



LOGGED BY: JM	COMPLETION DEPTH: 0.10 m
REVIEWED BY: GW	COMPLETION DATE: 10/9/11
PROJECT MANAGER: Gord Woollett	Page 1 of 1

PROJECT: Aklavik RCMP Phase II ESA	CLIENT: PWGSC	TESTHOLE NO: TH11-24
LOCATION: Centre of house.		PROJECT NO.: 60223458
CONTRACTOR: n/a	METHOD: Trowel	ELEVATION (m):
SAMPLE TYPE <input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK <input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE		

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000			COMMENTS	DEPTH (m)
0		Organic material integrated into clayey silt base, damp, black, slight petroleum hydrocarbon odour detected. Scoop sample from surface.	<input checked="" type="checkbox"/>		⊗			55 ppm	
1									1
2									2

ENVIRONMENTAL 60223458-AKLAVIK RCMP ENV-110910.GPJ UMA.GDT PRINT: 3/23/12 By:



LOGGED BY: JM	COMPLETION DEPTH: 0.10 m
REVIEWED BY: GW	COMPLETION DATE: 10/9/11
PROJECT MANAGER: Gord Woollett	Page 1 of 1

PROJECT: Aklavik RCMP Phase II ESA	CLIENT: PWGSC	TESTHOLE NO: TH11-25
LOCATION: Centre of N end of house.		PROJECT NO.: 60223458
CONTRACTOR: n/a	METHOD: Trowel	ELEVATION (m):
SAMPLE TYPE <input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK <input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE		

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm)			COMMENTS	DEPTH (m)
					100	1000	10000		
0		Organic material integrated into clayey silt base, damp, black. Scoop sample from surface.	<input checked="" type="checkbox"/>		⊗			45 ppm	
1									1
2									2

ENVIRONMENTAL 60223458-AKLAVIK RCMP ENV-110910.GPJ UMA.GDT PRINT: 3/23/12 By:



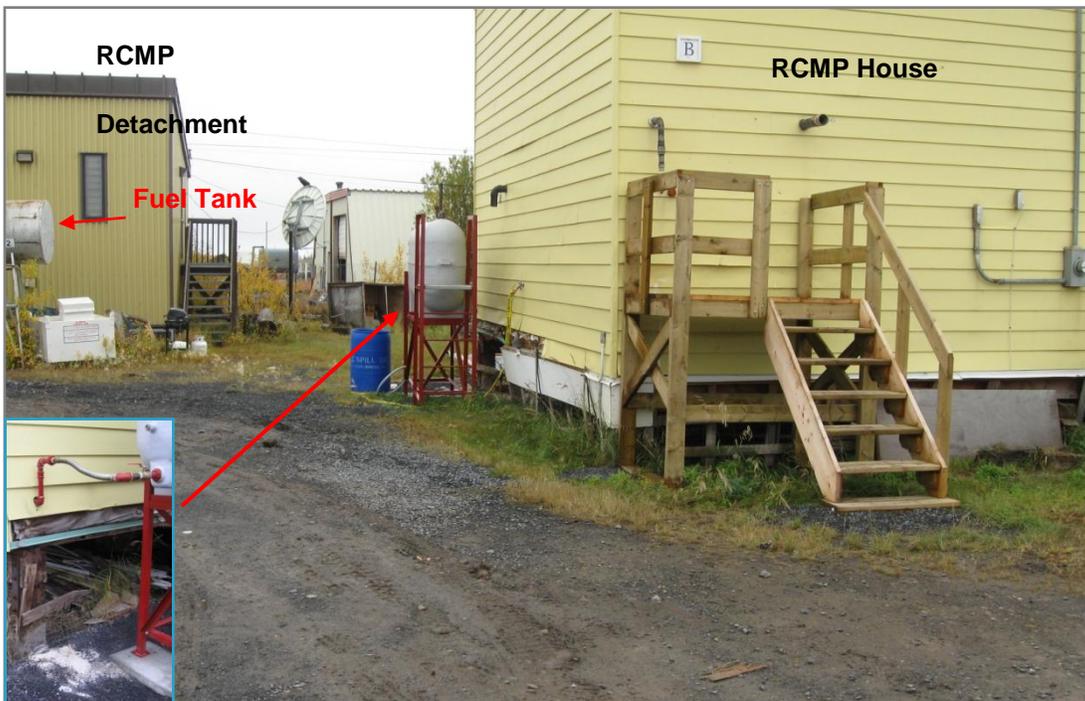
LOGGED BY: JM	COMPLETION DEPTH: 0.10 m
REVIEWED BY: GW	COMPLETION DATE: 10/9/11
PROJECT MANAGER: Gord Woollett	Page 1 of 1

Appendix D

Site Photographs



Photograph 1. Facing north over south end of house. Tarps held down by boards over the contamination zone. ↑



Photograph 2. View facing south over east side of house. Heating oil tank inset. Note additional fuel tank adjacent to RCMP detachment. ↑



Photograph 3. View beneath southeast corner of house (TH11-22 obtained at this location). ↑



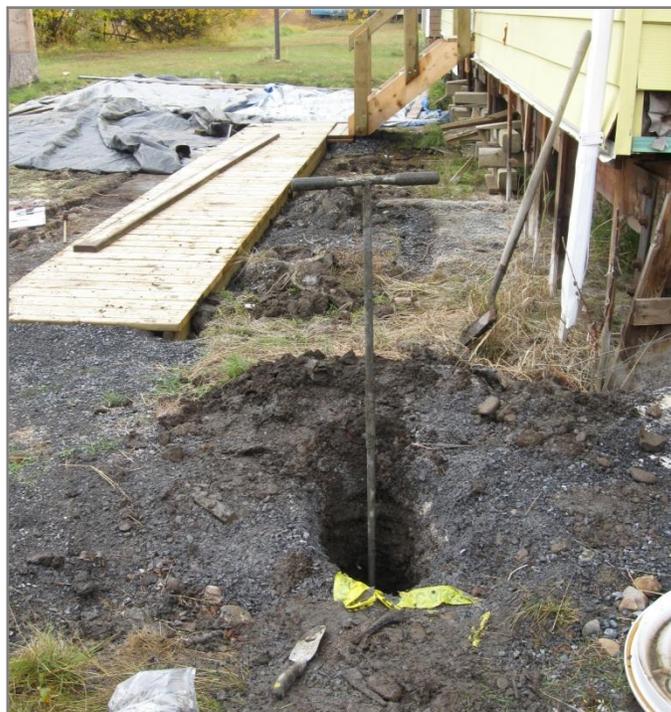
Photograph 4. Building materials stockpiled beneath southeast corner of house. ↑



Photograph 5. House piles with erosion wells and cracked soil. ↑



Photograph 6. Southeast pile and cribbing where wood shaving sample obtained. ↑



Photograph 7. TH11-01 testpit completed immediately south of tank. ↑



Photograph 8. TH11-02 location; view facing west over south end of house. PHC sheen on soil at depth of water (inset). ↑



Photograph 9. Location of TH11-11 on west side of lot; permafrost reached at approximately 1 mBGS. ↑



Photograph 10. View facing northwest over southwest corner of lot. Note close proximity to adjacent house and indentation in ground surface in front of the clothesline pole; this delineates the property line. ↑



Photograph 11. View facing northeast over cover placement in progress. ↑



Photograph 12. View facing north over west side of property during cover placement in progress. Cover eventually placed to full extent of west side of property line. ↑



Photograph 13. Ruts remaining from initial attempts to place cover material. Silty soil conditions resulted in heavy equipment getting stuck. ↑



Photograph 14. View facing east over north side of lot; view facing RCMP detachment building. ↑

Appendix E

Raw Laboratory Data



Your Project #: 60223458-01/ AKLAVIK
Your C.O.C. #: A012570, A012568, A012571

Attention: JENNIFER MCCALLUM

AECOM
17007 - 107 AVENUE
EDMONTON, AB
CANADA T5S 1G3

Report Date: 2011/09/16

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B185684

Received: 2011/09/12, 16:22

Sample Matrix: Soil
Samples Received: 15

Analyses	Quantity	Date		Laboratory Method	Analytical Method
		Extracted	Analyzed		
BTEX/F1 by HS GC/MS (MeOH extract)	15	2011/09/13	2011/09/15	EENVSOP-00012 EENVSOP-00002 EENVSOP-00005	CCME CWS, EPA 8260C
CCME Hydrocarbons (F2-F4 in soil)	15	2011/09/13	2011/09/14	AB SOP-00040 AB SOP-00036	CCME PHC-CWS
Moisture	15	N/A	2011/09/14	EENVSOP-00139	Carter SSMA 51.2

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Desirae Hopkinson, Project Manager
Email: DHopkinson@maxxam.ca
Phone# (780) 577-7104

=====
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1



Maxxam Job #: B185684
Report Date: 2011/09/16

AECOM
Client Project #: 60223458-01/ AKLAVIK

Sampler Initials: JM

AT1 BTEX AND F1-F4 IN SOIL (SOIL)

Maxxam ID		BM7464	BM7464	BM7518	BM7519	BM7520		
Sampling Date		2011/09/10	2011/09/10	2011/09/10	2011/09/10	2011/09/10		
COC Number		A012570	A012570	A012570	A012570	A012570		
	Units	TH11-01 TANK 0.4M	TH11-01 TANK 0.4M Lab-Dup	TH11-01 TANK 1.35	TH11-02 PIT SURFACE	TH11-02 PIT 1.3	RDL	QC Batch

Physical Properties								
Moisture	%	24	N/A	32	30	31	0.3	5172723
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	mg/kg	21	23	79	2600	4000	10	5172376
F3 (C16-C34 Hydrocarbons)	mg/kg	100	110	72	550	180	10	5172376
F4 (C34-C50 Hydrocarbons)	mg/kg	41	28	18	38	17	10	5172376
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	Yes	N/A	5172376
Volatiles								
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.49	0.0050	5172305
Toluene	mg/kg	<0.020	<0.020	0.10	0.050	4.6	0.020	5172305
Ethylbenzene	mg/kg	<0.010	<0.010	0.087	0.056	4.5	0.010	5172305
Xylenes (Total)	mg/kg	<0.040	<0.040	0.66	0.37	30	0.040	5172305
m & p-Xylene	mg/kg	<0.040	<0.040	0.43	0.27	20	0.040	5172305
o-Xylene	mg/kg	<0.020	<0.020	0.23	0.10	9.7	0.020	5172305
F1 (C6-C10) - BTEX	mg/kg	<12	<12	15	<12	560	12	5172305
(C6-C10)	mg/kg	<12	<12	16	<12	600	12	5172305
Surrogate Recovery (%)								
4-BROMOFLUOROBENZENE (sur.)	%	94	98	90	92	79	N/A	5172305
D10-ETHYLBENZENE (sur.)	%	97	102	102	81	97	N/A	5172305
D4-1,2-DICHLOROETHANE (sur.)	%	96	96	96	113	110	N/A	5172305
D8-TOLUENE (sur.)	%	102	103	99	96	108	N/A	5172305
O-TERPHENYL (sur.)	%	88	117	97	101	98	N/A	5172376

N/A = Not Applicable
RDL = Reportable Detection Limit



Maxxam Job #: B185684
 Report Date: 2011/09/16

AECOM
 Client Project #: 60223458-01/ AKLAVIK

Sampler Initials: JM

AT1 BTEX AND F1-F4 IN SOIL (SOIL)

Maxxam ID		BM7521	BM7522	BM7523	BM7525	BM7526		
Sampling Date		2011/09/10	2011/09/10	2011/09/10	2011/09/10	2011/09/10		
COC Number		A012570	A012570	A012570	A012570	A012570		
	Units	TH11-03 0.5	TH11-04 0.5	TH11-05 0.5	TH11-06 0.5	TH11-07 0.5	RDL	QC Batch

Physical Properties								
Moisture	%	25	24	25	27	35	0.3	5172723
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	mg/kg	2800	170	270	110	910	10	5172376
F3 (C16-C34 Hydrocarbons)	mg/kg	140	78	95	85	180	10	5172376
F4 (C34-C50 Hydrocarbons)	mg/kg	17	19	23	20	48	10	5172376
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	Yes	N/A	5172376
Volatiles								
Benzene	mg/kg	0.033	0.10	0.040	0.040	0.025	0.0050	5172305
Toluene	mg/kg	0.98	0.13	0.049	0.15	0.16	0.020	5172305
Ethylbenzene	mg/kg	2.3	0.25	0.24	0.24	0.17	0.010	5172305
Xylenes (Total)	mg/kg	17	1.8	0.95	1.5	1.7	0.040	5172305
m & p-Xylene	mg/kg	11	1.3	0.56	0.89	1.0	0.040	5172305
o-Xylene	mg/kg	5.7	0.54	0.39	0.65	0.65	0.020	5172305
F1 (C6-C10) - BTEX	mg/kg	410	28	<12	18	13	12	5172305
(C6-C10)	mg/kg	430	31	<12	20	15	12	5172305
Surrogate Recovery (%)								
4-BROMOFLUOROBENZENE (sur.)	%	90	92	80	87	87	N/A	5172305
D10-ETHYLBENZENE (sur.)	%	110	105	98	95	99	N/A	5172305
D4-1,2-DICHLOROETHANE (sur.)	%	107	97	102	118	102	N/A	5172305
D8-TOLUENE (sur.)	%	108	101	105	100	107	N/A	5172305
O-TERPHENYL (sur.)	%	102	104	100	101	116	N/A	5172376

N/A = Not Applicable
 RDL = Reportable Detection Limit



Maxxam Job #: B185684
Report Date: 2011/09/16

AECOM
Client Project #: 60223458-01/ AKLAVIK

Sampler Initials: JM

AT1 BTEX AND F1-F4 IN SOIL (SOIL)

Maxxam ID		BM7527	BM7529	BM7578	BM7579	BM7592		
Sampling Date		2011/09/10	2011/09/10	2011/09/10	2011/09/10	2011/09/10		
COC Number		A012570	A012570	A012568	A012568	A012571		
	Units	TH11-08 0.5	TH11-09 1.4	TH11-20 SURFACE	TH11-21 SURFACE	TH11-21 0.3M	RDL	QC Batch

Physical Properties								
Moisture	%	31	33	30	27	24	0.3	5172723
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	mg/kg	1500	12	19	12	14	10	5172376
F3 (C16-C34 Hydrocarbons)	mg/kg	150	66	850	150	76	10	5172376
F4 (C34-C50 Hydrocarbons)	mg/kg	28	16	180	38	21	10	5172376
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	Yes	N/A	5172376
Volatiles								
Benzene	mg/kg	0.075	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	5172305
Toluene	mg/kg	0.64	<0.020	<0.020	<0.020	<0.020	0.020	5172305
Ethylbenzene	mg/kg	0.96	<0.010	<0.010	<0.010	<0.010	0.010	5172305
Xylenes (Total)	mg/kg	10	<0.040	<0.040	<0.040	<0.040	0.040	5172305
m & p-Xylene	mg/kg	6.0	<0.040	<0.040	<0.040	<0.040	0.040	5172305
o-Xylene	mg/kg	4.1	<0.020	<0.020	<0.020	<0.020	0.020	5172305
F1 (C6-C10) - BTEX	mg/kg	170	<12	<12	<12	<12	12	5172305
(C6-C10)	mg/kg	180	<12	<12	<12	<12	12	5172305
Surrogate Recovery (%)								
4-BROMOFLUOROBENZENE (sur.)	%	81	106	86	91	93	N/A	5172305
D10-ETHYLBENZENE (sur.)	%	97	93	92	101	101	N/A	5172305
D4-1,2-DICHLOROETHANE (sur.)	%	104	129	100	100	100	N/A	5172305
D8-TOLUENE (sur.)	%	105	95	102	102	104	N/A	5172305
O-TERPHENYL (sur.)	%	110	111	104	104	102	N/A	5172376

N/A = Not Applicable
RDL = Reportable Detection Limit

AT1 BTEX AND F1-F4 IN SOIL (SOIL)

Maxxam ID		BM7593	BM7593		
Sampling Date		2011/09/10	2011/09/10		
COC Number		A012571	A012571		
	Units	TH11-24 SURFACE	TH11-24 SURFACE Lab-Dup	RDL	QC Batch

Physical Properties					
Moisture	%	30	31	0.3	5172723
Ext. Pet. Hydrocarbon					
F2 (C10-C16 Hydrocarbons)	mg/kg	18	N/A	10	5172376
F3 (C16-C34 Hydrocarbons)	mg/kg	670	N/A	10	5172376
F4 (C34-C50 Hydrocarbons)	mg/kg	130	N/A	10	5172376
Reached Baseline at C50	mg/kg	Yes	N/A	N/A	5172376
Volatiles					
Benzene	mg/kg	<0.0050	N/A	0.0050	5172305
Toluene	mg/kg	<0.020	N/A	0.020	5172305
Ethylbenzene	mg/kg	<0.010	N/A	0.010	5172305
Xylenes (Total)	mg/kg	<0.040	N/A	0.040	5172305
m & p-Xylene	mg/kg	<0.040	N/A	0.040	5172305
o-Xylene	mg/kg	<0.020	N/A	0.020	5172305
F1 (C6-C10) - BTEX	mg/kg	<12	N/A	12	5172305
(C6-C10)	mg/kg	<12	N/A	12	5172305
Surrogate Recovery (%)					
4-BROMOFLUOROBENZENE (sur.)	%	92	N/A	N/A	5172305
D10-ETHYLBENZENE (sur.)	%	97	N/A	N/A	5172305
D4-1,2-DICHLOROETHANE (sur.)	%	103	N/A	N/A	5172305
D8-TOLUENE (sur.)	%	99	N/A	N/A	5172305
O-TERPHENYL (sur.)	%	113	N/A	N/A	5172376
N/A = Not Applicable RDL = Reportable Detection Limit					



Maxxam Job #: B185684
Report Date: 2011/09/16

AECOM
Client Project #: 60223458-01/ AKLAVIK

Sampler Initials: JM

Package 1	7.7°C
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Each temperature is the average of up to three cooler temperatures taken at receipt

General Comments

Results relate only to the items tested.



AECOM
 Attention: JENNIFER MCCALLUM
 Client Project #: 60223458-01/ AKLAVIK
 P.O. #:
 Site Location:

Quality Assurance Report
 Maxxam Job Number: EB185684

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits	
5172305 YT	Matrix Spike [BM7518-01]	4-BROMOFLUOROBENZENE (sur.)	2011/09/15		99	%	60 - 140	
		D10-ETHYLBENZENE (sur.)	2011/09/15		107	%	60 - 130	
		D4-1,2-DICHLOROETHANE (sur.)	2011/09/15		101	%	60 - 140	
		D8-TOLUENE (sur.)	2011/09/15		104	%	60 - 140	
		Benzene	2011/09/15		107	%	60 - 140	
		Toluene	2011/09/15		100	%	60 - 140	
		Ethylbenzene	2011/09/15		108	%	60 - 140	
		m & p-Xylene	2011/09/15		104	%	60 - 140	
		o-Xylene	2011/09/15		104	%	60 - 140	
		(C6-C10)	2011/09/15		113	%	60 - 140	
	Spiked Blank	4-BROMOFLUOROBENZENE (sur.)	2011/09/15		93	%	60 - 140	
		D10-ETHYLBENZENE (sur.)	2011/09/15		97	%	60 - 130	
		D4-1,2-DICHLOROETHANE (sur.)	2011/09/15		100	%	60 - 140	
		D8-TOLUENE (sur.)	2011/09/15		101	%	60 - 140	
		Benzene	2011/09/15		97	%	60 - 140	
		Toluene	2011/09/15		93	%	60 - 140	
		Ethylbenzene	2011/09/15		97	%	60 - 140	
		m & p-Xylene	2011/09/15		95	%	60 - 140	
		o-Xylene	2011/09/15		93	%	60 - 140	
		(C6-C10)	2011/09/15		107	%	60 - 140	
	Method Blank	4-BROMOFLUOROBENZENE (sur.)	2011/09/15		93	%	60 - 140	
		D10-ETHYLBENZENE (sur.)	2011/09/15		96	%	60 - 130	
		D4-1,2-DICHLOROETHANE (sur.)	2011/09/15		99	%	60 - 140	
		D8-TOLUENE (sur.)	2011/09/15		97	%	60 - 140	
		Benzene	2011/09/15	<0.0050			mg/kg	
		Toluene	2011/09/15	<0.020			mg/kg	
		Ethylbenzene	2011/09/15	<0.010			mg/kg	
		Xylenes (Total)	2011/09/15	<0.040			mg/kg	
		m & p-Xylene	2011/09/15	<0.040			mg/kg	
		o-Xylene	2011/09/15	<0.020			mg/kg	
		F1 (C6-C10) - BTEX	2011/09/15	<12			mg/kg	
		(C6-C10)	2011/09/15	<12			mg/kg	
		RPD [BM7464-01]	Benzene	2011/09/15	NC			%
Toluene	2011/09/15		NC			%	50	
Ethylbenzene	2011/09/15		NC			%	50	
Xylenes (Total)	2011/09/15		NC			%	50	
m & p-Xylene	2011/09/15		NC			%	50	
o-Xylene	2011/09/15		NC			%	50	
F1 (C6-C10) - BTEX	2011/09/15		NC			%	50	
(C6-C10)	2011/09/15		NC			%	50	
5172376 PK4	Matrix Spike [BM7518-01]		O-TERPHENYL (sur.)	2011/09/14		99	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2011/09/14		105	%	50 - 130
		F3 (C16-C34 Hydrocarbons)	2011/09/14		99	%	50 - 130	
		F4 (C34-C50 Hydrocarbons)	2011/09/14		100	%	50 - 130	
	Spiked Blank	O-TERPHENYL (sur.)	2011/09/14		106	%	50 - 130	
		F2 (C10-C16 Hydrocarbons)	2011/09/14		107	%	70 - 130	
		F3 (C16-C34 Hydrocarbons)	2011/09/14		109	%	70 - 130	
		F4 (C34-C50 Hydrocarbons)	2011/09/14		110	%	70 - 130	
	Method Blank	O-TERPHENYL (sur.)	2011/09/14		93	%	50 - 130	
		F2 (C10-C16 Hydrocarbons)	2011/09/14	<10			mg/kg	
		F3 (C16-C34 Hydrocarbons)	2011/09/14	<10			mg/kg	
		F4 (C34-C50 Hydrocarbons)	2011/09/14	<10			mg/kg	
		RPD [BM7464-01]	F2 (C10-C16 Hydrocarbons)	2011/09/14	NC			%



AECOM
Attention: JENNIFER MCCALLUM
Client Project #: 60223458-01/ AKLAVIK
P.O. #:
Site Location:

Quality Assurance Report (Continued)

Maxxam Job Number: EB185684

QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
5172376 PK4	RPD [BM7464-01]	F3 (C16-C34 Hydrocarbons)	2011/09/14	7.8		%	50
		F4 (C34-C50 Hydrocarbons)	2011/09/14	NC		%	50
5172723 APA	Method Blank	Moisture	2011/09/14	<0.3		%	
	RPD [BM7593-01]	Moisture	2011/09/14	2.6		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone(780)577-7100 Fax(780)450-4187



Validation Signature Page

Maxxam Job #: B185684

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

A handwritten signature in black ink, appearing to read "Karla Offord". The signature is written in a cursive, somewhat stylized script.

Karla Offord, Senior Analyst

=====

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



Your Project #: 60223458-01 / AKLAVIK
Your C.O.C. #: A012569

Attention: JENNIFER MCCALLUM

AECOM
17007 - 107 AVENUE
EDMONTON, AB
CANADA T5S 1G3

Report Date: 2011/09/20

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B185591

Received: 2011/09/12, 16:03

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 in Water by HS GC/MS	3	N/A	2011/09/17	EENVSOP-00004 EENVSOP-00002	EPA 8260C/5021A/CCME
CCME Hydrocarbons in Water (F2; C10-C16)	3	2011/09/15	2011/09/16	AB SOP-00040 AB SOP-00037	EPA3510/CCME PHCCWS

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Desirae Hopkinson, Project Manager
Email: DHopkinson@maxxam.ca
Phone# (780) 577-7104

=====
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1



Maxxam Job #: B185591
 Report Date: 2011/09/20

AECOM
 Client Project #: 60223458-01 / AKLAVIK

Sampler Initials: JM

AT1 BTEX AND F1-F2 (WATER)

Maxxam ID		BM6770	BM6771	BM6772		
Sampling Date		2011/09/10 14:15	2011/09/10 15:30	2011/09/10 17:30		
COC Number		A012569	A012569	A012569		
	Units	TH11-01 TANK SEEP	TH11-02 PIT SEEP	TH11-09 SEEP	RDL	QC Batch

Hydrocarbons						
F2 (C10-C16 Hydrocarbons)	mg/L	62	15	0.9	0.1	5172441
Volatiles						
Benzene	ug/L	0.9	<0.4	<0.4	0.4	5176925
Toluene	ug/L	9.3	<0.4	<0.4	0.4	5176925
Ethylbenzene	ug/L	9.4	<0.4	<0.4	0.4	5176925
o-Xylene	ug/L	30	<0.4	<0.4	0.4	5176925
m & p-Xylene	ug/L	50	<0.8	<0.8	0.8	5176925
Xylenes (Total)	ug/L	80	<0.8	<0.8	0.8	5176925
F1 (C6-C10) - BTEX	ug/L	750	<100	<100	100	5176925
(C6-C10)	ug/L	850	<100	<100	100	5176925
Surrogate Recovery (%)						
4-BROMOFLUOROBENZENE (sur.)	%	119	92	94	N/A	5176925
D4-1,2-DICHLOROETHANE (sur.)	%	119	89	113	N/A	5176925
D8-TOLUENE (sur.)	%	84	100	104	N/A	5176925
O-TERPHENYL (sur.)	%	108	120	103	N/A	5172441

N/A = Not Applicable
 RDL = Reportable Detection Limit



Maxxam Job #: B185591
Report Date: 2011/09/20

AECOM
Client Project #: 60223458-01 / AKLAVIK

Sampler Initials: JM

Package 1	7.7°C
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Each temperature is the average of up to three cooler temperatures taken at receipt

General Comments

Results relate only to the items tested.



AECOM
 Attention: JENNIFER MCCALLUM
 Client Project #: 60223458-01 / AKLAVIK
 P.O. #:
 Site Location:

Quality Assurance Report
 Maxxam Job Number: EB185591

QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits	
5172441 JR1	Matrix Spike	O-TERPHENYL (sur.)	2011/09/16		121	%	50 - 130	
		F2 (C10-C16 Hydrocarbons)	2011/09/16		NC	%	70 - 130	
	Spiked Blank	O-TERPHENYL (sur.)	2011/09/16		97	%	50 - 130	
		F2 (C10-C16 Hydrocarbons)	2011/09/16		101	%	70 - 130	
Method Blank	RPD	O-TERPHENYL (sur.)	2011/09/16		109	%	50 - 130	
		F2 (C10-C16 Hydrocarbons)	2011/09/16	<0.1		mg/L		
5176925 KE4	Matrix Spike	F2 (C10-C16 Hydrocarbons)	2011/09/16	NC		%	40	
		4-BROMOFLUOROBENZENE (sur.)	2011/09/17		101	%	70 - 130	
		D4-1,2-DICHLOROETHANE (sur.)	2011/09/17		88	%	70 - 130	
		D8-TOLUENE (sur.)	2011/09/17		96	%	70 - 130	
	Spiked Blank	Method Blank	Benzene	2011/09/17		95	%	70 - 130
			Toluene	2011/09/17		95	%	70 - 130
			Ethylbenzene	2011/09/17		107	%	70 - 130
			o-Xylene	2011/09/17		105	%	70 - 130
			m & p-Xylene (C6-C10)	2011/09/17		107	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2011/09/17		76	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2011/09/17		101	%	70 - 130
			D8-TOLUENE (sur.)	2011/09/17		83	%	70 - 130
			Benzene	2011/09/17		97	%	70 - 130
			Toluene	2011/09/17		92	%	70 - 130
			Ethylbenzene	2011/09/17		94	%	70 - 130
			o-Xylene	2011/09/17		108	%	70 - 130
	Method Blank	RPD	m & p-Xylene (C6-C10)	2011/09/17		106	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2011/09/17		109	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2011/09/17		82	%	70 - 130
			D8-TOLUENE (sur.)	2011/09/17		91	%	70 - 130
			Benzene	2011/09/17		88	%	70 - 130
			Toluene	2011/09/17		102	%	70 - 130
			Ethylbenzene	2011/09/17	<0.4		ug/L	
			o-Xylene	2011/09/17	<0.4		ug/L	
			m & p-Xylene (C6-C10)	2011/09/17	<0.4		ug/L	
			Xylenes (Total)	2011/09/17	<0.8		ug/L	
			F1 (C6-C10) - BTEX (C6-C10)	2011/09/17	<0.8		ug/L	
			F1 (C6-C10) - BTEX (C6-C10)	2011/09/17	<100		ug/L	
Benzene	2011/09/17	<100		ug/L				
Toluene	2011/09/17	NC		%	40			
Ethylbenzene	2011/09/17	NC		%	40			
o-Xylene	2011/09/17	NC		%	40			
m & p-Xylene (C6-C10)	2011/09/17	NC		%	40			
Xylenes (Total)	2011/09/17	NC		%	40			
F1 (C6-C10) - BTEX (C6-C10)	2011/09/17	NC		%	40			
F1 (C6-C10) - BTEX (C6-C10)	2011/09/17	NC		%	40			

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
 Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
 Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
 Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
 Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
 NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
 NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.



Validation Signature Page

Maxxam Job #: B185591

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

A handwritten signature in black ink, appearing to read "Karla Offord". The signature is written in a cursive style and is positioned above a horizontal line.

Karla Offord, Senior Analyst

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Your Project #: 60223458-01/AKLAVIK
 Your C.O.C. #: A012572

Attention: JENNIFER MCCALLUM

AECOM
 17007 - 107 AVENUE
 EDMONTON, AB
 CANADA T5S 1G3

Report Date: 2011/09/20

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B186084

Received: 2011/09/12, 16:25

Sample Matrix: Solid
 # Samples Received: 1

Analyses	Quantity	Date		Laboratory Method	Analytical Method
		Extracted	Analyzed		
BTEX/F1 by HS GC/MS (MeOH extract)	1	2011/09/13	2011/09/15	EENVSOP-00012 EENVSOP-00002 EENVSOP-00005	CCME CWS, EPA 8260C
CCME Hydrocarbons (F2-F4 in soil)	1	2011/09/13	2011/09/18	AB SOP-00040 AB SOP-00036	CCME PHC-CWS

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Desirae Hopkinson, Project Manager
 Email: DHopkinson@maxxam.ca
 Phone# (780) 577-7104

=====

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1

Maxxam Job #: B186084
 Report Date: 2011/09/20

AECOM
 Client Project #: 60223458-01/AKLAVIK

Sampler Initials: JM

AT1 BTEX AND F1-F4 IN SOIL (SOLID)

Maxxam ID		BM9374		
Sampling Date		2011/09/11		
COC Number		A012572		
	Units	WOOD SHAVINGS	RDL	QC Batch

Ext. Pet. Hydrocarbon				
F2 (C10-C16 Hydrocarbons)	mg/kg	2600 (1)	20	5172390
F3 (C16-C34 Hydrocarbons)	mg/kg	2300 (1)	20	5172390
F4 (C34-C50 Hydrocarbons)	mg/kg	100 (1)	20	5172390
Reached Baseline at C50	mg/kg	Yes	N/A	5172390
Volatiles				
Benzene	mg/kg	<0.010 (1)	0.010	5172305
Toluene	mg/kg	0.057 (1)	0.040	5172305
Ethylbenzene	mg/kg	<0.020 (1)	0.020	5172305
Xylenes (Total)	mg/kg	<0.080 (1)	0.080	5172305
m & p-Xylene	mg/kg	<0.080 (1)	0.080	5172305
o-Xylene	mg/kg	<0.040 (1)	0.040	5172305
F1 (C6-C10) - BTEX	mg/kg	<24 (1)	24	5172305
(C6-C10)	mg/kg	<24 (1)	24	5172305
Surrogate Recovery (%)				
4-BROMOFLUOROBENZENE (sur.)	%	88	N/A	5172305
D10-ETHYLBENZENE (sur.)	%	88	N/A	5172305
D4-1,2-DICHLOROETHANE (sur.)	%	96	N/A	5172305
D8-TOLUENE (sur.)	%	103	N/A	5172305
O-TERPHENYL (sur.)	%	100	N/A	5172390
N/A = Not Applicable RDL = Reportable Detection Limit (1) Detection limit raised due to reduced sample volume.				

Maxxam Job #: B186084
Report Date: 2011/09/20

AECOM
Client Project #: 60223458-01/AKLAVIK

Sampler Initials: JM

General Comments

Results relate only to the items tested.

AECOM
 Attention: JENNIFER MCCALLUM
 Client Project #: 60223458-01/AKLAVIK
 P.O. #:
 Site Location:

Quality Assurance Report
 Maxxam Job Number: EB186084

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
5172305 YT	Matrix Spike	4-BROMOFLUOROBENZENE (sur.)	2011/09/15		99	%	60 - 140
		D10-ETHYLBENZENE (sur.)	2011/09/15		107	%	60 - 130
		D4-1,2-DICHLOROETHANE (sur.)	2011/09/15		101	%	60 - 140
		D8-TOLUENE (sur.)	2011/09/15		104	%	60 - 140
		Benzene	2011/09/15		107	%	60 - 140
		Toluene	2011/09/15		100	%	60 - 140
		Ethylbenzene	2011/09/15		108	%	60 - 140
		m & p-Xylene	2011/09/15		104	%	60 - 140
		o-Xylene	2011/09/15		104	%	60 - 140
		(C6-C10)	2011/09/15		113	%	60 - 140
	Spiked Blank	4-BROMOFLUOROBENZENE (sur.)	2011/09/15		93	%	60 - 140
		D10-ETHYLBENZENE (sur.)	2011/09/15		97	%	60 - 130
		D4-1,2-DICHLOROETHANE (sur.)	2011/09/15		100	%	60 - 140
		D8-TOLUENE (sur.)	2011/09/15		101	%	60 - 140
		Benzene	2011/09/15		97	%	60 - 140
		Toluene	2011/09/15		93	%	60 - 140
		Ethylbenzene	2011/09/15		97	%	60 - 140
		m & p-Xylene	2011/09/15		95	%	60 - 140
		o-Xylene	2011/09/15		93	%	60 - 140
		(C6-C10)	2011/09/15		107	%	60 - 140
	Method Blank	4-BROMOFLUOROBENZENE (sur.)	2011/09/15		93	%	60 - 140
		D10-ETHYLBENZENE (sur.)	2011/09/15		96	%	60 - 130
		D4-1,2-DICHLOROETHANE (sur.)	2011/09/15		99	%	60 - 140
		D8-TOLUENE (sur.)	2011/09/15		97	%	60 - 140
		Benzene	2011/09/15	<0.0050		mg/kg	
		Toluene	2011/09/15	<0.020		mg/kg	
		Ethylbenzene	2011/09/15	<0.010		mg/kg	
		Xylenes (Total)	2011/09/15	<0.040		mg/kg	
		m & p-Xylene	2011/09/15	<0.040		mg/kg	
		o-Xylene	2011/09/15	<0.020		mg/kg	
	RPD	F1 (C6-C10) - BTEX (C6-C10)	2011/09/15	<12		mg/kg	
		Benzene	2011/09/15	NC		%	50
		Toluene	2011/09/15	NC		%	50
Ethylbenzene		2011/09/15	NC		%	50	
Xylenes (Total)		2011/09/15	NC		%	50	
m & p-Xylene		2011/09/15	NC		%	50	
o-Xylene		2011/09/15	NC		%	50	
F1 (C6-C10) - BTEX (C6-C10)		2011/09/15	NC		%	50	
Benzene		2011/09/15	NC		%	50	
Toluene		2011/09/15	NC		%	50	
Ethylbenzene		2011/09/15	NC		%	50	
Xylenes (Total)		2011/09/15	NC		%	50	
m & p-Xylene		2011/09/15	NC		%	50	
o-Xylene	2011/09/15	NC		%	50		
5172390 RC6	Matrix Spike	O-TERPHENYL (sur.)	2011/09/18		112	%	50 - 130
		F2 (C10-C16 Hydrocarbons)	2011/09/18		102	%	50 - 130
		F3 (C16-C34 Hydrocarbons)	2011/09/18		100	%	50 - 130
		F4 (C34-C50 Hydrocarbons)	2011/09/18		102	%	50 - 130
	Spiked Blank	O-TERPHENYL (sur.)	2011/09/18		100	%	50 - 130
		F2 (C10-C16 Hydrocarbons)	2011/09/18		104	%	70 - 130
		F3 (C16-C34 Hydrocarbons)	2011/09/18		110	%	70 - 130
		F4 (C34-C50 Hydrocarbons)	2011/09/18		114	%	70 - 130
	Method Blank	O-TERPHENYL (sur.)	2011/09/18		115	%	50 - 130
		F2 (C10-C16 Hydrocarbons)	2011/09/18	<10		mg/kg	
		F3 (C16-C34 Hydrocarbons)	2011/09/18	<10		mg/kg	
		F4 (C34-C50 Hydrocarbons)	2011/09/18	<10		mg/kg	
	RPD	F2 (C10-C16 Hydrocarbons)	2011/09/18	NC		%	50
F3 (C16-C34 Hydrocarbons)		2011/09/18	NC		%	50	
F4 (C34-C50 Hydrocarbons)		2011/09/18	NC		%	50	
F4 (C34-C50 Hydrocarbons)		2011/09/18	NC		%	50	

AECOM
Attention: JENNIFER MCCALLUM
Client Project #: 60223458-01/AKLAVIK
P.O. #:
Site Location:

Quality Assurance Report (Continued)

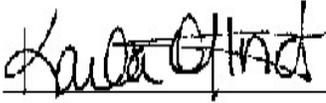
Maxxam Job Number: EB186084

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Validation Signature Page

Maxxam Job #: B186084

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Karla Offord, Senior Analyst

=====

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



Your P.O. #: 60223458

Your Project #: 60223458
 Site Location: AKLAVIK
 Your C.O.C. #: 05931

Attention: Mandeep Dhaliwal
 AECOM
 200-6807 Railway Street SE
 Calgary, AB
 CANADA T2H 2V6

Report Date: 2011/09/29

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B1E2715
Received: 2011/09/15, 22:00

Sample Matrix: AIR
 # Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Canister Pressure (TO-15)	2	N/A	2011/09/21	BRL SOP-00304	EPA TO-15
Canister Pressure (TO-15)	2	N/A	2011/09/22	BRL SOP-00304	EPA TO-15
Volatile Organics in Air (TO-15) ¶	2	N/A	2011/09/21	BRL SOP-00304	EPA TO-15
Volatile Organics in Air (TO-15) ¶	2	N/A	2011/09/22	BRL SOP-00304	EPA TO-15

(1) Air sampling canisters have been cleaned in accordance with U.S. EPA Method TO14A. At the end of the cleaning, evacuation, and pressurization cycles, one canister was selected and was pressurized with Zero Air. This canister was then analyzed via TO14A on a GC/MS. The canister must have been found to contain <0.2 ppbv concentration of all target analytes in order for the batch to have been considered clean. Each canister also underwent a leak check prior to shipment.

Please Note: SUMMA® canister samples will be retained by Maxxam for a period of 5 calendar days from the date of this report, after which time they will be cleaned for reuse. If you require a longer sample storage period, please contact your service representative.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

THERESA STEPHENSON, Project Manager
 Email: TStephenson@maxxam.ca
 Phone# (905) 817-5763

=====
 Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Total cover pages: 1

Maxxam Job #: B1E2715
 Report Date: 2011/09/29

AECOM
 Client Project #: 60223458
 Site Location: AKLAVIK
 Your P.O. #: 60223458

RESULTS OF ANALYSES OF AIR

Maxxam ID		KX3383	KX3384		KX3385	KX3386	
Sampling Date		2011/09/09 18:45	2011/09/09 18:45		2011/09/09 18:45	2011/09/09	
COC Number		05931	05931		05931	05931	
	Units	MAIN FLOOR-LIVING ROOM/ #2748	MAIN FLOOR-LIVING ROOM DUP/ #2578	QC Batch	UPPER FLOOR LIVING ROOM/ #2750	BLANK/ #7837	QC Batch

Volatile Organics							
Pressure on Receipt	psig	0	0	2623213	(-2.9)	(-14.2)	2624635
QC Batch = Quality Control Batch							

Maxxam Job #: B1E2715
 Report Date: 2011/09/29

 AECOM
 Client Project #: 60223458
 Site Location: AKLAVIK
 Your P.O. #: 60223458

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		KX3383				
Sampling Date		2011/09/09 18:45				
COC Number		05931				
	Units	MAIN FLOOR-LIVING ROOM/ #2748	RDL	ug/m3	DL (ug/m3)	QC Batch

Volatile Organics						
2,2,4-Trimethylpentane	ppbv	0.37	0.20	1.71	0.934	2623384
Carbon Disulfide	ppbv	<0.50	0.50	<1.56	1.56	2623384
Propene	ppbv	<0.30	0.30	<0.516	0.516	2623384
Vinyl Acetate	ppbv	<0.20	0.20	<0.704	0.704	2623384
Vinyl Bromide	ppbv	<0.20	0.20	<0.875	0.875	2623384
Dichlorodifluoromethane (FREON 12)	ppbv	1.01	0.20	5.00	0.989	2623384
1,2-Dichlorotetrafluoroethane	ppbv	<0.17	0.17	<1.19	1.19	2623384
Chloromethane	ppbv	0.45	0.30	0.937	0.620	2623384
Vinyl Chloride	ppbv	<0.18	0.18	<0.460	0.460	2623384
Chloroethane	ppbv	<0.30	0.30	<0.792	0.792	2623384
1,3-Butadiene	ppbv	<0.50	0.50	<1.11	1.11	2623384
Trichlorofluoromethane (FREON 11)	ppbv	1.84	0.20	10.3	1.12	2623384
Trichlorotrifluoroethane	ppbv	<0.15	0.15	<1.15	1.15	2623384
Ethanol	ppbv	50.9	2.3	96.0	4.33	2623384
2-propanol	ppbv	<3.0	3.0	<7.37	7.37	2623384
2-Propanone	ppbv	3.67	0.80	8.72	1.90	2623384
Methyl Ethyl Ketone (2-Butanone)	ppbv	<3.0	3.0	<8.85	8.85	2623384
Methyl Isobutyl Ketone	ppbv	<3.2	3.2	<13.1	13.1	2623384
Methyl Butyl Ketone (2-Hexanone)	ppbv	<2.0	2.0	<8.19	8.19	2623384
Methyl t-butyl ether (MTBE)	ppbv	<0.20	0.20	<0.721	0.721	2623384
Ethyl Acetate	ppbv	<2.2	2.2	<7.93	7.93	2623384
1,1-Dichloroethylene	ppbv	<0.25	0.25	<0.991	0.991	2623384
cis-1,2-Dichloroethylene	ppbv	<0.19	0.19	<0.753	0.753	2623384
trans-1,2-Dichloroethylene	ppbv	<0.20	0.20	<0.793	0.793	2623384
Methylene Chloride(Dichloromethane)	ppbv	<0.80	0.80	<2.78	2.78	2623384
Chloroform	ppbv	<0.15	0.15	<0.732	0.732	2623384
Carbon Tetrachloride	ppbv	<0.30	0.30	<1.89	1.89	2623384
1,1-Dichloroethane	ppbv	<0.20	0.20	<0.809	0.809	2623384
1,2-Dichloroethane	ppbv	<0.20	0.20	<0.809	0.809	2623384
Ethylene Dibromide	ppbv	<0.17	0.17	<1.31	1.31	2623384
RDL = Reportable Detection Limit QC Batch = Quality Control Batch						

Maxxam Job #: B1E2715
 Report Date: 2011/09/29

 AECOM
 Client Project #: 60223458
 Site Location: AKLAVIK
 Your P.O. #: 60223458

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		KX3383				
Sampling Date		2011/09/09 18:45				
COC Number		05931				
	Units	MAIN FLOOR-LIVING ROOM/ #2748	RDL	ug/m3	DL (ug/m3)	QC Batch
1,1,1-Trichloroethane	ppbv	<0.30	0.30	<1.64	1.64	2623384
1,1,2-Trichloroethane	ppbv	<0.15	0.15	<0.818	0.818	2623384
1,1,2,2-Tetrachloroethane	ppbv	<0.20	0.20	<1.37	1.37	2623384
cis-1,3-Dichloropropene	ppbv	<0.18	0.18	<0.817	0.817	2623384
trans-1,3-Dichloropropene	ppbv	<0.17	0.17	<0.772	0.772	2623384
1,2-Dichloropropane	ppbv	<0.40	0.40	<1.85	1.85	2623384
Bromomethane	ppbv	<0.18	0.18	<0.699	0.699	2623384
Bromoform	ppbv	<0.20	0.20	<2.07	2.07	2623384
Bromodichloromethane	ppbv	<0.20	0.20	<1.34	1.34	2623384
Dibromochloromethane	ppbv	<0.20	0.20	<1.70	1.70	2623384
Heptane	ppbv	<0.30	0.30	<1.23	1.23	2623384
Trichloroethylene	ppbv	<0.30	0.30	<1.61	1.61	2623384
Tetrachloroethylene	ppbv	<0.20	0.20	<1.36	1.36	2623384
Benzene	ppbv	<0.18	0.18	<0.575	0.575	2623384
Toluene	ppbv	0.33	0.20	1.24	0.753	2623384
Ethylbenzene	ppbv	<0.20	0.20	<0.868	0.868	2623384
p+m-Xylene	ppbv	0.39	0.37	1.71	1.61	2623384
o-Xylene	ppbv	<0.20	0.20	<0.868	0.868	2623384
Styrene	ppbv	<0.20	0.20	<0.852	0.852	2623384
1,3,5-Trimethylbenzene	ppbv	<0.50	0.50	<2.46	2.46	2623384
1,2,4-Trimethylbenzene	ppbv	<0.50	0.50	<2.46	2.46	2623384
4-ethyltoluene	ppbv	<2.2	2.2	<10.8	10.8	2623384
Chlorobenzene	ppbv	<0.20	0.20	<0.921	0.921	2623384
Benzyl chloride	ppbv	<1.0	1.0	<5.18	5.18	2623384
1,3-Dichlorobenzene	ppbv	<0.40	0.40	<2.40	2.40	2623384
1,4-Dichlorobenzene	ppbv	<0.40	0.40	<2.40	2.40	2623384
1,2-Dichlorobenzene	ppbv	<0.40	0.40	<2.40	2.40	2623384
1,2,4-Trichlorobenzene	ppbv	<2.0	2.0	<14.8	14.8	2623384
Hexachlorobutadiene	ppbv	<3.0	3.0	<32.0	32.0	2623384
Hexane	ppbv	<0.30	0.30	<1.06	1.06	2623384
Cyclohexane	ppbv	<0.20	0.20	<0.688	0.688	2623384
QC Batch = Quality Control Batch						

Maxxam Job #: B1E2715
 Report Date: 2011/09/29

AECOM
 Client Project #: 60223458
 Site Location: AKLAVIK
 Your P.O. #: 60223458

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		KX3383				
Sampling Date		2011/09/09 18:45				
COC Number		05931				
	Units	MAIN FLOOR-LIVING ROOM/ #2748	RDL	ug/m3	DL (ug/m3)	QC Batch

Tetrahydrofuran	ppbv	<0.40	0.40	<1.18	1.18	2623384
1,4-Dioxane	ppbv	<2.0	2.0	<7.21	7.21	2623384
Naphthalene	ppbv	<2.0	2.0	<10.5	10.5	2623384
Xylene (Total)	ppbv	<0.60	0.60	<2.61	2.61	2623384
Surrogate Recovery (%)						
Bromochloromethane	%	80		N/A	N/A	2623384
D5-Chlorobenzene	%	81		N/A	N/A	2623384
Difluorobenzene	%	81		N/A	N/A	2623384
N/A = Not Applicable QC Batch = Quality Control Batch						

Maxxam Job #: B1E2715
 Report Date: 2011/09/29

 AECOM
 Client Project #: 60223458
 Site Location: AKLAVIK
 Your P.O. #: 60223458

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		KX3384				
Sampling Date		2011/09/09 18:45				
COC Number		05931				
	Units	MAIN FLOOR-LIVING ROOM DUP/ #2578	RDL	ug/m3	DL (ug/m3)	QC Batch

Volatile Organics						
2,2,4-Trimethylpentane	ppbv	<0.20	0.20	<0.934	0.934	2623384
Carbon Disulfide	ppbv	<0.50	0.50	<1.56	1.56	2623384
Propene	ppbv	<0.30	0.30	<0.516	0.516	2623384
Vinyl Acetate	ppbv	<0.20	0.20	<0.704	0.704	2623384
Vinyl Bromide	ppbv	<0.20	0.20	<0.875	0.875	2623384
Dichlorodifluoromethane (FREON 12)	ppbv	0.95	0.20	4.70	0.989	2623384
1,2-Dichlorotetrafluoroethane	ppbv	<0.17	0.17	<1.19	1.19	2623384
Chloromethane	ppbv	0.41	0.30	0.855	0.620	2623384
Vinyl Chloride	ppbv	<0.18	0.18	<0.460	0.460	2623384
Chloroethane	ppbv	<0.30	0.30	<0.792	0.792	2623384
1,3-Butadiene	ppbv	<0.50	0.50	<1.11	1.11	2623384
Trichlorofluoromethane (FREON 11)	ppbv	1.68	0.20	9.45	1.12	2623384
Trichlorotrifluoroethane	ppbv	<0.15	0.15	<1.15	1.15	2623384
Ethanol	ppbv	48.2	2.3	90.9	4.33	2623384
2-propanol	ppbv	<3.0	3.0	<7.37	7.37	2623384
2-Propanone	ppbv	3.18	0.80	7.55	1.90	2623384
Methyl Ethyl Ketone (2-Butanone)	ppbv	<3.0	3.0	<8.85	8.85	2623384
Methyl Isobutyl Ketone	ppbv	<3.2	3.2	<13.1	13.1	2623384
Methyl Butyl Ketone (2-Hexanone)	ppbv	<2.0	2.0	<8.19	8.19	2623384
Methyl t-butyl ether (MTBE)	ppbv	<0.20	0.20	<0.721	0.721	2623384
Ethyl Acetate	ppbv	<2.2	2.2	<7.93	7.93	2623384
1,1-Dichloroethylene	ppbv	<0.25	0.25	<0.991	0.991	2623384
cis-1,2-Dichloroethylene	ppbv	<0.19	0.19	<0.753	0.753	2623384
trans-1,2-Dichloroethylene	ppbv	<0.20	0.20	<0.793	0.793	2623384
Methylene Chloride(Dichloromethane)	ppbv	<0.80	0.80	<2.78	2.78	2623384
Chloroform	ppbv	<0.15	0.15	<0.732	0.732	2623384
Carbon Tetrachloride	ppbv	<0.30	0.30	<1.89	1.89	2623384
1,1-Dichloroethane	ppbv	<0.20	0.20	<0.809	0.809	2623384
1,2-Dichloroethane	ppbv	<0.20	0.20	<0.809	0.809	2623384
RDL = Reportable Detection Limit QC Batch = Quality Control Batch						

Maxxam Job #: B1E2715
 Report Date: 2011/09/29

 AECOM
 Client Project #: 60223458
 Site Location: AKLAVIK
 Your P.O. #: 60223458

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		KX3384				
Sampling Date		2011/09/09 18:45				
COC Number		05931				
	Units	MAIN FLOOR-LIVING ROOM DUP/ #2578	RDL	ug/m3	DL (ug/m3)	QC Batch
Ethylene Dibromide	ppbv	<0.17	0.17	<1.31	1.31	2623384
1,1,1-Trichloroethane	ppbv	<0.30	0.30	<1.64	1.64	2623384
1,1,2-Trichloroethane	ppbv	<0.15	0.15	<0.818	0.818	2623384
1,1,2,2-Tetrachloroethane	ppbv	<0.20	0.20	<1.37	1.37	2623384
cis-1,3-Dichloropropene	ppbv	<0.18	0.18	<0.817	0.817	2623384
trans-1,3-Dichloropropene	ppbv	<0.17	0.17	<0.772	0.772	2623384
1,2-Dichloropropane	ppbv	<0.40	0.40	<1.85	1.85	2623384
Bromomethane	ppbv	<0.18	0.18	<0.699	0.699	2623384
Bromoform	ppbv	<0.20	0.20	<2.07	2.07	2623384
Bromodichloromethane	ppbv	<0.20	0.20	<1.34	1.34	2623384
Dibromochloromethane	ppbv	<0.20	0.20	<1.70	1.70	2623384
Heptane	ppbv	<0.30	0.30	<1.23	1.23	2623384
Trichloroethylene	ppbv	<0.30	0.30	<1.61	1.61	2623384
Tetrachloroethylene	ppbv	<0.20	0.20	<1.36	1.36	2623384
Benzene	ppbv	<0.18	0.18	<0.575	0.575	2623384
Toluene	ppbv	0.32	0.20	1.21	0.753	2623384
Ethylbenzene	ppbv	<0.20	0.20	<0.868	0.868	2623384
p+m-Xylene	ppbv	<0.37	0.37	<1.61	1.61	2623384
o-Xylene	ppbv	<0.20	0.20	<0.868	0.868	2623384
Styrene	ppbv	<0.20	0.20	<0.852	0.852	2623384
1,3,5-Trimethylbenzene	ppbv	<0.50	0.50	<2.46	2.46	2623384
1,2,4-Trimethylbenzene	ppbv	<0.50	0.50	<2.46	2.46	2623384
4-ethyltoluene	ppbv	<2.2	2.2	<10.8	10.8	2623384
Chlorobenzene	ppbv	<0.20	0.20	<0.921	0.921	2623384
Benzyl chloride	ppbv	<1.0	1.0	<5.18	5.18	2623384
1,3-Dichlorobenzene	ppbv	<0.40	0.40	<2.40	2.40	2623384
1,4-Dichlorobenzene	ppbv	<0.40	0.40	<2.40	2.40	2623384
1,2-Dichlorobenzene	ppbv	<0.40	0.40	<2.40	2.40	2623384
1,2,4-Trichlorobenzene	ppbv	<2.0	2.0	<14.8	14.8	2623384
Hexachlorobutadiene	ppbv	<3.0	3.0	<32.0	32.0	2623384
Hexane	ppbv	<0.30	0.30	<1.06	1.06	2623384
QC Batch = Quality Control Batch						

Maxxam Job #: B1E2715
 Report Date: 2011/09/29

AECOM
 Client Project #: 60223458
 Site Location: AKLAVIK
 Your P.O. #: 60223458

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		KX3384				
Sampling Date		2011/09/09 18:45				
COC Number		05931				
	Units	MAIN FLOOR-LIVING ROOM DUP/ #2578	RDL	ug/m3	DL (ug/m3)	QC Batch
Cyclohexane	ppbv	<0.20	0.20	<0.688	0.688	2623384
Tetrahydrofuran	ppbv	<0.40	0.40	<1.18	1.18	2623384
1,4-Dioxane	ppbv	<2.0	2.0	<7.21	7.21	2623384
Naphthalene	ppbv	<2.0	2.0	<10.5	10.5	2623384
Xylene (Total)	ppbv	<0.60	0.60	<2.61	2.61	2623384
Surrogate Recovery (%)						
Bromochloromethane	%	81		N/A	N/A	2623384
D5-Chlorobenzene	%	80		N/A	N/A	2623384
Difluorobenzene	%	82		N/A	N/A	2623384
N/A = Not Applicable QC Batch = Quality Control Batch						

Maxxam Job #: B1E2715
 Report Date: 2011/09/29

 AECOM
 Client Project #: 60223458
 Site Location: AKLAVIK
 Your P.O. #: 60223458

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		KX3385				
Sampling Date		2011/09/09 18:45				
COC Number		05931				
	Units	UPPER FLOOR LIVING ROOM/ #2750	RDL	ug/m3	DL (ug/m3)	QC Batch

Volatile Organics						
2,2,4-Trimethylpentane	ppbv	0.34	0.20	1.59	0.934	2624734
Carbon Disulfide	ppbv	<0.50	0.50	<1.56	1.56	2624734
Propene	ppbv	<0.30	0.30	<0.516	0.516	2624734
Vinyl Acetate	ppbv	<0.20	0.20	<0.704	0.704	2624734
Vinyl Bromide	ppbv	<0.20	0.20	<0.875	0.875	2624734
Dichlorodifluoromethane (FREON 12)	ppbv	1.27	0.20	6.28	0.989	2624734
1,2-Dichlorotetrafluoroethane	ppbv	<0.17	0.17	<1.19	1.19	2624734
Chloromethane	ppbv	0.51	0.30	1.05	0.620	2624734
Vinyl Chloride	ppbv	<0.18	0.18	<0.460	0.460	2624734
Chloroethane	ppbv	<0.30	0.30	<0.792	0.792	2624734
1,3-Butadiene	ppbv	<0.50	0.50	<1.11	1.11	2624734
Trichlorofluoromethane (FREON 11)	ppbv	3.97	0.20	22.3	1.12	2624734
Trichlorotrifluoroethane	ppbv	<0.15	0.15	<1.15	1.15	2624734
Ethanol	ppbv	443	22	835	41.2	2624734
2-propanol	ppbv	<3.0	3.0	<7.37	7.37	2624734
2-Propanone	ppbv	8.62	0.80	20.5	1.90	2624734
Methyl Ethyl Ketone (2-Butanone)	ppbv	<3.0	3.0	<8.85	8.85	2624734
Methyl Isobutyl Ketone	ppbv	<3.2	3.2	<13.1	13.1	2624734
Methyl Butyl Ketone (2-Hexanone)	ppbv	<2.0	2.0	<8.19	8.19	2624734
Methyl t-butyl ether (MTBE)	ppbv	<0.20	0.20	<0.721	0.721	2624734
Ethyl Acetate	ppbv	<2.2	2.2	<7.93	7.93	2624734
1,1-Dichloroethylene	ppbv	<0.25	0.25	<0.991	0.991	2624734
cis-1,2-Dichloroethylene	ppbv	<0.19	0.19	<0.753	0.753	2624734
trans-1,2-Dichloroethylene	ppbv	<0.20	0.20	<0.793	0.793	2624734
Methylene Chloride(Dichloromethane)	ppbv	<0.80	0.80	<2.78	2.78	2624734
Chloroform	ppbv	0.36	0.15	1.77	0.732	2624734
Carbon Tetrachloride	ppbv	<0.30	0.30	<1.89	1.89	2624734
1,1-Dichloroethane	ppbv	<0.20	0.20	<0.809	0.809	2624734
1,2-Dichloroethane	ppbv	<0.20	0.20	<0.809	0.809	2624734
Ethylene Dibromide	ppbv	<0.17	0.17	<1.31	1.31	2624734
RDL = Reportable Detection Limit QC Batch = Quality Control Batch						

Maxxam Job #: B1E2715
 Report Date: 2011/09/29

 AECOM
 Client Project #: 60223458
 Site Location: AKLAVIK
 Your P.O. #: 60223458

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		KX3385				
Sampling Date		2011/09/09 18:45				
COC Number		05931				
	Units	UPPER FLOOR LIVING ROOM/ #2750	RDL	ug/m3	DL (ug/m3)	QC Batch
1,1,1-Trichloroethane	ppbv	<0.30	0.30	<1.64	1.64	2624734
1,1,2-Trichloroethane	ppbv	<0.15	0.15	<0.818	0.818	2624734
1,1,2,2-Tetrachloroethane	ppbv	<0.20	0.20	<1.37	1.37	2624734
cis-1,3-Dichloropropene	ppbv	<0.18	0.18	<0.817	0.817	2624734
trans-1,3-Dichloropropene	ppbv	<0.17	0.17	<0.772	0.772	2624734
1,2-Dichloropropane	ppbv	<0.40	0.40	<1.85	1.85	2624734
Bromomethane	ppbv	<0.18	0.18	<0.699	0.699	2624734
Bromoform	ppbv	<0.20	0.20	<2.07	2.07	2624734
Bromodichloromethane	ppbv	<0.20	0.20	<1.34	1.34	2624734
Dibromochloromethane	ppbv	<0.20	0.20	<1.70	1.70	2624734
Heptane	ppbv	0.32	0.30	1.31	1.23	2624734
Trichloroethylene	ppbv	<0.30	0.30	<1.61	1.61	2624734
Tetrachloroethylene	ppbv	<0.20	0.20	<1.36	1.36	2624734
Benzene	ppbv	<0.18	0.18	<0.575	0.575	2624734
Toluene	ppbv	0.92	0.20	3.48	0.753	2624734
Ethylbenzene	ppbv	0.37	0.20	1.60	0.868	2624734
p+m-Xylene	ppbv	1.03	0.37	4.47	1.61	2624734
o-Xylene	ppbv	0.48	0.20	2.07	0.868	2624734
Styrene	ppbv	<0.20	0.20	<0.852	0.852	2624734
1,3,5-Trimethylbenzene	ppbv	<0.50	0.50	<2.46	2.46	2624734
1,2,4-Trimethylbenzene	ppbv	1.15	0.50	5.65	2.46	2624734
4-ethyltoluene	ppbv	<2.2	2.2	<10.8	10.8	2624734
Chlorobenzene	ppbv	<0.20	0.20	<0.921	0.921	2624734
Benzyl chloride	ppbv	<1.0	1.0	<5.18	5.18	2624734
1,3-Dichlorobenzene	ppbv	<0.40	0.40	<2.40	2.40	2624734
1,4-Dichlorobenzene	ppbv	<0.40	0.40	<2.40	2.40	2624734
1,2-Dichlorobenzene	ppbv	<0.40	0.40	<2.40	2.40	2624734
1,2,4-Trichlorobenzene	ppbv	<2.0	2.0	<14.8	14.8	2624734
Hexachlorobutadiene	ppbv	<3.0	3.0	<32.0	32.0	2624734
Hexane	ppbv	<0.30	0.30	<1.06	1.06	2624734
Cyclohexane	ppbv	<0.20	0.20	<0.688	0.688	2624734
QC Batch = Quality Control Batch						

Maxxam Job #: B1E2715
 Report Date: 2011/09/29

AECOM
 Client Project #: 60223458
 Site Location: AKLAVIK
 Your P.O. #: 60223458

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		KX3385				
Sampling Date		2011/09/09 18:45				
COC Number		05931				
	Units	UPPER FLOOR LIVING ROOM/ #2750	RDL	ug/m3	DL (ug/m3)	QC Batch

Tetrahydrofuran	ppbv	<0.40	0.40	<1.18	1.18	2624734
1,4-Dioxane	ppbv	<2.0	2.0	<7.21	7.21	2624734
Naphthalene	ppbv	<2.0	2.0	<10.5	10.5	2624734
Xylene (Total)	ppbv	1.51	0.60	6.54	2.61	2624734
Surrogate Recovery (%)						
Bromochloromethane	%	87		N/A	N/A	2624734
D5-Chlorobenzene	%	73		N/A	N/A	2624734
Difluorobenzene	%	84		N/A	N/A	2624734
N/A = Not Applicable QC Batch = Quality Control Batch						

Maxxam Job #: B1E2715
 Report Date: 2011/09/29

 AECOM
 Client Project #: 60223458
 Site Location: AKLAVIK
 Your P.O. #: 60223458

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		KX3386				
Sampling Date		2011/09/09				
COC Number		05931				
	Units	BLANK/ #7837	RDL	ug/m3	DL (ug/m3)	QC Batch

Volatile Organics						
2,2,4-Trimethylpentane	ppbv	<0.20	0.20	<0.934	0.934	2624734
Carbon Disulfide	ppbv	<0.50	0.50	<1.56	1.56	2624734
Propene	ppbv	<0.30	0.30	<0.516	0.516	2624734
Vinyl Acetate	ppbv	<0.20	0.20	<0.704	0.704	2624734
Vinyl Bromide	ppbv	<0.20	0.20	<0.875	0.875	2624734
Dichlorodifluoromethane (FREON 12)	ppbv	<0.20	0.20	<0.989	0.989	2624734
1,2-Dichlorotetrafluoroethane	ppbv	<0.17	0.17	<1.19	1.19	2624734
Chloromethane	ppbv	<0.30	0.30	<0.620	0.620	2624734
Vinyl Chloride	ppbv	<0.18	0.18	<0.460	0.460	2624734
Chloroethane	ppbv	<0.30	0.30	<0.792	0.792	2624734
1,3-Butadiene	ppbv	<0.50	0.50	<1.11	1.11	2624734
Trichlorofluoromethane (FREON 11)	ppbv	<0.20	0.20	<1.12	1.12	2624734
Trichlorotrifluoroethane	ppbv	<0.15	0.15	<1.15	1.15	2624734
Ethanol	ppbv	<2.3	2.3	<4.33	4.33	2624734
2-propanol	ppbv	<3.0	3.0	<7.37	7.37	2624734
2-Propanone	ppbv	<0.80	0.80	<1.90	1.90	2624734
Methyl Ethyl Ketone (2-Butanone)	ppbv	<3.0	3.0	<8.85	8.85	2624734
Methyl Isobutyl Ketone	ppbv	<3.2	3.2	<13.1	13.1	2624734
Methyl Butyl Ketone (2-Hexanone)	ppbv	<2.0	2.0	<8.19	8.19	2624734
Methyl t-butyl ether (MTBE)	ppbv	<0.20	0.20	<0.721	0.721	2624734
Ethyl Acetate	ppbv	<2.2	2.2	<7.93	7.93	2624734
1,1-Dichloroethylene	ppbv	<0.25	0.25	<0.991	0.991	2624734
cis-1,2-Dichloroethylene	ppbv	<0.19	0.19	<0.753	0.753	2624734
trans-1,2-Dichloroethylene	ppbv	<0.20	0.20	<0.793	0.793	2624734
Methylene Chloride(Dichloromethane)	ppbv	<0.80	0.80	<2.78	2.78	2624734
Chloroform	ppbv	<0.15	0.15	<0.732	0.732	2624734
Carbon Tetrachloride	ppbv	<0.30	0.30	<1.89	1.89	2624734
1,1-Dichloroethane	ppbv	<0.20	0.20	<0.809	0.809	2624734
1,2-Dichloroethane	ppbv	<0.20	0.20	<0.809	0.809	2624734
Ethylene Dibromide	ppbv	<0.17	0.17	<1.31	1.31	2624734
1,1,1-Trichloroethane	ppbv	<0.30	0.30	<1.64	1.64	2624734

 RDL = Reportable Detection Limit
 QC Batch = Quality Control Batch

Maxxam Job #: B1E2715
 Report Date: 2011/09/29

 AECOM
 Client Project #: 60223458
 Site Location: AKLAVIK
 Your P.O. #: 60223458

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		KX3386				
Sampling Date		2011/09/09				
COC Number		05931				
	Units	BLANK/ #7837	RDL	ug/m3	DL (ug/m3)	QC Batch
1,1,2-Trichloroethane	ppbv	<0.15	0.15	<0.818	0.818	2624734
1,1,2,2-Tetrachloroethane	ppbv	<0.20	0.20	<1.37	1.37	2624734
cis-1,3-Dichloropropene	ppbv	<0.18	0.18	<0.817	0.817	2624734
trans-1,3-Dichloropropene	ppbv	<0.17	0.17	<0.772	0.772	2624734
1,2-Dichloropropane	ppbv	<0.40	0.40	<1.85	1.85	2624734
Bromomethane	ppbv	<0.18	0.18	<0.699	0.699	2624734
Bromoform	ppbv	<0.20	0.20	<2.07	2.07	2624734
Bromodichloromethane	ppbv	<0.20	0.20	<1.34	1.34	2624734
Dibromochloromethane	ppbv	<0.20	0.20	<1.70	1.70	2624734
Heptane	ppbv	<0.30	0.30	<1.23	1.23	2624734
Trichloroethylene	ppbv	<0.30	0.30	<1.61	1.61	2624734
Tetrachloroethylene	ppbv	<0.20	0.20	<1.36	1.36	2624734
Benzene	ppbv	<0.18	0.18	<0.575	0.575	2624734
Toluene	ppbv	<0.20	0.20	<0.753	0.753	2624734
Ethylbenzene	ppbv	<0.20	0.20	<0.868	0.868	2624734
p+m-Xylene	ppbv	<0.37	0.37	<1.61	1.61	2624734
o-Xylene	ppbv	<0.20	0.20	<0.868	0.868	2624734
Styrene	ppbv	<0.20	0.20	<0.852	0.852	2624734
1,3,5-Trimethylbenzene	ppbv	<0.50	0.50	<2.46	2.46	2624734
1,2,4-Trimethylbenzene	ppbv	<0.50	0.50	<2.46	2.46	2624734
4-ethyltoluene	ppbv	<2.2	2.2	<10.8	10.8	2624734
Chlorobenzene	ppbv	<0.20	0.20	<0.921	0.921	2624734
Benzyl chloride	ppbv	<1.0	1.0	<5.18	5.18	2624734
1,3-Dichlorobenzene	ppbv	<0.40	0.40	<2.40	2.40	2624734
1,4-Dichlorobenzene	ppbv	<0.40	0.40	<2.40	2.40	2624734
1,2-Dichlorobenzene	ppbv	<0.40	0.40	<2.40	2.40	2624734
1,2,4-Trichlorobenzene	ppbv	<2.0	2.0	<14.8	14.8	2624734
Hexachlorobutadiene	ppbv	<3.0	3.0	<32.0	32.0	2624734
Hexane	ppbv	<0.30	0.30	<1.06	1.06	2624734
Cyclohexane	ppbv	<0.20	0.20	<0.688	0.688	2624734
Tetrahydrofuran	ppbv	<0.40	0.40	<1.18	1.18	2624734
1,4-Dioxane	ppbv	<2.0	2.0	<7.21	7.21	2624734
Naphthalene	ppbv	<2.0	2.0	<10.5	10.5	2624734
QC Batch = Quality Control Batch						

Maxxam Job #: B1E2715
 Report Date: 2011/09/29

AECOM
 Client Project #: 60223458
 Site Location: AKLAVIK
 Your P.O. #: 60223458

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		KX3386				
Sampling Date		2011/09/09				
COC Number		05931				
	Units	BLANK/ #7837	RDL	ug/m3	DL (ug/m3)	QC Batch

Xylene (Total)	ppbv	<0.60	0.60	<2.61	2.61	2624734
Surrogate Recovery (%)						
Bromochloromethane	%	92		N/A	N/A	2624734
D5-Chlorobenzene	%	96		N/A	N/A	2624734
Difluorobenzene	%	94		N/A	N/A	2624734

N/A = Not Applicable
 QC Batch = Quality Control Batch

Maxxam Job #: B1E2715
Report Date: 2011/09/29

AECOM
Client Project #: 60223458
Site Location: AKLAVIK
Your P.O. #: 60223458

GENERAL COMMENTS

Sample KX3385-01: TO15
Ethanol was analyzed at a 9.5X dilution. The DL was adjusted accordingly.

Results relate only to the items tested.

AECOM
 Attention: Mandeep Dhaliwal
 Client Project #: 60223458
 P.O. #: 60223458
 Site Location: AKLAVIK

Quality Assurance Report
 Maxxam Job Number: GB1E2715

QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	%Recovery	Units	QC Limits
2623384 LSY	Spiked Blank	Bromochloromethane	2011/09/21		92	%	60 - 140
		D5-Chlorobenzene	2011/09/21		99	%	60 - 140
		Difluorobenzene	2011/09/21		96	%	60 - 140
		2,2,4-Trimethylpentane	2011/09/21		86	%	70 - 130
		Carbon Disulfide	2011/09/21		83	%	70 - 130
		Propene	2011/09/21		71	%	70 - 130
		Vinyl Acetate	2011/09/21		90	%	70 - 130
		Vinyl Bromide	2011/09/21		107	%	70 - 130
		Dichlorodifluoromethane (FREON 12)	2011/09/21		105	%	70 - 130
		1,2-Dichlorotetrafluoroethane	2011/09/21		110	%	70 - 130
		Chloromethane	2011/09/21		86	%	70 - 130
		Vinyl Chloride	2011/09/21		88	%	70 - 130
		Chloroethane	2011/09/21		89	%	70 - 130
		1,3-Butadiene	2011/09/21		73	%	70 - 130
		Trichlorofluoromethane (FREON 11)	2011/09/21		114	%	70 - 130
		Trichlorotrifluoroethane	2011/09/21		102	%	70 - 130
		Ethanol	2011/09/21		74	%	70 - 130
		2-propanol	2011/09/21		81	%	70 - 130
		2-Propanone	2011/09/21		81	%	70 - 130
		Methyl Ethyl Ketone (2-Butanone)	2011/09/21		77	%	70 - 130
		Methyl Isobutyl Ketone	2011/09/21		85	%	70 - 130
		Methyl Butyl Ketone (2-Hexanone)	2011/09/21		85	%	70 - 130
		Methyl t-butyl ether (MTBE)	2011/09/21		104	%	70 - 130
		Ethyl Acetate	2011/09/21		85	%	70 - 130
		1,1-Dichloroethylene	2011/09/21		98	%	70 - 130
		cis-1,2-Dichloroethylene	2011/09/21		96	%	70 - 130
		trans-1,2-Dichloroethylene	2011/09/21		93	%	70 - 130
		Methylene Chloride(Dichloromethane)	2011/09/21		80	%	70 - 130
		Chloroform	2011/09/21		104	%	70 - 130
		Carbon Tetrachloride	2011/09/21		128	%	70 - 130
		1,1-Dichloroethane	2011/09/21		94	%	70 - 130
		1,2-Dichloroethane	2011/09/21		113	%	70 - 130
		Ethylene Dibromide	2011/09/21		107	%	70 - 130
		1,1,1-Trichloroethane	2011/09/21		119	%	70 - 130
		1,1,2-Trichloroethane	2011/09/21		104	%	70 - 130
		1,1,2,2-Tetrachloroethane	2011/09/21		83	%	70 - 130
		cis-1,3-Dichloropropene	2011/09/21		106	%	70 - 130
		trans-1,3-Dichloropropene	2011/09/21		109	%	70 - 130
		1,2-Dichloropropane	2011/09/21		89	%	70 - 130
		Bromomethane	2011/09/21		100	%	70 - 130
		Bromoform	2011/09/21		132 (1)	%	70 - 130
		Bromodichloromethane	2011/09/21		108	%	70 - 130
		Dibromochloromethane	2011/09/21		126	%	70 - 130
		Heptane	2011/09/21		87	%	70 - 130
		Trichloroethylene	2011/09/21		111	%	70 - 130
		Tetrachloroethylene	2011/09/21		121	%	70 - 130
		Benzene	2011/09/21		96	%	70 - 130
		Toluene	2011/09/21		108	%	70 - 130
		Ethylbenzene	2011/09/21		110	%	70 - 130
		p+m-Xylene	2011/09/21		114	%	70 - 130
		o-Xylene	2011/09/21		113	%	70 - 130
		Styrene	2011/09/21		112	%	70 - 130
		1,3,5-Trimethylbenzene	2011/09/21		104	%	70 - 130
		1,2,4-Trimethylbenzene	2011/09/21		99	%	70 - 130
		4-ethyltoluene	2011/09/21		106	%	70 - 130

AECOM
 Attention: Mandeep Dhaliwal
 Client Project #: 60223458
 P.O. #: 60223458
 Site Location: AKLAVIK

Quality Assurance Report (Continued)

Maxxam Job Number: GB1E2715

QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	%Recovery	Units	QC Limits
2623384 LSY	Spiked Blank	Chlorobenzene	2011/09/21		107	%	70 - 130
		Benzyl chloride	2011/09/21		88	%	70 - 130
		1,3-Dichlorobenzene	2011/09/21		97	%	70 - 130
		1,4-Dichlorobenzene	2011/09/21		98	%	70 - 130
		1,2-Dichlorobenzene	2011/09/21		90	%	70 - 130
		1,2,4-Trichlorobenzene	2011/09/21		90	%	70 - 130
		Hexachlorobutadiene	2011/09/21		112	%	70 - 130
		Hexane	2011/09/21		89	%	70 - 130
		Cyclohexane	2011/09/21		91	%	70 - 130
		Tetrahydrofuran	2011/09/21		83	%	70 - 130
		1,4-Dioxane	2011/09/21		88	%	70 - 130
		Xylene (Total)	2011/09/21		114	%	70 - 130
	Method Blank	Bromochloromethane	2011/09/21		87	%	60 - 140
		D5-Chlorobenzene	2011/09/21		91	%	60 - 140
		Difluorobenzene	2011/09/21		90	%	60 - 140
		2,2,4-Trimethylpentane	2011/09/21	<0.20		ppbv	
		Carbon Disulfide	2011/09/21	<0.50		ppbv	
		Propene	2011/09/21	<0.30		ppbv	
		Vinyl Acetate	2011/09/21	<0.20		ppbv	
		Vinyl Bromide	2011/09/21	<0.20		ppbv	
		Dichlorodifluoromethane (FREON 12)	2011/09/21	<0.20		ppbv	
		1,2-Dichlorotetrafluoroethane	2011/09/21	<0.17		ppbv	
		Chloromethane	2011/09/21	<0.30		ppbv	
		Vinyl Chloride	2011/09/21	<0.18		ppbv	
		Chloroethane	2011/09/21	<0.30		ppbv	
		1,3-Butadiene	2011/09/21	<0.50		ppbv	
		Trichlorofluoromethane (FREON 11)	2011/09/21	<0.20		ppbv	
		Trichlorotrifluoroethane	2011/09/21	<0.15		ppbv	
		Ethanol	2011/09/21	<2.3		ppbv	
		2-propanol	2011/09/21	<3.0		ppbv	
		2-Propanone	2011/09/21	<0.80		ppbv	
		Methyl Ethyl Ketone (2-Butanone)	2011/09/21	<3.0		ppbv	
		Methyl Isobutyl Ketone	2011/09/21	<3.2		ppbv	
		Methyl Butyl Ketone (2-Hexanone)	2011/09/21	<2.0		ppbv	
		Methyl t-butyl ether (MTBE)	2011/09/21	<0.20		ppbv	
		Ethyl Acetate	2011/09/21	<2.2		ppbv	
		1,1-Dichloroethylene	2011/09/21	<0.25		ppbv	
		cis-1,2-Dichloroethylene	2011/09/21	<0.19		ppbv	
		trans-1,2-Dichloroethylene	2011/09/21	<0.20		ppbv	
		Methylene Chloride(Dichloromethane)	2011/09/21	<0.80		ppbv	
		Chloroform	2011/09/21	<0.15		ppbv	
		Carbon Tetrachloride	2011/09/21	<0.30		ppbv	
		1,1-Dichloroethane	2011/09/21	<0.20		ppbv	
		1,2-Dichloroethane	2011/09/21	<0.20		ppbv	
		Ethylene Dibromide	2011/09/21	<0.17		ppbv	
		1,1,1-Trichloroethane	2011/09/21	<0.30		ppbv	
		1,1,2-Trichloroethane	2011/09/21	<0.15		ppbv	
		1,1,2,2-Tetrachloroethane	2011/09/21	<0.20		ppbv	
		cis-1,3-Dichloropropene	2011/09/21	<0.18		ppbv	
		trans-1,3-Dichloropropene	2011/09/21	<0.17		ppbv	
		1,2-Dichloropropane	2011/09/21	<0.40		ppbv	
		Bromomethane	2011/09/21	<0.18		ppbv	
		Bromoform	2011/09/21	<0.20		ppbv	
		Bromodichloromethane	2011/09/21	<0.20		ppbv	
		Dibromochloromethane	2011/09/21	<0.20		ppbv	

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QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	%Recovery	Units	QC Limits
2623384 LSY	Method Blank	Heptane	2011/09/21	<0.30		ppbv	
		Trichloroethylene	2011/09/21	<0.30		ppbv	
		Tetrachloroethylene	2011/09/21	<0.20		ppbv	
		Benzene	2011/09/21	<0.18		ppbv	
		Toluene	2011/09/21	<0.20		ppbv	
		Ethylbenzene	2011/09/21	<0.20		ppbv	
		p+m-Xylene	2011/09/21	<0.37		ppbv	
		o-Xylene	2011/09/21	<0.20		ppbv	
		Styrene	2011/09/21	<0.20		ppbv	
		1,3,5-Trimethylbenzene	2011/09/21	<0.50		ppbv	
		1,2,4-Trimethylbenzene	2011/09/21	<0.50		ppbv	
		4-ethyltoluene	2011/09/21	<2.2		ppbv	
		Chlorobenzene	2011/09/21	<0.20		ppbv	
		Benzyl chloride	2011/09/21	<1.0		ppbv	
		1,3-Dichlorobenzene	2011/09/21	<0.40		ppbv	
		1,4-Dichlorobenzene	2011/09/21	<0.40		ppbv	
		1,2-Dichlorobenzene	2011/09/21	<0.40		ppbv	
		1,2,4-Trichlorobenzene	2011/09/21	<2.0		ppbv	
		Hexachlorobutadiene	2011/09/21	<3.0		ppbv	
		Hexane	2011/09/21	<0.30		ppbv	
		Cyclohexane	2011/09/21	<0.20		ppbv	
		Tetrahydrofuran	2011/09/21	<0.40		ppbv	
		1,4-Dioxane	2011/09/21	<2.0		ppbv	
		Naphthalene	2011/09/21	<2.0		ppbv	
		Xylene (Total)	2011/09/21	<0.60		ppbv	
	RPD - Sample/Sample Dup	2,2,4-Trimethylpentane	2011/09/21	NC		%	25
		Carbon Disulfide	2011/09/21	NC		%	25
		Propene	2011/09/21	NC		%	25
		Vinyl Acetate	2011/09/21	NC		%	25
		Vinyl Bromide	2011/09/21	NC		%	25
		Dichlorodifluoromethane (FREON 12)	2011/09/21	NC		%	25
		1,2-Dichlorotetrafluoroethane	2011/09/21	NC		%	25
		Chloromethane	2011/09/21	NC		%	25
		Vinyl Chloride	2011/09/21	NC		%	25
		Chloroethane	2011/09/21	NC		%	25
		1,3-Butadiene	2011/09/21	NC		%	25
		Trichlorofluoromethane (FREON 11)	2011/09/21	1.7		%	25
		Trichlorotrifluoroethane	2011/09/21	NC		%	25
		Ethanol	2011/09/21	1		%	25
		2-propanol	2011/09/21	NC		%	25
		2-Propanone	2011/09/21	NC		%	25
		Methyl Ethyl Ketone (2-Butanone)	2011/09/21	NC		%	25
		Methyl Isobutyl Ketone	2011/09/21	NC		%	25
		Methyl Butyl Ketone (2-Hexanone)	2011/09/21	NC		%	25
		Methyl t-butyl ether (MTBE)	2011/09/21	NC		%	25
		Ethyl Acetate	2011/09/21	NC		%	25
		1,1-Dichloroethylene	2011/09/21	NC		%	25
		cis-1,2-Dichloroethylene	2011/09/21	NC		%	25
		trans-1,2-Dichloroethylene	2011/09/21	NC		%	25
		Methylene Chloride(Dichloromethane)	2011/09/21	NC		%	25
		Chloroform	2011/09/21	NC		%	25
		Carbon Tetrachloride	2011/09/21	NC		%	25
		1,1-Dichloroethane	2011/09/21	NC		%	25

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2623384 LSY	RPD - Sample/Sample Dup	1,2-Dichloroethane	2011/09/21	NC		%	25
		Ethylene Dibromide	2011/09/21	NC		%	25
		1,1,1-Trichloroethane	2011/09/21	NC		%	25
		1,1,2-Trichloroethane	2011/09/21	NC		%	25
		1,1,2,2-Tetrachloroethane	2011/09/21	NC		%	25
		cis-1,3-Dichloropropene	2011/09/21	NC		%	25
		trans-1,3-Dichloropropene	2011/09/21	NC		%	25
		1,2-Dichloropropane	2011/09/21	NC		%	25
		Bromomethane	2011/09/21	NC		%	25
		Bromoform	2011/09/21	NC		%	25
		Bromodichloromethane	2011/09/21	NC		%	25
		Dibromochloromethane	2011/09/21	NC		%	25
		Heptane	2011/09/21	NC		%	25
		Trichloroethylene	2011/09/21	NC		%	25
		Tetrachloroethylene	2011/09/21	NC		%	25
		Benzene	2011/09/21	NC		%	25
		Toluene	2011/09/21	NC		%	25
		Ethylbenzene	2011/09/21	NC		%	25
		p+m-Xylene	2011/09/21	NC		%	25
		o-Xylene	2011/09/21	NC		%	25
		Styrene	2011/09/21	NC		%	25
		1,3,5-Trimethylbenzene	2011/09/21	NC		%	25
		1,2,4-Trimethylbenzene	2011/09/21	NC		%	25
		4-ethyltoluene	2011/09/21	NC		%	25
		Chlorobenzene	2011/09/21	NC		%	25
		Benzyl chloride	2011/09/21	NC		%	25
		1,3-Dichlorobenzene	2011/09/21	NC		%	25
		1,4-Dichlorobenzene	2011/09/21	NC		%	25
		1,2-Dichlorobenzene	2011/09/21	NC		%	25
		1,2,4-Trichlorobenzene	2011/09/21	NC		%	25
		Hexachlorobutadiene	2011/09/21	NC		%	25
		Hexane	2011/09/21	NC		%	25
		Cyclohexane	2011/09/21	NC		%	25
		Tetrahydrofuran	2011/09/21	NC		%	25
		1,4-Dioxane	2011/09/21	NC		%	25
		Naphthalene	2011/09/21	NC		%	25
		Xylene (Total)	2011/09/21	NC		%	25
2624734 LSY	Spiked Blank	Bromochloromethane	2011/09/22		96	%	60 - 140
		D5-Chlorobenzene	2011/09/22		99	%	60 - 140
		Difluorobenzene	2011/09/22		99	%	60 - 140
		2,2,4-Trimethylpentane	2011/09/22		87	%	70 - 130
		Carbon Disulfide	2011/09/22		83	%	70 - 130
		Propene	2011/09/22		70	%	70 - 130
		Vinyl Acetate	2011/09/22		89	%	70 - 130
		Vinyl Bromide	2011/09/22		107	%	70 - 130
		Dichlorodifluoromethane (FREON 12)	2011/09/22		102	%	70 - 130
		1,2-Dichlorotetrafluoroethane	2011/09/22		110	%	70 - 130
		Chloromethane	2011/09/22		86	%	70 - 130
		Vinyl Chloride	2011/09/22		87	%	70 - 130
		Chloroethane	2011/09/22		90	%	70 - 130
		1,3-Butadiene	2011/09/22		72	%	70 - 130
		Trichlorofluoromethane (FREON 11)	2011/09/22		115	%	70 - 130
		Trichlorotrifluoroethane	2011/09/22		103	%	70 - 130

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2624734 LSY	Spiked Blank	Ethanol	2011/09/22		74	%	70 - 130
		2-propanol	2011/09/22		83	%	70 - 130
		2-Propanone	2011/09/22		82	%	70 - 130
		Methyl Ethyl Ketone (2-Butanone)	2011/09/22		78	%	70 - 130
		Methyl Isobutyl Ketone	2011/09/22		87	%	70 - 130
		Methyl Butyl Ketone (2-Hexanone)	2011/09/22		86	%	70 - 130
		Methyl t-butyl ether (MTBE)	2011/09/22		105	%	70 - 130
		Ethyl Acetate	2011/09/22		85	%	70 - 130
		1,1-Dichloroethylene	2011/09/22		97	%	70 - 130
		cis-1,2-Dichloroethylene	2011/09/22		96	%	70 - 130
		trans-1,2-Dichloroethylene	2011/09/22		94	%	70 - 130
		Methylene Chloride(Dichloromethane)	2011/09/22		80	%	70 - 130
		Chloroform	2011/09/22		105	%	70 - 130
		Carbon Tetrachloride	2011/09/22		130	%	70 - 130
		1,1-Dichloroethane	2011/09/22		95	%	70 - 130
		1,2-Dichloroethane	2011/09/22		113	%	70 - 130
		Ethylene Dibromide	2011/09/22		107	%	70 - 130
		1,1,1-Trichloroethane	2011/09/22		121	%	70 - 130
		1,1,2-Trichloroethane	2011/09/22		106	%	70 - 130
		1,1,2,2-Tetrachloroethane	2011/09/22		85	%	70 - 130
		cis-1,3-Dichloropropene	2011/09/22		107	%	70 - 130
		trans-1,3-Dichloropropene	2011/09/22		109	%	70 - 130
		1,2-Dichloropropane	2011/09/22		91	%	70 - 130
		Bromomethane	2011/09/22		101	%	70 - 130
		Bromoform	2011/09/22		135 (1)	%	70 - 130
		Bromodichloromethane	2011/09/22		109	%	70 - 130
		Dibromochloromethane	2011/09/22		127	%	70 - 130
		Heptane	2011/09/22		88	%	70 - 130
		Trichloroethylene	2011/09/22		112	%	70 - 130
		Tetrachloroethylene	2011/09/22		121	%	70 - 130
		Benzene	2011/09/22		97	%	70 - 130
		Toluene	2011/09/22		109	%	70 - 130
		Ethylbenzene	2011/09/22		112	%	70 - 130
		p+m-Xylene	2011/09/22		115	%	70 - 130
		o-Xylene	2011/09/22		115	%	70 - 130
		Styrene	2011/09/22		113	%	70 - 130
		1,3,5-Trimethylbenzene	2011/09/22		106	%	70 - 130
		1,2,4-Trimethylbenzene	2011/09/22		101	%	70 - 130
		4-ethyltoluene	2011/09/22		108	%	70 - 130
		Chlorobenzene	2011/09/22		108	%	70 - 130
		Benzyl chloride	2011/09/22		89	%	70 - 130
		1,3-Dichlorobenzene	2011/09/22		98	%	70 - 130
		1,4-Dichlorobenzene	2011/09/22		98	%	70 - 130
		1,2-Dichlorobenzene	2011/09/22		92	%	70 - 130
		1,2,4-Trichlorobenzene	2011/09/22		92	%	70 - 130
		Hexachlorobutadiene	2011/09/22		114	%	70 - 130
		Hexane	2011/09/22		89	%	70 - 130
		Cyclohexane	2011/09/22		92	%	70 - 130
		Tetrahydrofuran	2011/09/22		83	%	70 - 130
		1,4-Dioxane	2011/09/22		90	%	70 - 130
		Xylene (Total)	2011/09/22		115	%	70 - 130
	Method Blank	Bromochloromethane	2011/09/22		91	%	60 - 140
		D5-Chlorobenzene	2011/09/22		90	%	60 - 140
		Difluorobenzene	2011/09/22		92	%	60 - 140
		2,2,4-Trimethylpentane	2011/09/22	<0.20		ppbv	

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2624734 LSY	Method Blank	Carbon Disulfide	2011/09/22	<0.50		ppbv	
		Propene	2011/09/22	<0.30		ppbv	
		Vinyl Acetate	2011/09/22	<0.20		ppbv	
		Vinyl Bromide	2011/09/22	<0.20		ppbv	
		Dichlorodifluoromethane (FREON 12)	2011/09/22	<0.20		ppbv	
		1,2-Dichlorotetrafluoroethane	2011/09/22	<0.17		ppbv	
		Chloromethane	2011/09/22	<0.30		ppbv	
		Vinyl Chloride	2011/09/22	<0.18		ppbv	
		Chloroethane	2011/09/22	<0.30		ppbv	
		1,3-Butadiene	2011/09/22	<0.50		ppbv	
		Trichlorofluoromethane (FREON 11)	2011/09/22	<0.20		ppbv	
		Trichlorotrifluoroethane	2011/09/22	<0.15		ppbv	
		Ethanol	2011/09/22	<2.3		ppbv	
		2-propanol	2011/09/22	<3.0		ppbv	
		2-Propanone	2011/09/22	<0.80		ppbv	
		Methyl Ethyl Ketone (2-Butanone)	2011/09/22	<3.0		ppbv	
		Methyl Isobutyl Ketone	2011/09/22	<3.2		ppbv	
		Methyl Butyl Ketone (2-Hexanone)	2011/09/22	<2.0		ppbv	
		Methyl t-butyl ether (MTBE)	2011/09/22	<0.20		ppbv	
		Ethyl Acetate	2011/09/22	<2.2		ppbv	
		1,1-Dichloroethylene	2011/09/22	<0.25		ppbv	
		cis-1,2-Dichloroethylene	2011/09/22	<0.19		ppbv	
		trans-1,2-Dichloroethylene	2011/09/22	<0.20		ppbv	
		Methylene Chloride(Dichloromethane)	2011/09/22	<0.80		ppbv	
		Chloroform	2011/09/22	<0.15		ppbv	
		Carbon Tetrachloride	2011/09/22	<0.30		ppbv	
		1,1-Dichloroethane	2011/09/22	<0.20		ppbv	
		1,2-Dichloroethane	2011/09/22	<0.20		ppbv	
		Ethylene Dibromide	2011/09/22	<0.17		ppbv	
		1,1,1-Trichloroethane	2011/09/22	<0.30		ppbv	
		1,1,2-Trichloroethane	2011/09/22	<0.15		ppbv	
		1,1,2,2-Tetrachloroethane	2011/09/22	<0.20		ppbv	
		cis-1,3-Dichloropropene	2011/09/22	<0.18		ppbv	
		trans-1,3-Dichloropropene	2011/09/22	<0.17		ppbv	
		1,2-Dichloropropane	2011/09/22	<0.40		ppbv	
		Bromomethane	2011/09/22	<0.18		ppbv	
		Bromoform	2011/09/22	<0.20		ppbv	
		Bromodichloromethane	2011/09/22	<0.20		ppbv	
		Dibromochloromethane	2011/09/22	<0.20		ppbv	
		Heptane	2011/09/22	<0.30		ppbv	
		Trichloroethylene	2011/09/22	<0.30		ppbv	
		Tetrachloroethylene	2011/09/22	<0.20		ppbv	
		Benzene	2011/09/22	<0.18		ppbv	
		Toluene	2011/09/22	<0.20		ppbv	
		Ethylbenzene	2011/09/22	<0.20		ppbv	
		p+m-Xylene	2011/09/22	<0.37		ppbv	
		o-Xylene	2011/09/22	<0.20		ppbv	
		Styrene	2011/09/22	<0.20		ppbv	
		1,3,5-Trimethylbenzene	2011/09/22	<0.50		ppbv	
		1,2,4-Trimethylbenzene	2011/09/22	<0.50		ppbv	
		4-ethyltoluene	2011/09/22	<2.2		ppbv	
		Chlorobenzene	2011/09/22	<0.20		ppbv	
		Benzyl chloride	2011/09/22	<1.0		ppbv	
		1,3-Dichlorobenzene	2011/09/22	<0.40		ppbv	
		1,4-Dichlorobenzene	2011/09/22	<0.40		ppbv	

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2624734 LSY	Method Blank	1,2-Dichlorobenzene	2011/09/22	<0.40		ppbv	
		1,2,4-Trichlorobenzene	2011/09/22	<2.0		ppbv	
		Hexachlorobutadiene	2011/09/22	<3.0		ppbv	
		Hexane	2011/09/22	<0.30		ppbv	
		Cyclohexane	2011/09/22	<0.20		ppbv	
		Tetrahydrofuran	2011/09/22	<0.40		ppbv	
		1,4-Dioxane	2011/09/22	<2.0		ppbv	
		Naphthalene	2011/09/22	<2.0		ppbv	
		Xylene (Total)	2011/09/22	<0.60		ppbv	
	RPD - Sample/Sample Dup	2,2,4-Trimethylpentane	2011/09/22	NC		%	25
		Carbon Disulfide	2011/09/22	NC		%	25
		Propene	2011/09/22	NC		%	25
		Vinyl Acetate	2011/09/22	NC		%	25
		Vinyl Bromide	2011/09/22	NC		%	25
		Dichlorodifluoromethane (FREON 12)	2011/09/22	1.5		%	25
		1,2-Dichlorotetrafluoroethane	2011/09/22	NC		%	25
		Chloromethane	2011/09/22	NC		%	25
		Vinyl Chloride	2011/09/22	NC		%	25
		Chloroethane	2011/09/22	NC		%	25
		1,3-Butadiene	2011/09/22	NC		%	25
		Trichlorofluoromethane (FREON 11)	2011/09/22	0.7		%	25
		Trichlorotrifluoroethane	2011/09/22	NC		%	25
		Ethanol	2011/09/22	6.1		%	25
		2-propanol	2011/09/22	NC		%	25
		2-Propanone	2011/09/22	0.4		%	25
		Methyl Ethyl Ketone (2-Butanone)	2011/09/22	NC		%	25
		Methyl Isobutyl Ketone	2011/09/22	NC		%	25
		Methyl Butyl Ketone (2-Hexanone)	2011/09/22	NC		%	25
		Methyl t-butyl ether (MTBE)	2011/09/22	NC		%	25
		Ethyl Acetate	2011/09/22	NC		%	25
		1,1-Dichloroethylene	2011/09/22	NC		%	25
		cis-1,2-Dichloroethylene	2011/09/22	NC		%	25
		trans-1,2-Dichloroethylene	2011/09/22	NC		%	25
		Methylene Chloride(Dichloromethane)	2011/09/22	NC		%	25
		Chloroform	2011/09/22	NC		%	25
		Carbon Tetrachloride	2011/09/22	NC		%	25
		1,1-Dichloroethane	2011/09/22	NC		%	25
		1,2-Dichloroethane	2011/09/22	NC		%	25
		Ethylene Dibromide	2011/09/22	NC		%	25
		1,1,1-Trichloroethane	2011/09/22	NC		%	25
		1,1,2-Trichloroethane	2011/09/22	NC		%	25
		1,1,2,2-Tetrachloroethane	2011/09/22	NC		%	25
		cis-1,3-Dichloropropene	2011/09/22	NC		%	25
		trans-1,3-Dichloropropene	2011/09/22	NC		%	25
		1,2-Dichloropropane	2011/09/22	NC		%	25
		Bromomethane	2011/09/22	NC		%	25
		Bromoform	2011/09/22	NC		%	25
		Bromodichloromethane	2011/09/22	NC		%	25
		Dibromochloromethane	2011/09/22	NC		%	25
		Heptane	2011/09/22	NC		%	25
		Trichloroethylene	2011/09/22	NC		%	25
		Tetrachloroethylene	2011/09/22	NC		%	25
		Benzene	2011/09/22	NC		%	25

AECOM
 Attention: Mandeep Dhaliwal
 Client Project #: 60223458
 P.O. #: 60223458
 Site Location: AKLAVIK

Quality Assurance Report (Continued)

Maxxam Job Number: GB1E2715

QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	%Recovery	Units	QC Limits
2624734 LSY	RPD - Sample/Sample Dup	Toluene	2011/09/22	NC		%	25
		Ethylbenzene	2011/09/22	NC		%	25
		p+m-Xylene	2011/09/22	NC		%	25
		o-Xylene	2011/09/22	NC		%	25
		Styrene	2011/09/22	NC		%	25
		1,3,5-Trimethylbenzene	2011/09/22	NC		%	25
		1,2,4-Trimethylbenzene	2011/09/22	NC		%	25
		4-ethyltoluene	2011/09/22	NC		%	25
		Chlorobenzene	2011/09/22	NC		%	25
		Benzyl chloride	2011/09/22	NC		%	25
		1,3-Dichlorobenzene	2011/09/22	NC		%	25
		1,4-Dichlorobenzene	2011/09/22	NC		%	25
		1,2-Dichlorobenzene	2011/09/22	NC		%	25
		1,2,4-Trichlorobenzene	2011/09/22	NC		%	25
		Hexachlorobutadiene	2011/09/22	NC		%	25
		Hexane	2011/09/22	NC		%	25
		Cyclohexane	2011/09/22	NC		%	25
		Tetrahydrofuran	2011/09/22	NC		%	25
		1,4-Dioxane	2011/09/22	NC		%	25
		Naphthalene	2011/09/22	NC		%	25
		Xylene (Total)	2011/09/22	NC		%	25

Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.