HJ 34

A Preliminary Environmental Investigation

of Site HJ034 - Canyon Creek

Prepared for:

Arctic Environmental Strategy

Action on Waste

DIAND, Whitehorse, Y.T.

Prepared by:

D. B. Craig, Consulting Engineer
and
W. J. Klassen and Associates Ltd.

February, 1998

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Natural Resource Management - Environmental Assessment

February 5th, 1998

Mr. Brett Hartshorne,
Manager,
Action on Waste,
Arctic Environmental Strategy,
345 - 300 Main Street,
Whitehorse, Y.T. Y1A 2B5

Dear Mr. Hartshorne:

Re: Site HJ034 -- Canyon Creek: Continuation of Contract 96-6138
Preliminary Environmental Investigations

Enclosed is the final report of "A Preliminary Environmental Investigation of Site HJ034 - Canyon Creek" which incorporates the changes to the draft which you suggested.

The report provides the results of our investigation of this site, following on other work done on this site by MDA Environmental Limited in 1996. As the report indicates, there are no contaminants of any concern at this site.

Dr. Craig and I and our team enjoyed working on this project. Thank you for the opportunity.

Yours truly,

W. J. Klassen

Executive Summary

A preliminary environmental investigation of **Site HJ034 -- Canyon Creek** (Km. 1604, Alaska Highway) was conducted in September/October, 1997, under the auspices of Indian and Northern Affairs - Canada, Waste Management Program - Yukon. The purpose of this investigation was to follow up on work done the previous year at this site by MDA Environmental Limited (MDA) to determine if further assessment or site remediation work would be required. The primary objective was to determine if contaminants were present on the site and, if present, were they migrating from the site and did they pose a human or environmental health hazard. A secondary objective was to identify any physical hazards that might be present on the site.

The investigation of this site consisted of a review of the literature and other background material, interviews, field work, analysis and recommendations. Literature searches, airphoto analysis and interviews confirmed the presence of additional waste dumps at this fairly extensive site. These were found immediately to the west of the Aishihik River bridge and on both sides of the old Alaska Highway with surface garbage at several locations. Field work included identifying and delineating the site, mapping and photographing it, and carrying out an EMI survey; test pits were dug and soil samples taken. Some buried waste was discovered.

The site is well vegetated with an apparently healthy aspen/white spruce vegetation community, grassland/forb community and willow/sedge community at various locations. It is underlain by fluvial gravel, sand and silt containing no visible ground water.

There is scattered surface garbage at a number of locations as well as buried garbage. Tests for DDT and PCBs, the anticipated contaminants, indicated these substances were either not present or were well below the CCME criteria for Residential/Parkland areas. The same was the case for cadmium, lead, mercury and zinc levels in soil samples from this site. The water samples from shallow pits at the toe of the slope below the "military dump" (MDA 20D) located by MDA indicated levels of aluminum, calcium and iron above the CCME standards for certain purposes. One soil sample contained concentrations of extractable petroleum hydrocarbons (EPHs) well above the permissible levels in the Yukon Government "Contaminated Sites Regulations."

A number of further actions are recommended at this site. The potential physical hazards should be dealt with by cleaning up the waste material. The surface garbage and debris, such as broken glass and sharp metal, should be removed and disposed of appropriately. The patch of soil contaminated with petroleum hydrocarbons should be dug up and disposed of properly.

Table of Contents

A Preliminary Environmental Investigation

of Site HJ034 -- Canyon Creek

1.0 Introduction

The Indian and Northern Affairs - Canada, Waste Management Program - Yukon identified a number of abandoned waste and disposal sites throughout the Yukon Territory. These sites were generally associated with exploration, mining, industrial or military operations. The Waste Management Program initiated environmental investigations at a number of such sites.

The purpose of these investigations was to gather preliminary environmental information to determine if further assessment or site remediation work would be required. The primary objective was to determine if contaminants were present on the site. If contaminants were present, the investigation was to determine if they are migrating from the site and whether they posed a human or environmental health hazard. A secondary objective of these investigations was to identify any physical hazards that might be present on the site.

Site HJ034, Canyon Creek, was one of these sites. It was investigated by MDA Environmental Limited in 1996 and the results of their investigation were reported on in a document entitled Preliminary Environmental Investigations of Existing Waste Sites in the Yukon Territories: Site 19 - Cracker Creek; Site 20 - Canyon Creek; Site 42 - Hayes Creek Noranda Camp. This multiple location site is located near the community of Canyon Creek at the Aishihik River crossing on the Alaska Highway at Km 1604. MDA's report recommended that follow-up work be done to investigate several other locations at this site to identify other potential waste burial sites. This recommendation was based on the assumption that the waste dumps which MDA examined did not contain as much waste as could be expected from the years the camps which generated the waste were in operation.

2.0 Methodology

The preliminary environmental investigation of this site consisted of a review of the literature and other background material, interviews, field work on site, analysis and recommendations.

2.1 Literature Review

That portion of the mentioned MDA report that referred to Site HJ034 was reviewed in detail. It identified two possible locations for a dump site, one apparently a natural meadow, the other a cleared area to the north of the Canyon Creek repeater station. Survey maps of the area containing Site HJ034 were obtained and studied to determine the location of private land holdings in relation to the two possible dump sites mentioned in the MDA report. Land claim maps showing Champagne and Aishihik First Nation Settlement Lands were also obtained and reviewed to determine the relationship of the two indicated sites to settlement lands.

The Yukon Archives, DOE Environmental Protection Service library, and the DIAND library were checked for references to this site. The site is briefly mentioned in Bisset's (1995) report in the DOE library. Bisset's report identifies a third possible location of surface and buried waste material along the old Alaska Highway south of the current routing of the Highway at Km 1605. No other written record of this site was found. Bisset's report is not referenced in the MDA report.

Aerial photographs, from 1948, 1964, and 1992, were studied for further evidence of the possible use of two other sites as dumps. The photographs were also examined to determine when the "military dump" south of the highway at Canyon Creek, mentioned in the MDA report as sub-site 20D, was first noted to be in use. Based on this air photo analysis the "military dump" site appeared to have been in use as early as 1948.

2.2 Interviews

Mr. Derrick Fraser and Dr. Craig met with several individuals at Canyon Creek in August, 1997, including Mr. Harold Kane and Mr. Gordon Allison. These individuals as well as Mr. Hayden Woodruff were further interviewed by Dr. Craig and Mr. Trerice to determine whether there were other sites that they might know of in the Canyon Creek vicinity that had been used as dumps. No other potential dump locations were identified as a result of these interviews.

2.3 Field Work

Field work at the site consisted of three visits. During the preliminary visit a reconnaissance was conducted to locate the two potential dump sites identified in the MDA report. The natural meadow site mentioned in the report proved to be exactly that, vegetated primarily with several species of grasses and a native wild flax (*Linum perenne* subsp.). This meadow has been used to tether horses and is being invaded by aspen growth. No waste material was found at this site. The second potential site was located and it and the surrounding area were visually inspected.

On the second visit the second of the suspected sites identified in the MDA report as being located north of the residences on the north side of the Alaska Highway (See MDA Sites 1A, 1B, 1C on Map) as well as a third potential site (Site 1-A) were checked with electro-magnetic indicator (EMI) equipment for buried material (See Appendix A). There was neither surface nor subsurface evidence to suggest that any waste or garbage had been disposed of at the second site suggested in the MDA report. Rather, it shows up on the aerial photographs because it is probably the spoil pile for overburden excavated from a nearby granular source or gravel pit. Part of the old gravel pit is on private property and contains several 1960 and newer model year car hulks. Photo-ionization detection (PID) field work was not carried out owing to the dry nature of the sites.

On the third visit the new site (Sites1-A and 2-A) was mapped and photographed; test pits were dug and soil samples were taken. Water samples were taken at the toe of the slope at the sub-site described as the "military dump" (Site 20D) in the MDA report on the third visit and sent to Analytical Services Limited Laboratories (ASL) in Vancouver, B.C., within 13 hours for analysis.

2.3.1 Site Identification

A thorough search for the two sites suggested in the MDA report was carried out based on information in that report, air photo analysis and interview information. These were located as indicated in the foregoing. MDA Sub-site 20D, the "military dump," was located based on information in the MDA report and further water quality sampling and analysis was undertaken. The two suggested waste sites are, in fact, *not* waste sites.

A third site (Sites 1-A and 2-A -- discovered as a result of information in Bisset's report) and a fourth site (Sites 3-A, 3-B, 3-C -- pointed out to Dr. Craig by Mr. Fraser) were, however, located and investigated. Soil samples were also taken in the immediate vicinity of the former repeater station, adjacent to and outside of property lines.

2.3.2 Site Investigation

The dump locations are substantially vegetated or revegetated. Vegetation at these sites showed no indications of stress. It was therefore felt unnecessary to take any plant samples for analysis.

Soil samples were taken at "hot spots" on the site as evidenced by surface debris, surface disturbance, and electro-magnetic information to confirm the presence of waste material, its areal extent and level of any contamination of the soil. Test pits were dug by hand since the MDA report indicated burial of waste at other sub-sites in this location was only .5 to 1.0 m.; the use of a backhoe was therefore not required. Soil samples were taken from the test pits at or near the surface and at a level below any buried debris. Test pits were refilled on completion of the work on the sites.

Soil samples were taken according to accepted protocols. Soil samples from this site were field tested for the presence of PCBs, DDT and extractable petroleum hydrocarbons (EPH). Selected samples were analyzed by ASL for PCBs, EPH and metals (MDA reported high levels of chromium, copper, iron, manganese, aluminum and silicon). Soil samples to obtain background levels were also taken well away (50 m) from suspected dump sites for comparison purposes. Soil sample sites were examined for visual signs of impact.

Ground water samples were taken at the toe of the "military dump" (MDA Sub-site 20D) as suggested in the MDA report, using the same shallow pit collection method employed by MDA. No ground water was encountered at any of the other test pit locations.

MDA analysis of benthic organism samples in the Aishihik River indicated healthy populations at Site 20 (HJ034) and concluded that Aishihik River water quality remains unaffected by the dumps located to date. No further sampling for benthic organisms was deemed necessary because the waste sites were not found in close proximity to the Aishihik River.

The HJ034 site was mapped to ensure easy future relocation of garbage sites and other features if necessary (See Site HJ034 Map on following pages). In the test pit locations indicated on the map local soil disturbance and scattered surface garbage suggested the potential presence of buried waste material. At one of these locations the presence of buried material was further indicated by EMI equipment.

Photographs were taken of the sites, surface features, and test pits and are provided in this report on the following pages.

The following sites were investigated and test pits dug at the HJO34 Site; the site references are noted on the map of the overall site.

Test Pit Site 1 - A

There was an obvious shallow trench of approximately 100 m. in length and approximately 3 m. in width, trending southwesterly from the Old Alaska Highway. In the test pit dug where the EMI indicated the presence of bulky metallic materials in this shallow trench were found buried truck tires, a wheel hub, a flattened barrel, rusted metal cans of various sizes up to one gallon, 1 quart oil cans, and metal strapping.

The soil profile in the test pit consisted of a thin layer of dry silty-sand over sand.

Vegetative regrowth consisted of scattered 4 metre aspen, grasses, forbs, kinnikinnik and soapberry. There was no evidence of stress on the regrowth.

Test Pit Site BGS

A test pit was dug approximately 50 metres from any location containing waste to obtain background values for comparison. The background test pit soil profile consisted of dry sand to a depth of more than one metre. Vegetative cover at this test pit consisted of one metre tall aspen and kinnikinnik.

Test Pit Site 2 - A

This site is located on the north side of the Old Alaska Highway, where an area of approximately 100 m by 100 m of the somewhat disturbed ground surface is covered with a variety of scattered debris. It includes: rectangular U.S. military anti-freeze tins, food tins, 45 gallon drums, building material, partially-burned dimensional lumber, bottles, wire, broken crockery, a small quantity (less than .25 cu. m.) scattered asbestos shingles of the kind used for siding, and flattened cans.

The test pit was dug at a point where EMI indicated buried metal materials. Found in the test pit were a crumpled 45 gallon drum and a variety of bottles, cans, wire and other miscellaneous debris.

The soil profile in this test pit consists of a thin layer of organic material, 40 cm. of sandy/silt with fine gravel overlying grey sand.

There is good regrowth of aspen, spruce, roses, grasses, kinnikinnik. None show any sign of stress.

There was ample evidence of the presence of ground squirrels, grouse and hares on this site.

Site 3 - A

The surface garbage at this location consisted only of a group of six or more 45 gallon drums which had been modified for use as stoves and perhaps bathtubs in a stand of aspens. There was no evidence of any buried debris at this site.

Site 3 - B

Surface garbage at this location consisted mostly of broken bottles and large tin cans and portions of 45 gallon drums. There was no evidence of any buried debris at this site. Vegetation at this site consisted of aspen, roses, fireweed, and grasses.

Site 3 - C

Surface garbage at this location included cans, bottles, cable, and oil drum tops at the base of a large mature white spruce. There was no evidence of any buried debris at this site.

Site Test Pit 4 - A

This test pit location is situated approximately 5 m. southeast and downslope of the survey marker at the SE corner of the white fence on the edge of the former repeater site. Regrowth at this site is 8 m. aspen and balsam poplar, 5 m. willow and white spruce. The soil profile consisted of 30 cm. of gravel aluvium overlying silty sand. The purpose of this test pit was to determine if there were any contaminants seeping from the former repeater site.

Site Test Pit 4 - B

The test pit at this site is immediately adjacent to the NW corner of the concrete slab of the former diesel plant building which itself is located 20 m. west of the fenced former repeater site. It would

appear that there may be a fuel tank buried beneath or adjacent to this slab. There is an old excavation on the north side of this slab surrounding a concrete "well," approximately 1.5 m. deep, at the bottom of which are visible copper lines, possibly leading to the fuel tank. The vertical pipe in this well may have been for filling the tank. (Not having anticipated a buried tank at this site we did not have with us the means to determine if the vertical pipe lead to a tank and, if so, were there petroleum products in it.) There was no soil discolouration in the test pit nor in the excavation although the concrete slab appears to be discoloured by petroleum products. There appears to be an oil sump in the slab adjacent to the engine mount bolts.

Subsequent to the field work, Tom Clare of Whitehorse, who formerly worked for NorthwesTel on the north Alaska Highway, was contacted concerning the possibility of a buried fuel tank at this location. Although this site had not been in his area of responsibility, he suggested that this concrete slab would have been the location of a standby generator. He could, unfortunately, neither confirm the presence of a buried tank nor discount it. Such standby units, however, usually had a buried tank associated with them, he said.

The soil in the test pit, dug to a depth of 60 cm., was clayey silt.

White spruce and aspen growing beside the slab have reached a height of approximately 4 m.

Site Pit 4 - C

This site is located 45 m. to the north of the diesel plant slab (Site 4-B) in an open area surrounded by mature spruce, 20 m. from an old overgrown meander. There was a 3 m. by 2 m. bare patch of oil-discoloured soil bordered by low-growing sage. Our digging determined that the soil discolouration/contamination is approximately 20 cm. deep; estimated volume of contaminated soil is 1.2 cu. m.

Site 4-D

This small building appears to have been a rectangular pump house of approximately 2.5 m. x 2.5 m., covered with asbestos siding shingles, similar to those found at Site 2-A. This building is on the left hand bank of the Aishihik River immediately upstream of

the Jacquot Bridge, approximately 60 m. west of the former repeater site. (The Jacquot Bridge, an historic reconstruction, is itself located immediately upstream of the Alaska Highway Bridge over the Aishihik River.) The door to this building is unlocked and its floor is buckled. It would appear that there are buried pipes and cables leading from the building toward the former repeater site.

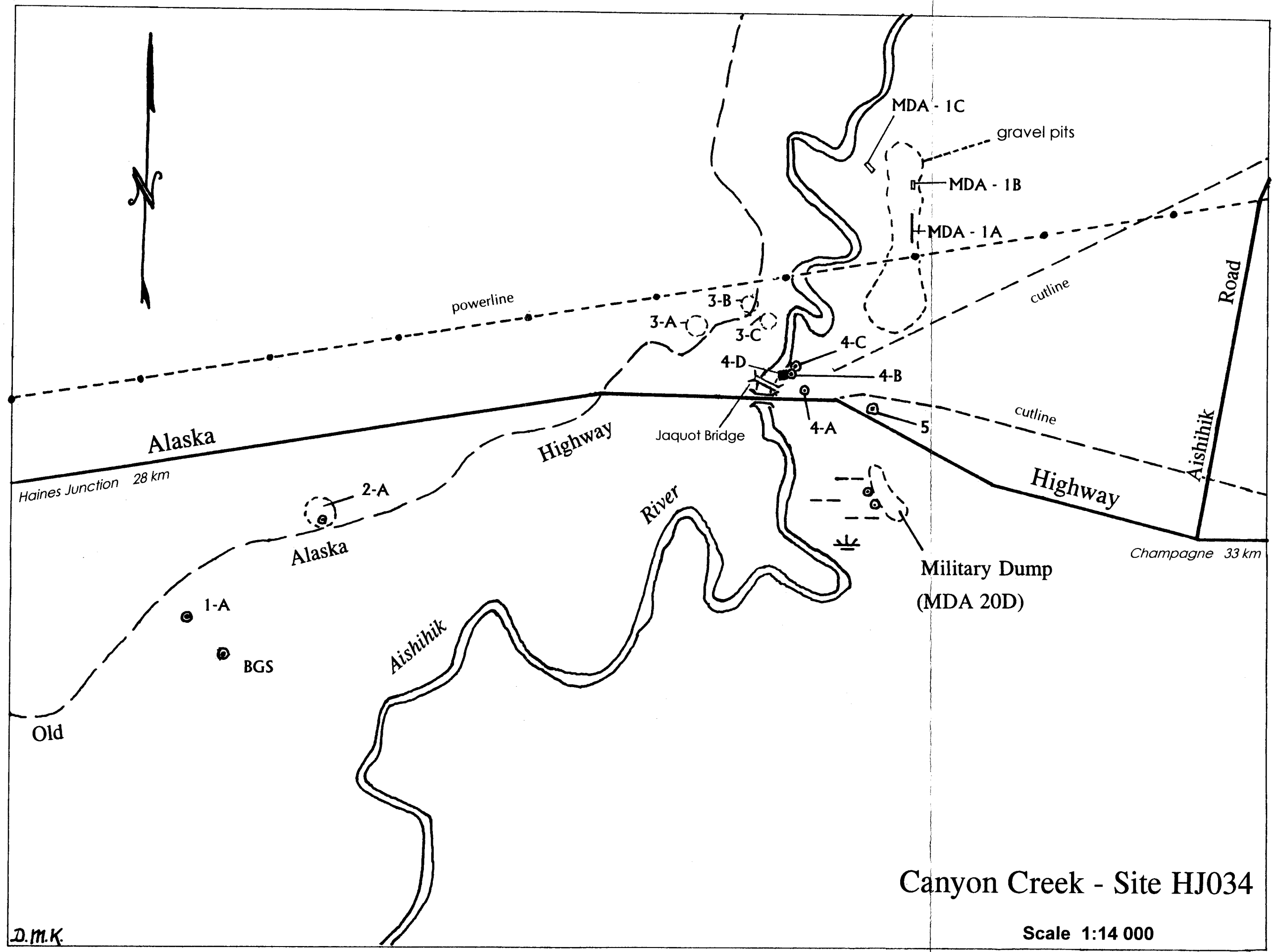
Site 5

This site consists of three concrete-lined vehicle-servicing pits, approximately 60 cm. wide and 1 m. deep, set between 2 m. wide concrete slabs, parallel to and 25 m. from the centre line of the existing Alaska Highway, to the east of the former repeater site. The bottoms of these pits contain soil that appears to be stained with oil. There is evidence of recent use in the form of modern empty oil containers. These pits could be a hazard to wildlife.

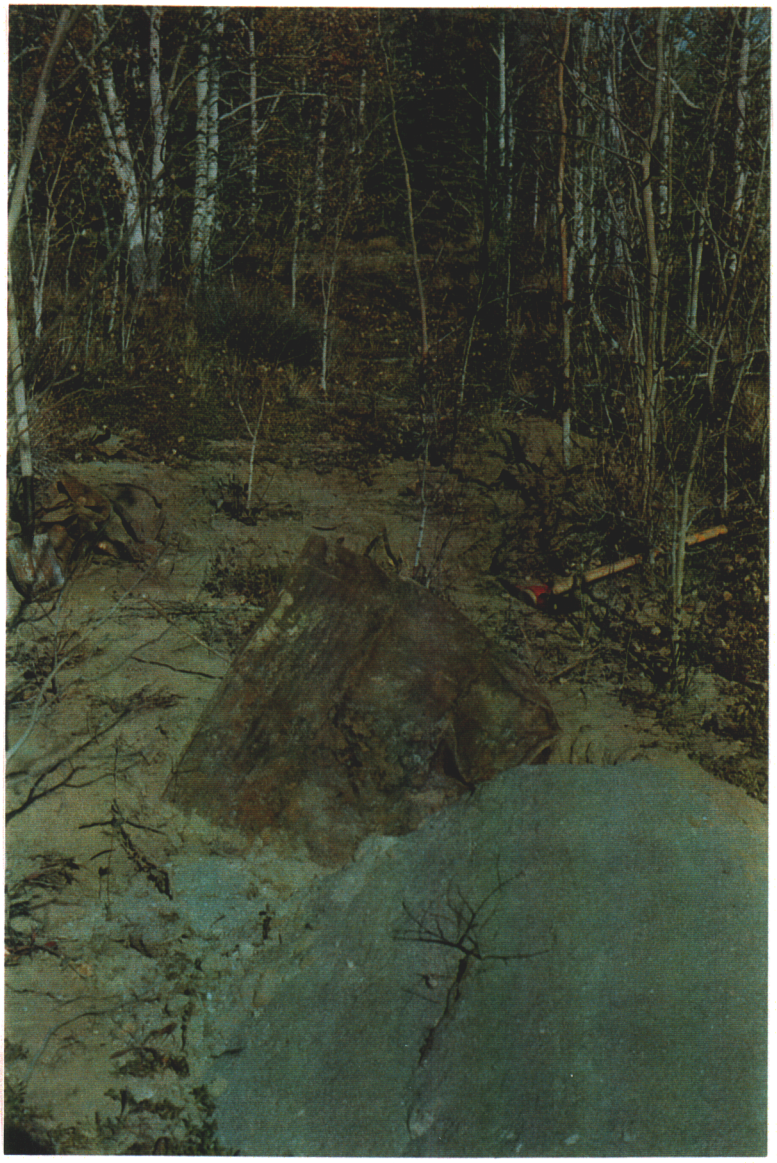
2.3.3 Analytical Program and Criteria

Given the objectives of the environmental investigation, the potential contaminants of concern at Site HJ034 were PCBs, DDT, metals and hydrocarbons. It was felt that PCBs might have found their way to this site in oils and that DDT might have been used as pesticide. Soil samples were therefore field screened for extractable petroleum hydrocarbons (EPHs), DDT and PCBs using immunoassay field kits. Field screening determined the need for analytical testing of some samples. Testing for PCBs, metals and extractable hydrocarbons was carried out by the ASL laboratory in Vancouver, B.C.

The criteria used for comparison of the analytical results were the "Interim Canadian Environmental Quality Criteria for Contaminated Sites - Report CCME EPC-CS34 September 1991" and the "Contaminated Sites Regulations" of the Yukon Government. The analytical results for the indicated substances of concern were compared to the appropriate criteria established for Residential/Parkland or Residential land areas.


MDA - 1C
gravel pits
MDA - 1B
MDA - 1A
powerline
cutline
Road
3-B
3-A
3-C
4-C
4-D
4-B
Alaska
Highway
Jaquot Bridge
4-A
5
cutline
Aishihik
Haines Junction 28 km
2-A
River
Highway
Champagne 33 km
Alaska
Military Dump
(MDA 20D)
1-A
BGS
Aishihik
Old
D.M.K.
Canyon Creek - Site HJ034
Scale 1:14 000

Photographs of Site HJ034



Flattened 45 gallon drum found in test pit.

Test Pit Site 1 - A

Test Pit Site 2 - A

Site 3 - A

Site 3 - C

Site Test Pit 4 - B

Slab foundation of generator building.

Concrete well with copper fuel lines.

3.0 Physical Setting

3.1 General Description

The bulk of Site HJ034, Canyon Creek is located at Km. 1604 (approximately 28 km. east of Haines Junction and 33 km. west of Champagne) on the Alaska Highway. As indicated in the MDA report, this is a fairly extensive site. The two previously unidentified surface garbage locations (Sites 1-A and 2-A) are found west of Canyon Creek on a terrace above the Aishihik River, covered with open Aspen/White Spruce communities.

3.2 Physiography

Physiographically the area is situated in the Kluane Plateau, part of the greater Yukon Plateau. The specific site is at the Alaska Highway crossing of the Aishihik River, some three kilometers north of where the Aishihik River joins the Dezadeash River.

3.3 Geology

The Canyon Creek site is immediately underlain by fluvial gravel, sand and silt of Pleistocene age (Kindle, Unit 12). Bedrock beneath this unconsolidated material and present in outcrop at the historic Jacquot bridge over the Aishihik River consists of greenstone and gneiss of the Yukon Group (Kindle, Unit 1).

3.4 Hydrogeology

Ground water seepage was noted in only two of the test pits at this site, all dug to a depth of one meter or more. The ground water was found in the pits dug at the toe of the slope of the "military dump" at a depth of less than .5 m. The test pits dug at the other locations were all absolutely dry.

3.5 Biology

Three plant communities cover the site, Aspen/White Spruce community, Grassland/Forb community and the Willow/Sedge community (Kennedy, 1993).

The toe of the slope of the "military dump" portion of the Canyon Creek site is a Willow/Sedge (*Salix/ Carex*) community. The overstory bordering the edge of the abandoned meander at the "military dump" consists of black spruce (*Picea mariana*) and small willow (*Salix* spp.). The tussock tundra groundcover is dominated by water sedge (*Carex* spp.) and also includes horsetails and sweet coltsfoot (*Petasites frigidus*). Associated species are shrub birch (*Betula glandulosa*) and shrubby cinquefoil (*Potentilla fruticosa*). The slope

itself had an overstory of aspen (*Populus tremuloides*) and white spruce (*Picea glauca*) with a groundcover predominantly of grasses.

The plant composition at the other sites consisted of white spruce (*Picea glauca*), lodgepole pine (*Pinus contorta*), aspen (*Populus tremuloides*) and balsam poplar (*Populus balsamifera*) as the dominant species in the open canopy. The shrub understory included willow (*Salix* spp.), soapberry (*Sheperdia canadensis*), rose (*Rosa acicularis*), kinnikinnik (*Arctostaphylos uva-ursi*), lowbush cranberry (*Vaccinium vitis-idae*), and twinflower (*Linnaea borealis*). Grasses covered the sunnier aspects of the open forest and meadows, being mainly Altai fescue (*Festuca altaica*) and wheatgrass (*Agropyron* spp.) species. The groundcover of the more shaded parts of the forest floor included grasses, mosses and reindeer lichens (*Cladina* sp.).

Forbs present in the drier areas were lupins (*Lupinus arctica*), pussytoes (*Antennaria pulcherrina*), sage (*Artemisia frigida*), flax and crocus (*Pulsatilla patens*).

All plants that were growing at these sites, both in the space around the waste debris and in the immediate environs, seemed healthy. Mosses growing inside the cans or through the wooden boxes were similar in every respect to those nearby.

Evidence of wildlife consisted of arctic ground squirrel dens and snowshoe hare and spruce grouse droppings throughout the sites. Old beaver cuttings were noted on the slope adjacent to the "military dump." Horses, probably belonging to residents of the Canyon Creek area, have ranged throughout this area as evidenced by old trails and dung.

4.0 Test Results

There is some hydrocarbon contamination from localized petroleum spills at these sites. Soil at one site (4-C) was visibly stained and an odour associated with old oil contamination was evident. As a result, the soil sample from this site was field tested for hydrocarbon presence.

Because of the nature of the use to which this site had been subjected, soil samples were field tested for Extractable Petroleum Hydrocarbons (EPHs), DDT and PCBs. The field testing, briefly, consisted of the following. A soil extraction was made from a portion of each sample. Each extraction was mixed in an individual enzyme-coated test tube with a substrate. A null test and stepped concentrations of the substance being tested for were mixed in the same way. The substrate competes for enzyme bonding places with the soil extraction. A stop solution was added to the test tube mixture and the resulting colour of each

test tube was compared with a clear stop solution tube for refraction. The resulting value for each soil solution was compared with those for the null test tube and the stepped concentrations of the substance being tested for in order to determine the necessity of having each soil sample undergo laboratory analysis.

Following field testing, selected soil samples were submitted to ASL Laboratories in Vancouver for testing for PCBs, EPH and metals. A metals scan of these samples was conducted, looking particularly for lead, zinc, cadmium and mercury.

4.1 DDT

The results of the field test for DDT indicated values lower than those for the "negative control" or null test so no further analysis by the laboratory was required.

4.2 PCBs

The field test for PCB suggested there might be between 1 and 10 ppm PCB in the soil at this site. Subsequent analysis by ASL laboratory in Vancouver, B.C., indicated, however, that there was less than .05 ppm PCB material in all of the soil samples. The level of PCBs permitted by the CCME interim remediation criteria in Residential/Parkland areas is 5 ppm. The lab analysis found less than .001 ppm PCBs in the water samples, well below even the Freshwater Aquatic Life CCME remediation criteria for water.

4.3 Metals

Laboratory analysis was also conducted on the soil sampled from this site for cadmium, lead, mercury and zinc. The values found for these metals in the soil samples from this site were substantially below those cited in the CCME interim remediation criteria for soil in Residential/Parkland areas. The values for soil samples from waste site test pits were only marginally higher than background values, not enough to suggest that the buried waste was contributing to these values.

4.4 Extractable Petroleum Hydrocarbons (EPHs)

The laboratory analysis of the one location (Site 4-C) at this site suspected to be contaminated with hydrocarbons found 47.1% relative amount of hydrocarbons in the diesel range and 50.3% relative amount of hydrocarbons in the heavy oil range. EPHs in the C10-18 range (which includes diesel) were present in the amount of 20800 milligrams per dry kilogram. EPHs in the C19-31 range (which includes heavy oils) were present in the amount of 35600 milligrams per dry

kilogram. These values are well above the Yukon Government standards for contaminated sites for all uses except commercial and industrial. The volume of contaminated soil is relatively small, approximately 1.2 cu. m.

4.5 Water Samples

In general the water samples collected from the toe of the slope at the "military dump" (MDA Site 20-D) contained total metals substantially below the CCME criteria for freshwater aquatic life which are lower than those for drinking water. The exceptions were aluminum and iron which exceeded the CCME remediation standard for both aquatic life and drinking water and calcium which exceeded the aquatic life and the livestock use standards. We concur with the MDA report that these are naturally occurring levels and do not result from leaching from the dump.

(The complete laboratory analysis results are provided in Appendix B).

5.0 Discussion and Conclusions

The investigation of this site found the presence of only three naturally occuring substances at values above CCME standards in ground water: aluminum, calcium and iron. Of these the MDA investigation had also found aluminum and iron at values above CCME standards but not for calcium. On the other hand, the values from this study for chromium, copper and manganese in groundwater are below CCME standards whereas MDA found these to be present in concentrations exceeding these standards. As indicated, these levels are judged to be naturally occuring.

This rather extensive site contains a number of surface deposits of garbage. For the most part these appear to be relatively benign except for asbestos shingle debris which may over time disintegrate and enter the environment. The debris consisting of broken glass, crockery and old drums with exposed sharp edges could constitute a physical hazard to hikers, hunters, trappers and wildlife in the area.

There are also two other potential physical hazards associated with this site. One (Site 4-D) is what appears to have been a rectangular pump house of approximately 2.5 m x 2.5 m, covered with asbestos siding shingles, similar to those found at Site 2-A. The door to this building is unlocked and its floor may not be safe.

The second potential hazard consists of three concrete-lined vehicle-servicing pits (Site 5) in the ditch along the Alaska Highway. These pits could be a hazard to wildlife.

6.0 Recommendations

A number of further actions are recommended at HJ034. The potential physical hazards should be dealt with by cleaning up these locations.

6.1 The surface garbage and debris such as broken glass and sharp metal (Sites 3-A, 3-B, 3-C) should be removed and disposed of appropriately.

6.2 The standby generator slab and "well" (Site 4-B) should be removed. This work will require the use of loader with a backhoe. When this removal is being carried out, this location should be investigated for the presence of a buried fuel tank. The excavation on the north side of the slab should be filled and the site levelled.

6.3 The patch of soil contaminated with petroleum hydrocarbons (Site 4-C) should be dug up and disposed of properly.

6.4 The pumphouse (Site 4-D) should be dismantled, building debris removed, and the site leveled.

6.5 The concrete vehicle-servicing pits (Site 5) should either be dug out and the site filled and levelled or the pits should at least be filled in.

6.6 The asbestos shingles at Site 2-A and those forming the siding on the pumphouse at Site 4-D should be gathered and disposed of in an approved manner.

The recommended cleanup should be undertaken after consultation and in conjunction with the Champagne/Aishihik First Nation, given the site's proximity to the Canyon Creek CAFN residential area.

References:

Bisset, K. 1995. Research of former military sites and activities in the Yukon. AES, DIAND. Whitehorse, Y.T.

Kennedy, C.E. 1993. Guidelines for reclamation/ revegetation in the Yukon. Yukon Renewable Resources. Whitehorse, Y.T.

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Appendix A

EMI Results

Gartner Lee

Geophysical Survey – Canyon Area, Yukon

Prepared for:
W.J. Klassen & Associates Ltd

Prepared by:
Gartner Lee Limited

GLL 97-785

January, 1998

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January 26, 1998

W.J. Klassen & Associates
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Attention: Mr. William Klassen

Dear Mr. Klassen,

Re: Final Report Geophysical Surveys – Canyon Area, Yukon.

Gartner Lee Limited is pleased to provide the following final report which summarizes the results of the geophysical surveys conducted on four sites in the Canyon area, near Haines Junction, Yukon. The purpose of this geophysical work was to help ascertain if buried debris exists under suspect mounds and clearings. Results of these surveys may be used to assess the need for future investigations of the sites.

Thank you for involving Gartner Lee Limited in this most interesting work. We look forward to working with you on future projects. If you have questions or comments, please do not hesitate to call us at 633-6474.

Yours very truly,
GARTNER LEE LIMITED

Forest Pearson
Geological Engineer, EIT

TABLE OF CONTENTS

List of Figures

1.0 INTRODUCTION

Gartner Lee Limited is pleased to provide the following report which summarizes the results of the geophysical surveys conducted on four sites in the Canyon area, near Haines Junction, Yukon. The purpose of this geophysical work was to help ascertain if buried debris exists under suspect mounds and clearings. Results of these surveys may be used to assess the need for future investigations of the sites.

2.0 SITE SETTING

Four sites surrounding the un-incorporated hamlet of Canyon were investigated. The first three sites are proximal to each other and lie about half a kilometre north of the Alaska Highway, and east of the Aishihik River. The fourth site lies a few kilometres west of the Aishihik River and south of the Alaska Highway.

A summary of the sites is presented below.

2.1 CANYON SITE MDA - 1A GRAVEL PIT

Site MDA – 1A is dominated by a long, narrow mound. This mound, which is approximately 100 m long by 10 m wide and 1 to 2 m high, was the subject of the geophysical survey. Surficial materials exposed on the mound consisted mostly of well graded cobble sized gravel. The mound is overgrown by young spruce and willows. An overhead powerline at the south end of the mound has the ability to impact the geophysical results.

Surficial geology in the area consist of alluvial sands and silts. These silts appear initially to be a thin veneer (<0.5m) overlying alluvial gravels. Topography at the site is flat and is interpreted to be a high flood plain or low alluvial terrace. The water table, based on ponding and marshy areas noted west of the site, is estimated to be within one metre of the surface.

2.2 CANYON SITE MDA - 1B GRAVEL PIT

Site MDA – 1B lies approximately fifty metres north of the northern limit of the survey conducted over Site MDA – 1A. This site is a clearing vegetated with grass and sage. The focus of the geophysical survey was a square, low gravel mound. This mound, measuring approximately 30 x 15 by 0.5 metres high, appears similar to that surveyed in Site MDA – 1A.

Surficial materials are similar that described at Canyon Site MDA – 1A.

2.3 CANYON SITE MDA - 1C GRAVEL PIT

The focus of the survey conducted at Site MDA – 1C was a suspect clearing in the forest. This clearing lies some 200 m west of Site MDA – 1B. This clearing is bounded by small terrace down to a marshy area to the southwest, and a shallow swale on the northeast. The orientation of the long axis of the clearing is northwest-southeast.

Surficial materials are similar that described at Canyon Site MDA – 1A.

2.4 CANYON SITE 1A

The survey was conducted at Site 1A was to document a geophysical anomaly discovered while conducting a casual (not recorded) geophysical survey of a long trench south of the Old Alaska Highway. The site lies south of the Alaska Highway, and a couple kilometres west of the Aishihik River on a glaciolacustrine terrace. The site is accessed by following the Old Alaska highway southwest from the modern highway.

Surficial materials are dominated by sparsely overgrown dune features. Soils are sands and represent the upper surface of the Glacial Lake Champagne. Soils are very well drained due to the sandy nature and the high terrace location.

3.0 METHODOLOGY

A terrain conductivity survey was completed over the study sites using a Geonics EM31 Ground Conductivity Meter. The survey was conducted to help detect and delineate the presence of buried metal objects such as metal debris and steel drums.

Prior to the geophysical survey, temporary baselines were established along one edge of the survey site. Each baseline consisted of flagging tape spaced 5 m apart and affixed to vegetation. The geophysical surveys were conducted along lines run perpendicular to the baseline at 5 m intervals. The lines were typically oriented east-west. Grid coordinates are shown on Figures 1 through 4.

Following the completion of the surveys, the data are plotted and interpreted from the profile lines of the geophysical data and notes collected in the field. Final presentation of the data is in the form of colour contour maps on Figures 1 through 4.

3.1 EM31 SURVEY

The Geonics EM31 is an inductive electromagnetic geophysical instrument designed to measure the conductivity of near surface soils. The device has a depth of exploration of approximately 5 m. Changes in conductivity often indicate a change in soil type or the presence of buried metal. To further characterize surficial materials, the inphase component of the EM field is also measured. The inphase is considered the metal detection mode. Buried metal within 5 m below the surface, such as drums, pipes, or metallic debris can be mapped in the inphase mode.

The EM31 was used with a data logger, allowing for rapid acquisition of data and transferal of the data to a computer for subsequent processing. Terrain conductivity and inphase readings were taken along lines spaced 5 m apart (except for Site 4 at which a 2.5 m line spacing was used) on a near continuous basis at 1 metre intervals. Location and distances along the lines were established by the use of a hip-chain.

4.0 RESULTS

The geophysical surveys were completed September 12th, 1997. The results of the geophysical surveys are presented in Figures 1 through 4. Figure 1a, 2a, 3a & 4a represent the "Terrain Conductivity" results for sites MDA – 1A, B, C & 1A respectively, while Figure 1b, 2b, 3b & 4b represent the "Inphase Component" respectively.

4.1 CANYON SITE MDA - 1A

Figure 1a represents the terrain conductivity survey conducted over this site. Background conductivities appear to be in the 4 to 6 mS/m range. This is appropriate considering gravel conductivities are typically in the 4 to 15 mS/m range for gravely sands and silts. Elevated conductivities noted in the southern portion of the survey may be due to the influence of the powerline approximately noted on the Figure. The trend of the suspect mound is difficult to detect in this Figure, implying a mixed genetic nature comparable to the surrounding soils. A subtle north-south trend can be detected which is correlative with the long axis of the mound. No significant anomalies which would indicate the presence of buried metal are seen in the data.

Figure 1b represents the inphase component of the electromagnetic field measured over the site. As stated earlier, this is considered the "metal detecting" mode of the EM31. Similar to Figure 1a, a linear feature which is correlative to the mound is seen in the data, yet no major

anomalies are present. For comparison, the major metal anomaly found at Canyon Site 1A is shown in Figure 4b; note the scale on the right hand side of the Figures.

4.2 CANYON SITE MDA - 1B

The terrain conductivity of Site MDA – 1B is shown in Figure 2a. In this Figure, the gravel mound which was the target of the survey is clearly visible. The mound shows as a low conductivity feature, with conductivies in the low 4 mS/m range, versus the surrounding alluvial silts and sands in the 4 to 5 mS/m range. This is a very subtle variation in terrain conductivity, and no metallic anomalies were interpreted at this site.

The inphase component for this site is shown in Figure 2b. The data is variable, and shows no major trends, nor significant anomalies that would indicate the presence of buried metal.

4.3 CANYON SITE MDA - 1C

Figure 3a represents the terrain conductivity over this site. Again, terrain conductivites are low, in the 3-4 mS/m range which is in accordance with the soils in this area. A conductivity high can be seen in the lower right (northwest side) of the map; this corresponds with the shallow swale northwest of the clearing. This could be due to higher moisture content in the soils or perhaps finer grained soils. No significant anomalies are visible in this survey.

Figure 3b shows the inphase component for the survey of Site MDA – 1C. As in the inphase data for Site MDA – 1B, the data is variable, shows no major trends, but more importantly, no significant anomalies indicating the presence of buried metallic debris.

4.4 CANYON SITE 1A

The results of the small terrain conductivity survey conducted at Site 1A are shown in Figure 4a. The obvious negative conductivity in the centre of the survey represents a significant geophysical anomaly. Background values in the 2.5 mS/m range, which is low due to the very dry, well sorted sands, but still clearly distinguishable from the anomaly. The anomaly is characterized by high conductivity "shoulders" on the edges, and a negative conductivity centre. The high shoulder – negative centre type anomaly is typical of that created by a laterally small metallic object. The negative conductivity core is an effect due to the geometry and design of the EM31 Terrain Conductivity Meter.

The inphase component of the survey conducted at Site 1A is shown in Figure 4b. The anomaly shown here mirrors that seen in the terrain conductivity. This anomaly represents a very near surface, large buried metallic object or objects.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the above findings, the following conclusions are made:

1. The long linear mound surveyed Site MDA – 1A is most likely a push created by bulldozers stripping soil from the small borrow pit to the west. The mound may be of mixed genetic material, creating a similar conductivity response to the surround terrain. No significant metallic anomalies were detected.
2. The low square mound surveyed at Site MDA – 1B is likely another bulldozer stripping pile, mostly composed of gravel. Again, no significant metallic anomalies were detected.
3. The suspect clearing at Site MDA – 1C appears to be natural with no significant metallic anomalies. Such clearings are commonly found in the Takhini and Watson River valleys.
4. The anomaly at site 1A is most likely a small buried metal object or objects.

Based on the above findings it is recommended that:

1. No further work is required be taken at Sites MDA – 1A, B, C. Further investigation should be undertaken at Site 1A to determine the cause of the anomaly.
2. During causal geophysical surveys conducted after completing the survey of Site 1A, a large area of refuse was encountered. This area lies approximately half a kilometre northeast along the Old Alaska Highway from Site 1A. This area presented many geophysical anomalies representing both buried and surface debris. This area appears to either be an old army camp/s, or dump. Can middens and burnt building remains were seen though the forested area. Follow-up work should be conducted at this site to determine the extent of the refuse in this area

Report prepared by:

Forest Pearson
Geological Engineer, E.I.T.

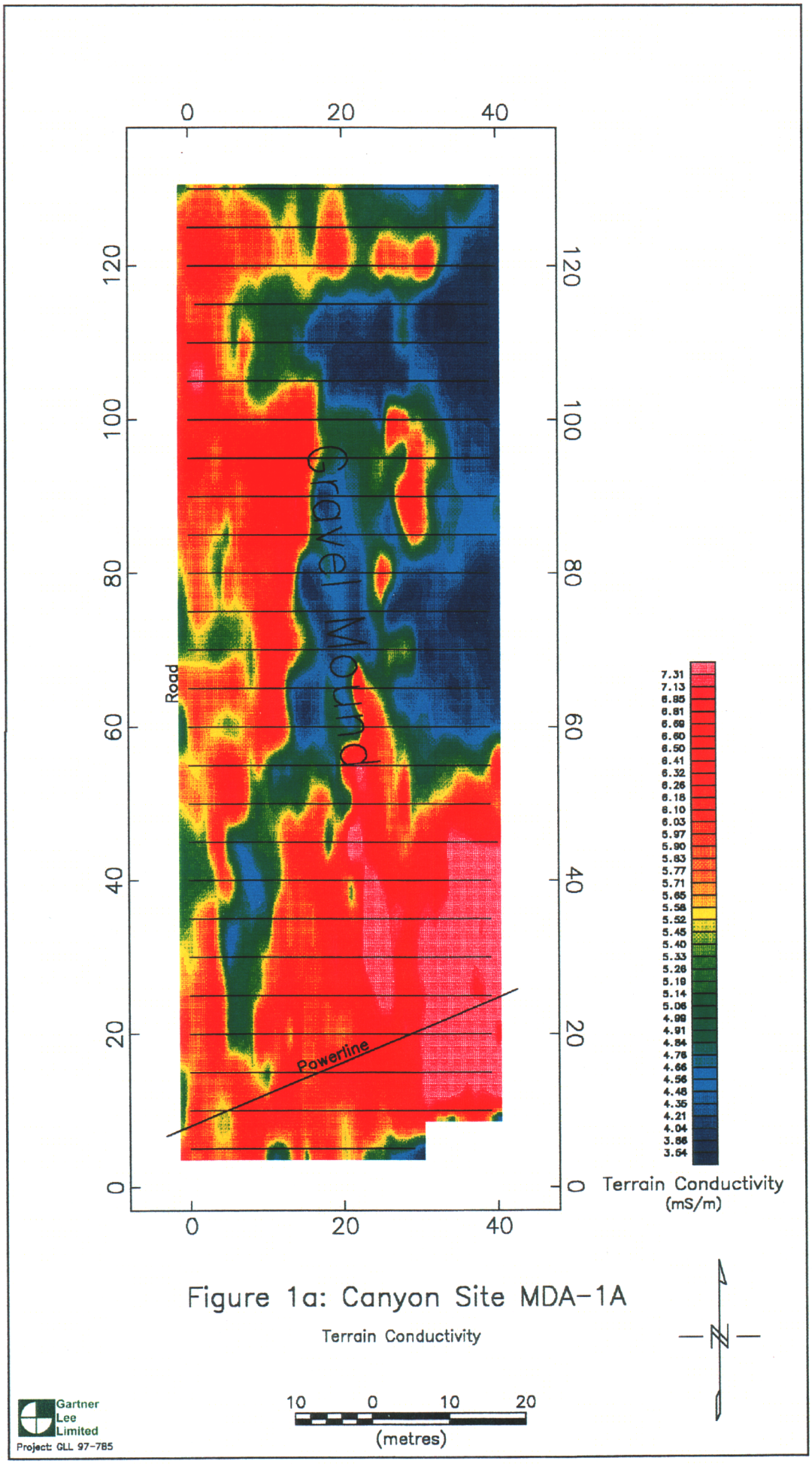


Figure 1a: Canyon Site MDA-1A

Terrain Conductivity

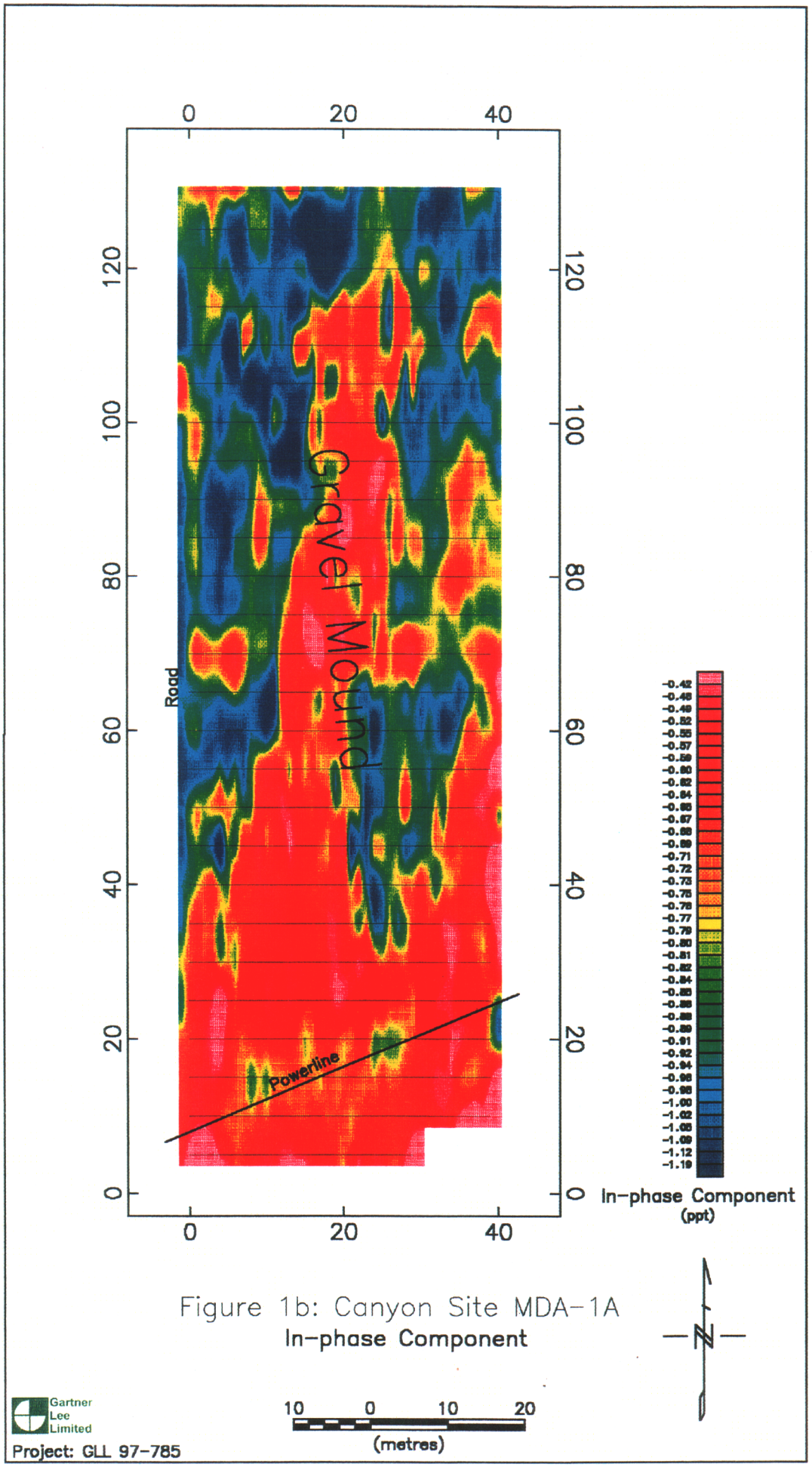
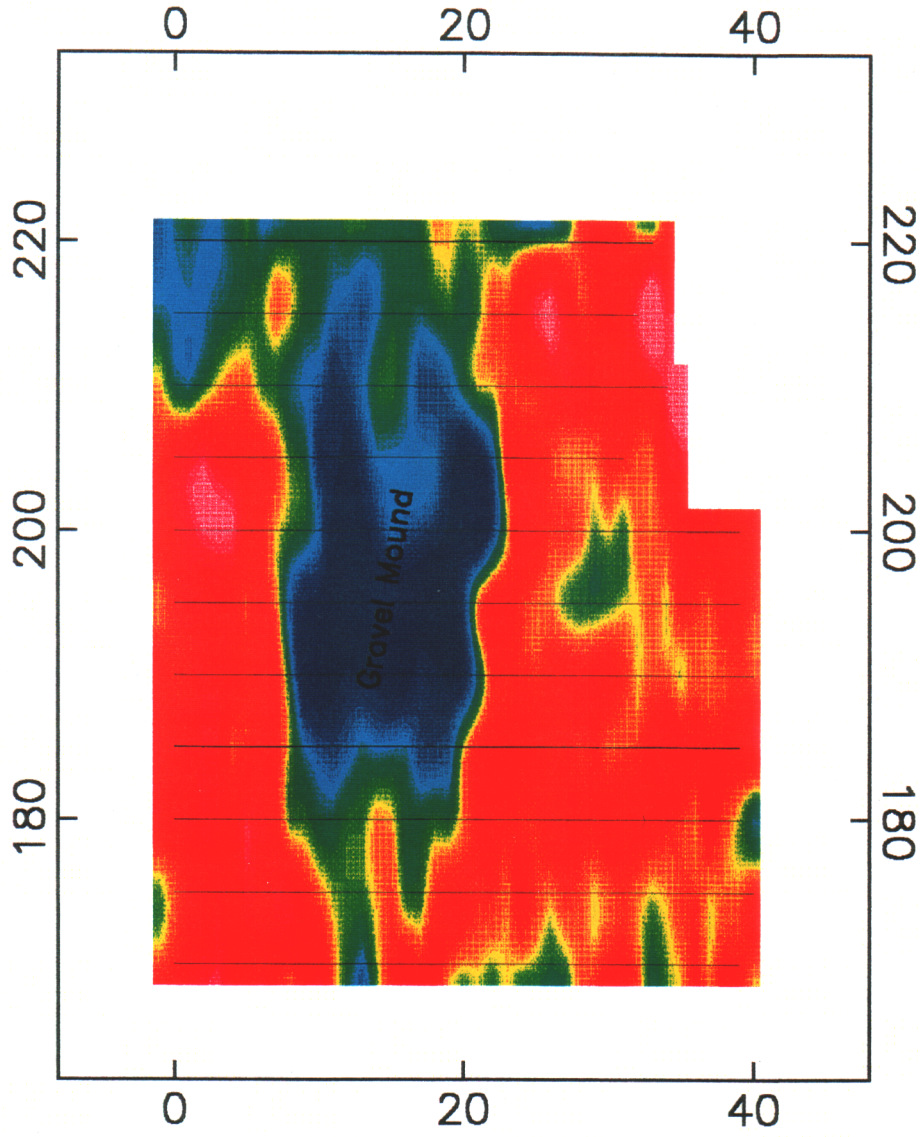
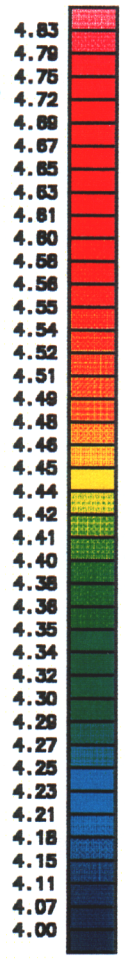


Figure 1b: Canyon Site MDA-1A
In-phase Component

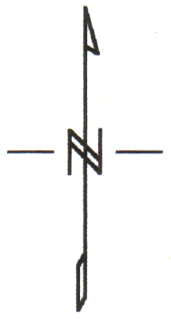




Terrain Conductivity
(mS/m)

Figure 2a: Canyon Site MDA-1B

Terrain Conductivity



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(metres)

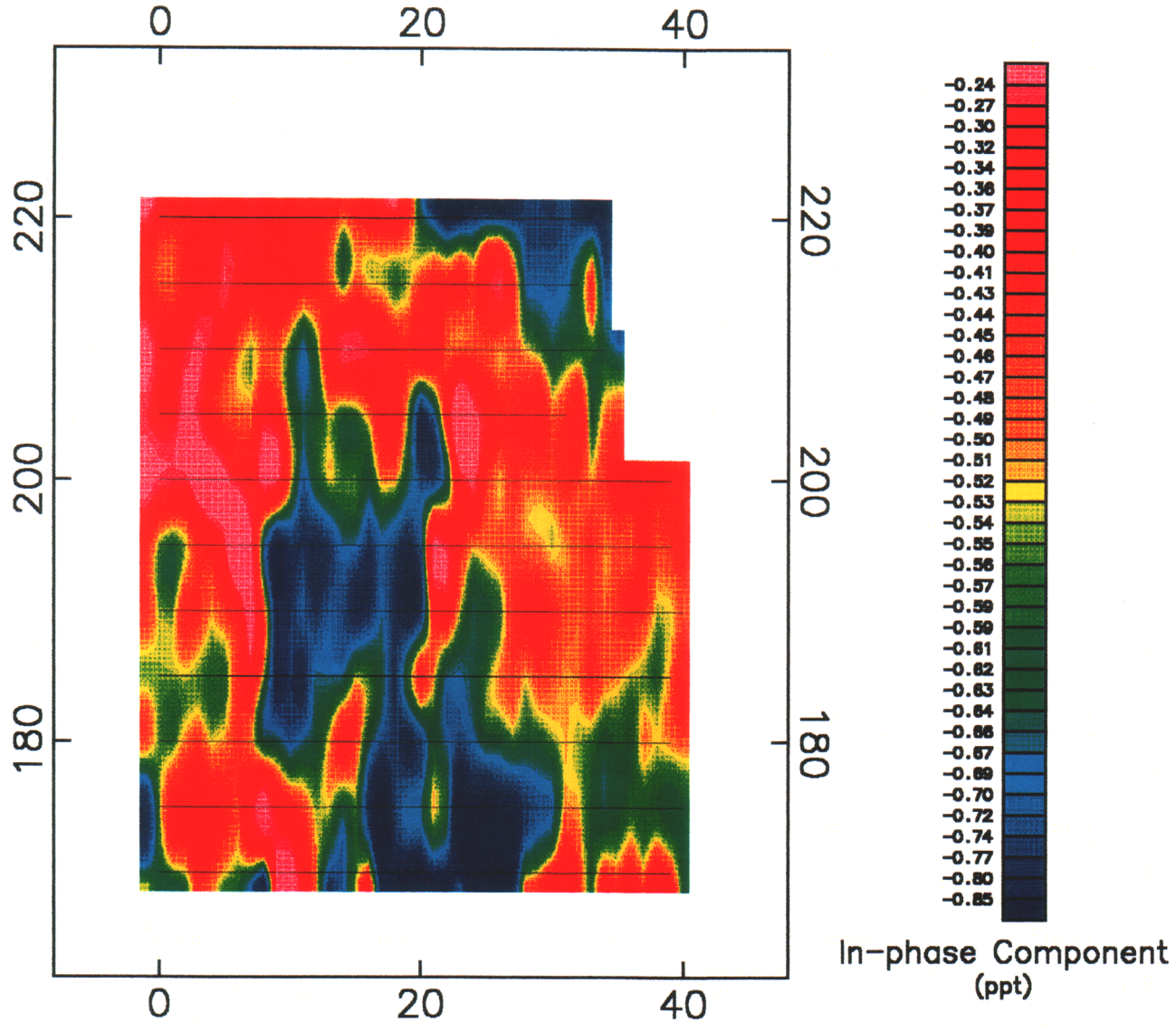
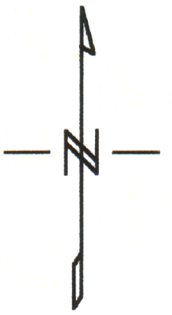
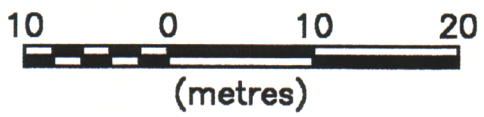


Figure 2b: Canyon Site MDA-1B

In-phase Component





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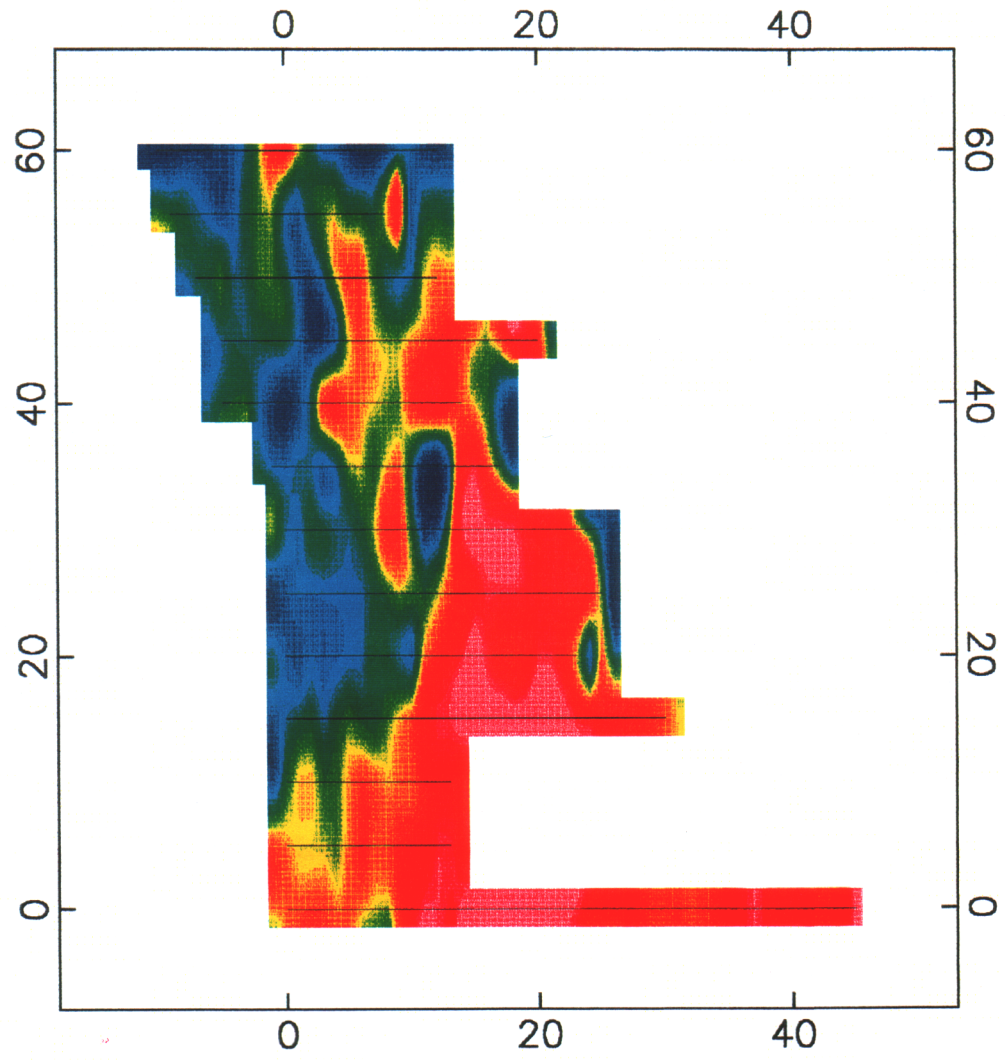
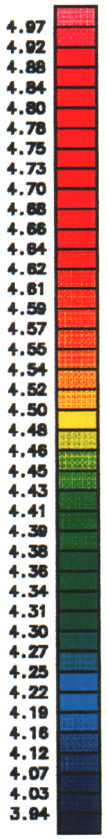
Project: GLL 97-785

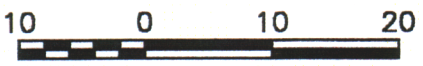




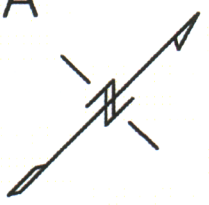
Terrain Conductivity
(mS/m)

Figure 3a: Canyon Site MDA-3A

Terrain Conductivity



(metres)



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Project: GLL 97-765

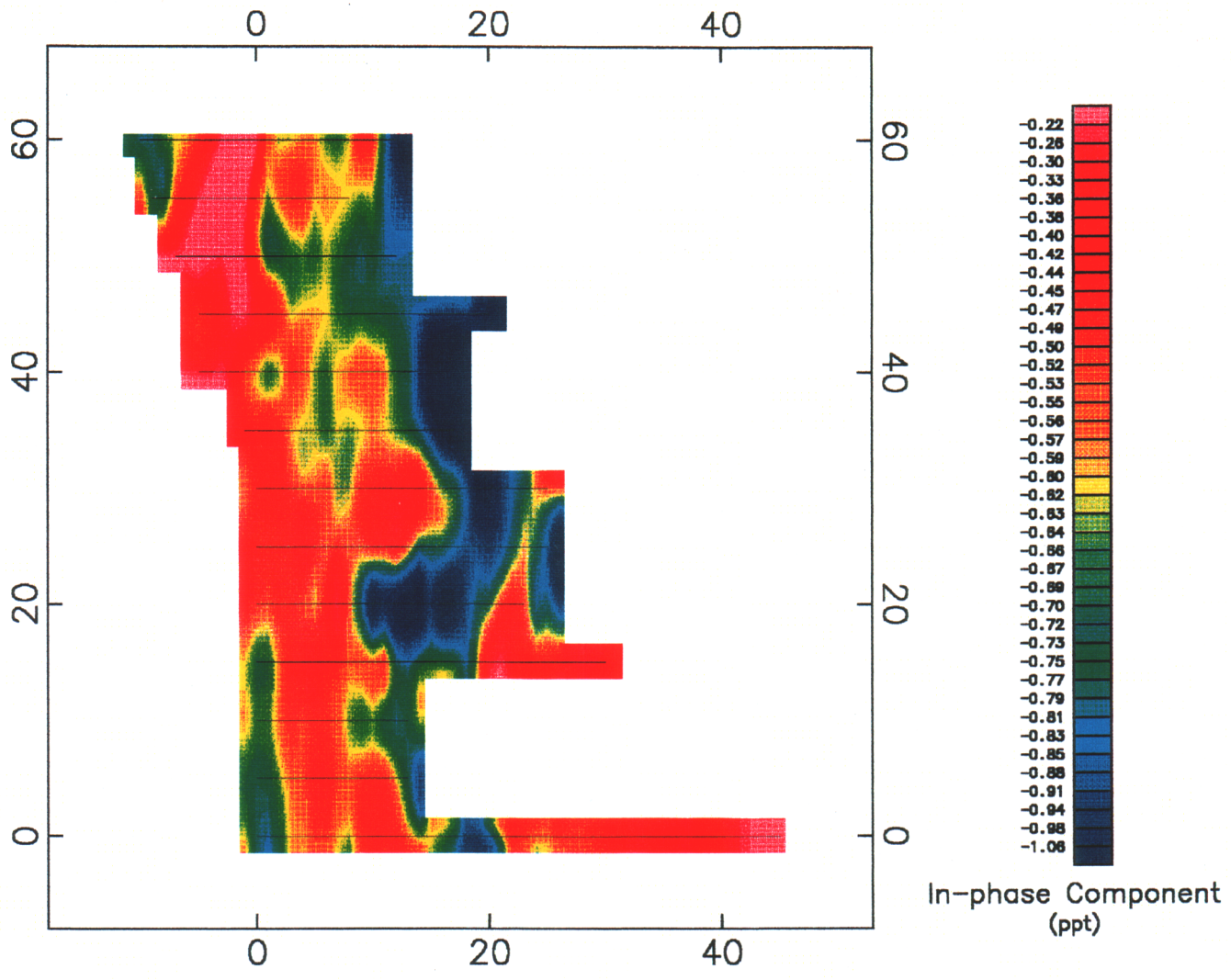
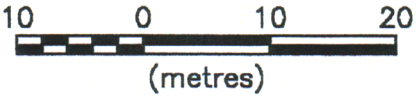


Figure 3b: Canyon Site MDA-3A

In-phase Component



Gartner Lee Limited

Project: GLL 97-975

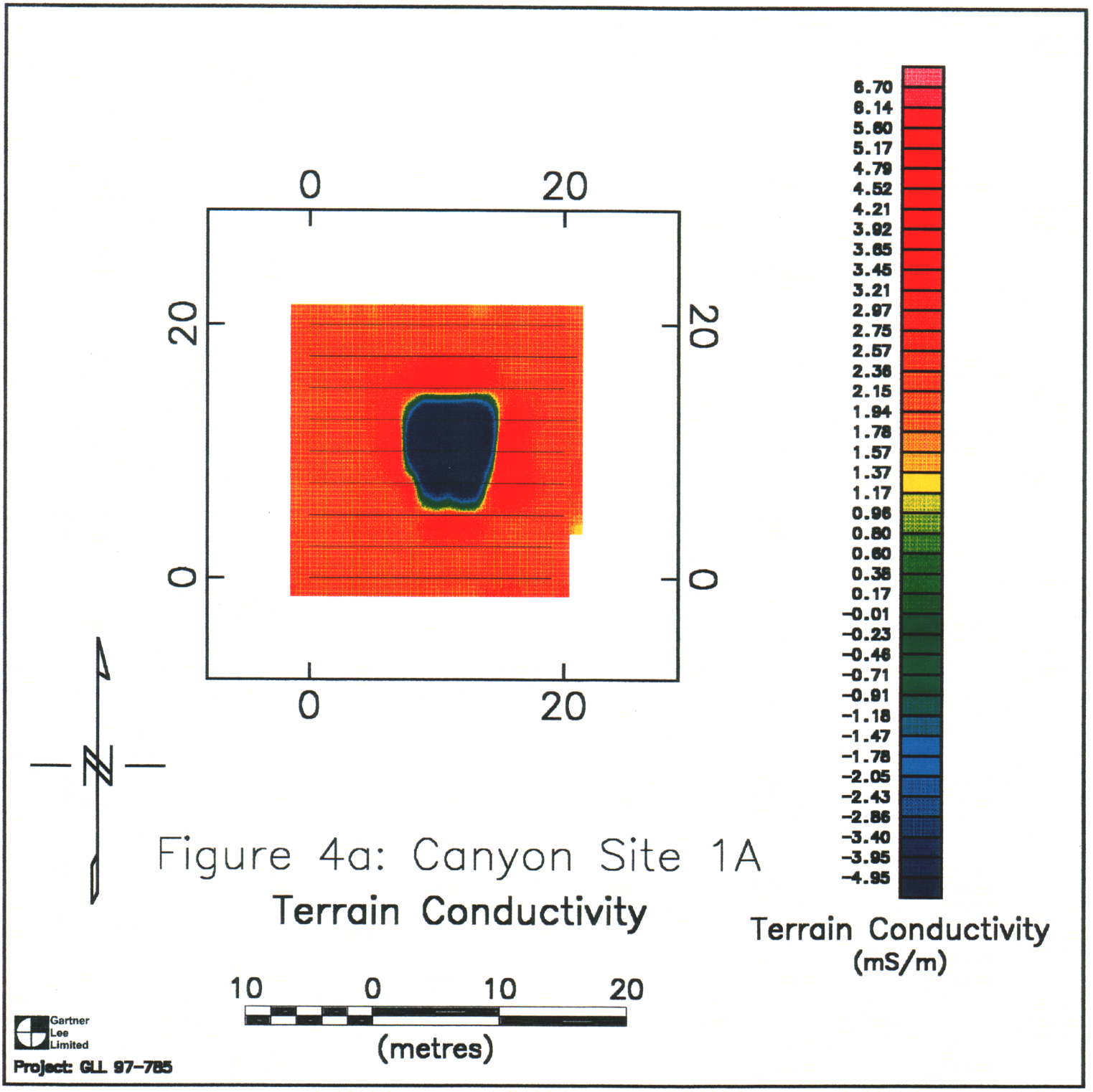
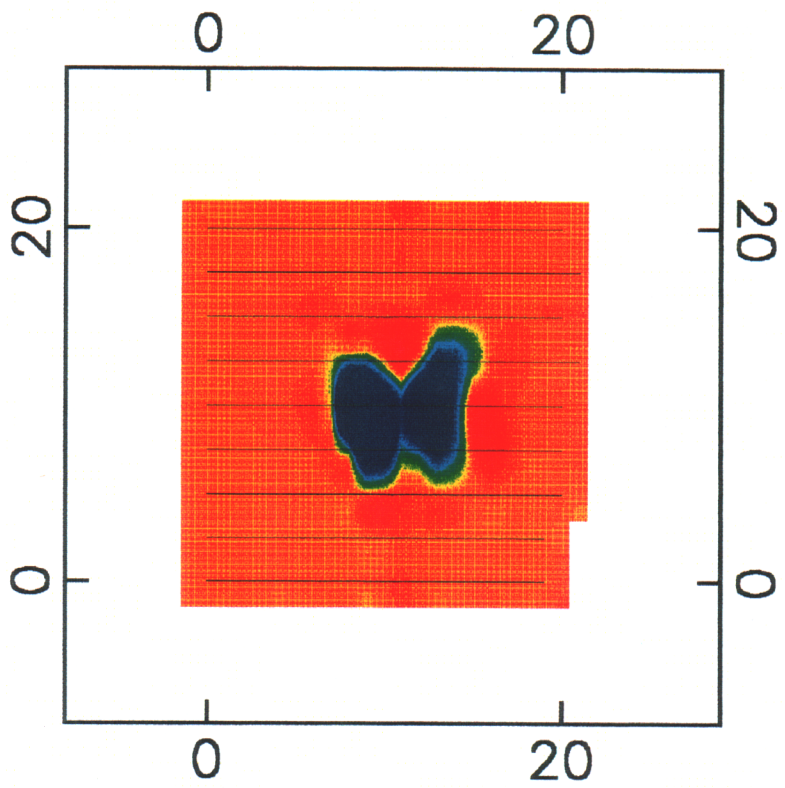
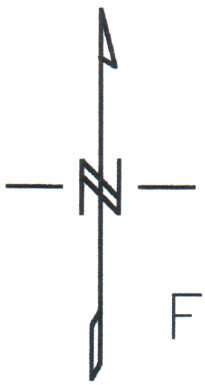
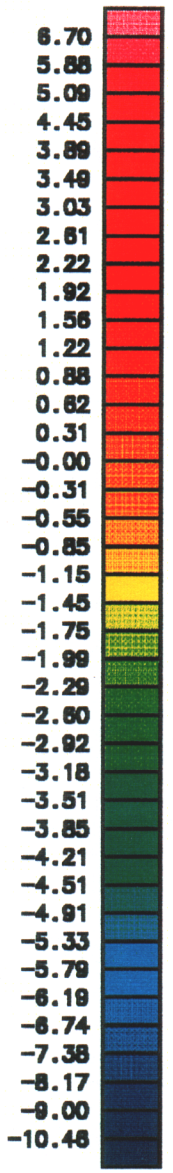


Figure 4a: Canyon Site 1A

Terrain Conductivity







In-phase Component
(ppt)

Figure 4b: Canyon Site 1A
In-phase Component

Gartner Lee Limited

Project: GLL 97-785

Appendix B

Laboratory Analysis Results

1988 Triumph Street, Vancouver, B.C., Canada V5L 1K5

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CHEMICAL ANALYSIS REPORT

Date: October 15, 1997

ASL File No. H7658

Report On: Canyon Creek HJ034 Soil Analysis

Report To: **W.J. Klassen & Associates Ltd.**
PO Box 4896
Whitehorse, YT
Y1A 4N6

Attention: **Mr. Bill Klassen**

Received: September 29, 1997

ASL ANALYTICAL SERVICE LABORATORIES LTD.
per:

Joanne Patrick, B.Sc.
Project Chemist

Heather A. Ross, B.Sc.
Project Chemist

RESULTS OF ANALYSIS - Sediment/Soil File No. H7658

		1-A-2	2-A-1	2-A-2	4-A-1	4-A-2
		97 09 20	97 09 20	97 09 20	97 09 20	97 09 20
Physical Tests						
Moisture	%	0.6	2.1	0.7	8.7	3.6
Total Metals						
Cadmium	T-Cd	0.1	<0.1	<0.1	-	-
Lead	T-Pb	<2	3	2	-	-
Mercury	T-Hg	0.007	0.008	0.008	-	-
Zinc	T-Zn	39.3	41.9	41.3	-	-
Polychlorinated Biphenyls						
Total Polychlorinated Biphenyls		<0.05	<0.05	<0.05	<0.05	<0.05

Results are expressed as milligrams per dry kilogram except where noted.
< = Less than the detection limit indicated.
EPH = Extractable Petroleum Hydrocarbons.

RESULTS OF ANALYSIS - Sediment/Soil

File No. H7658

		4-B-1	4-C	BGS-1A1	BGS-1A2
		97 09 20	97 09 20	97 09 20	97 09 20
Physical Tests					
Moisture	%	5.0	3.0	0.9	2.6
Total Metals					
Cadmium	T-Cd	-	-	<0.1	<0.1
Lead	T-Pb	-	-	<2	2
Mercury	T-Hg	-	-	0.006	0.006
Zinc	T-Zn	-	-	34.1	34.0
Polychlorinated Biphenyls					
Total Polychlorinated Biphenyls		<0.05	<0.05	-	-
Extractables					
EPH (C10-18)		-	20800	-	-
EPH (C19-31)		-	35600	-	-
Total Extr Hydrocarbons (C10-30)		-	55600	-	-

Results are expressed as milligrams per dry kilogram except where noted.
< = Less than the detection limit indicated.
EPH = Extractable Petroleum Hydrocarbons.

Appendix 1 - QUALITY CONTROL - Replicates

File No. H7658

Sediment/Soil	**4-A-2**	**4-A-2**
	97 09 20	QC # 102709
Physical Tests		
Moisture %	3.6	4.0
Polychlorinated Biphenyls		
Total Polychlorinated Biphenyls	<0.05	<0.05

Results are expressed as milligrams per dry kilogram except where noted.
< = Less than the detection limit indicated.
EPH = Extractable Petroleum Hydrocarbons.

Outlines of the methodologies utilized for the analysis of the samples submitted are as follows:

Moisture

This analysis is carried out gravimetrically by drying the sample at 103 C for a minimum of three hours.

Metals in Sediment/Soil

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 Method 3050 or Method 3051, published by the United States Environmental Protection Agency (EPA). The procedures involve a digestion using a 1:1 ratio of nitric acid and hydrochloric acid, along with hotplate or microwave heating. Instrumental analysis is by atomic absorption spectrophotometry (EPA Method 7000) and/or inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010).

Method Limitation: The stated acid digestion will provide excellent results for total recoverable metals; however, it is only partially effective on mineralized or non-environmentally available metals.

Polychlorinated Biphenyls in Sediment

This analysis is carried out using a procedure adapted from EPA Method 8082 (Publ. # SW-846 3rd ed., Washington, DC 20460). The procedure involves a solid-liquid extraction of the sample with hexane/acetone and back extraction with water. The hexane extract is cleaned and analysed by capillary column gas chromatography with electron capture detection.

Extractable Hydrocarbons in Sediment/Soil

This analysis is carried out using procedures adapted from U.S. EPA Methods 3500/8015 (Publ. # SW-846 3rd ed., Washington, DC 20460) and British Columbia Ministry of Environment, Lands and Parks Method for "Extractable Petroleum Hydrocarbons in Soil by GC/FID" (January 1996) The procedure involves a hexane/acetone solvent extraction followed by analysis of the extract by capillary column gas chromatography with flame ionization detection. Results are not corrected for Polycyclic Aromatic Hydrocarbons (PAHs) for Extractable Petroleum Hydrocarbon (LEPH/HEPH) purposes.

End of Report

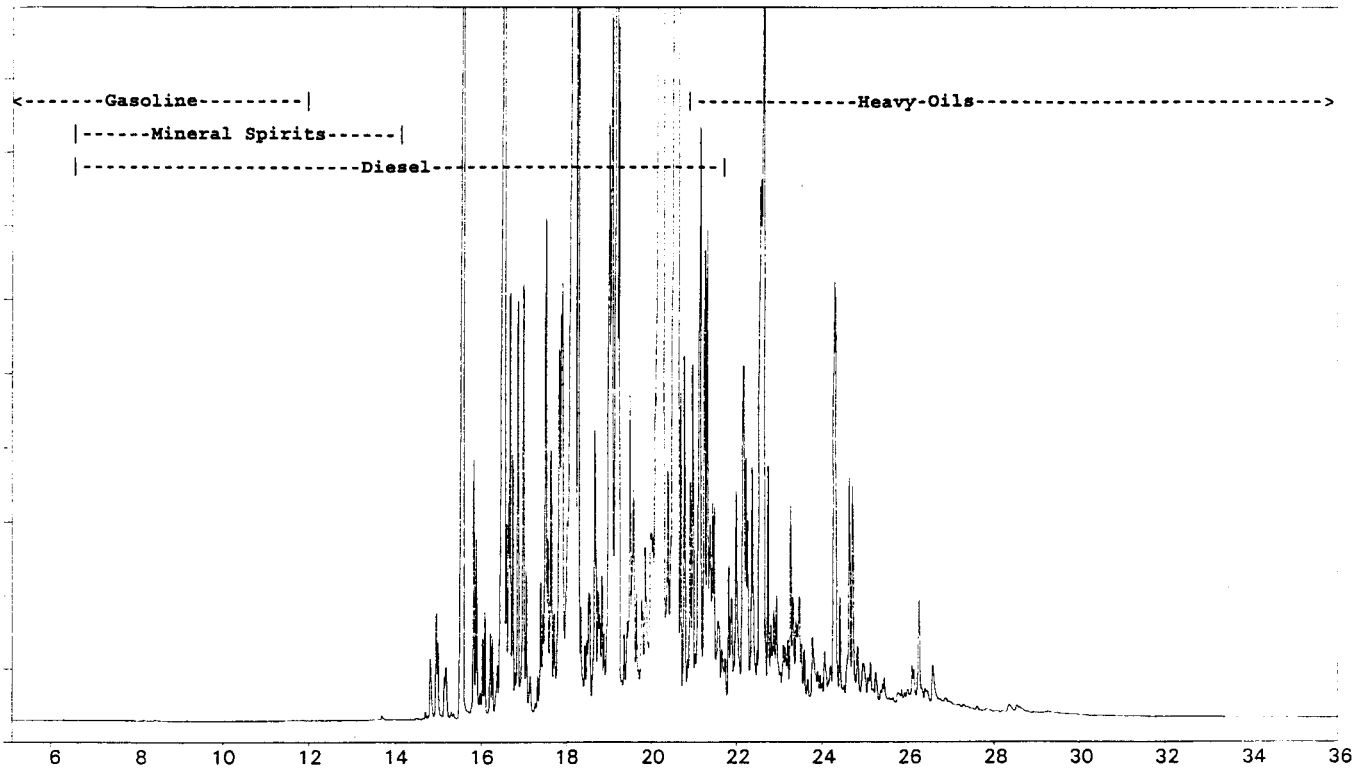
HYDROCARBON DISTRIBUTION REPORT

SAMPLE NAME: **H7658-T--7#R10X** 4-C

Sample acquired: OCT 8, 1997 17:10:13

File Name: C:\TEH\OCT08\TEHOCT08.10R , Sample Name: H7658-T--7#R10X

Sequence file: TEHOCT08



ASL Sample ID: H7658-T--7#R10X* 80.0Dilution

HYDROCARBON RANGE (by Carbon#)		RELATIVE AMOUNT (%)
C9	(beg-nC9 to beg-nC10)	0.0
C10-C19	(beg-nC10 to beg-nC20)	47.1
C20-C30	(beg-nC20 to beg-nC31)	50.3
C31-C40	(beg-nC31 to beg-nC41)	2.6

The Hydrocarbon Distribution Report is intended to assist you in characterizing the hydrocarbon product present in a given sample. The scale at the top of the chromatographic trace represents the hydrocarbon range of common petroleum products. Comparison of this report with those of reference standards may also assist you in the identification of the hydrocarbon product detected in your sample. The second part of the report is a table that expresses the relative amounts of hydrocarbon product present in the ranges specified. Percent values are relative to the sum of all chromatographic peaks between the retention times of the alkanes n-C9 and n-C40, and are based solely on the areas of those peaks.

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CHEMICAL ANALYSIS REPORT

Date:	October 15, 1997
ASL File No.	H7500
Report On:	Canyon Creek HJ034 Water Analysis
Report To:	**W.J. Klassen & Associates Ltd.** PO Box 4896 Whitehorse, YT Y1A 4N6
Attention:	**Mr. Bill Klassen**
Received:	September 23, 1997

ASL ANALYTICAL SERVICE LABORATORIES LTD.
per:

Joanne Patrick, B.Sc.
Project Chemist

Heather A. Ross, B.Sc.
Project Chemist

RESULTS OF ANALYSIS - Water File No. H7500

		N-5	S-5
		97 09 20 07:00	97 09 20 07:00
Physical Tests			
Hardness	CaCO3	4840	2320
Total Metals			
Aluminum	T-Al	756	237
Antimony	T-Sb	<0.4	<0.2
Arsenic	T-As	<0.4	<0.2
Barium	T-Ba	7.45	2.00
Beryllium	T-Be	0.02	0.008
Boron	T-B	0.4	0.1
Cadmium	T-Cd	0.01	<0.01
Calcium	T-Ca	1130	585
Chromium	T-Cr	1.47	0.50
Cobalt	T-Co	0.45	0.19
Copper	T-Cu	1.67	0.83
Iron	T-Fe	1110	326
Lead	T-Pb	0.20	0.09
Magnesium	T-Mg	491	208
Manganese	T-Mn	19.7	9.66
Mercury	T-Hg	0.00114	0.00079
Molybdenum	T-Mo	<0.06	<0.03
Nickel	T-Ni	1.20	0.48
Selenium	T-Se	0.0717	0.0081
Silver	T-Ag	<0.005	<0.005
Thallium	T-Tl	0.007	<0.005
Uranium	T-U	0.059	0.023
Zinc	T-Zn	3.83	0.820
Polychlorinated Biphenyls			
Total Polychlorinated Biphenyls		<0.001	<0.001

Results are expressed as milligrams per litre.
< = Less than the detection limit indicated.

METHODOLOGY File No. H7500

Outlines of the methodologies utilized for the analysis of the samples submitted are as follows:

Conventional Parameters in Water

These analyses are carried out in accordance with procedures described in "Methods for Chemical Analysis of Water and Wastes" (USEPA), "Manual for the Chemical Analysis of Water, Wastewaters, Sediments and Biological Tissues" (BCMOE), and/or "Standard Methods for the Examination of Water and Wastewater" (APHA). Further details are available on request.

Metals in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 19th Edition 1995 published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005), followed by instrumental analysis by atomic absorption spectrophotometry (EPA Method 7000), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Mercury in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 19th Edition 1995 published by the American Public Health Association. A cold-oxidation procedure involving bromine monochloride is used, followed by instrumental analysis by cold-vapour atomic absorption spectrophotometry (CVAAS).

Polychlorinated Biphenyls in Water

This analysis is carried out using a procedure adapted from U.S. EPA Methods 3510, 8080 and 8082. (Publ. #SW-846, 3rd Ed., Washington, DC 20460). The procedure involves liquid-liquid extraction of the sample with dichloromethane. The extract is cleaned and analyzed by capillary column gas chromatography with electron capture detection.

End of Report