

**PRELIMINARY ASSESSMENT
OF THE
OLD MAYO LANDFILL SITE**

Arctic Environment Strategy - Action on Waste
Department of Indian Affairs and Northern Development
Whitehorse, Yukon

J. Gibson & Associates
Whitehorse, Yukon

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OVERVIEW

J. Gibson & Associates was contracted by Arctic Environmental Strategy Action on Waste (Department of Indian Affairs and Northern Development) to conduct a preliminary assessment of the "old Mayo dump" in regards to public concerns over the possible presence of contaminants at the dump site.

The contaminants of concern are:

- organochlorines
- Polychlorinated Biphenyls (PCB's)

The preliminary assessment was divided into three phases:

1. A literature search of public and private records and reports for any indications of the above contaminants being landfilled at the dumpsite.
2. Conduct oral interviews with local residents, past and present employees of Mayo area businesses who would have utilized the dump.
3. A field sampling and laboratory analysis program of water and soils in and around the dumps site, focusing on organochlorines and PCB's.

An assessment report detailing results of the above work and any recommendations for further action was to be submitted to the Action on Waste representative.

BACKGROUND

ORGANOCHLORINES

Organochlorines or chlorinated hydrocarbons are the active ingredient in pesticides (herbicides, insecticides and piscicides). In the post World War II era, large quantities of pesticides were manufactured and used world wide under a variety of product names.

Documented use of pesticides in the Yukon Territory includes DDT products as insecticides for mosquito control, applied either as a spray or an oil emulsion, 2, 4, 5-T as a herbicide for brush control at microwave or electrical substations, and toxaphene as a piscicides to remove unwanted fish species from selected lakes (Laberge Environmental Service L.E.S. 1993).

POLY CHLORINATED BIPHENYLS (PCB'S)

Poly Chlorinated Biphenyls were used for a variety of industrial uses from the 1930's until the product was banned in 1975. Laberge Environmental Services 1993 states that "prewar use of PCB's in the Yukon was very limited. The substance was not likely used in significant quantities until the wartime construction era". PCB use in the territory occurred in electrical transformers and capacitors, hydraulic fluids and open end uses such as plastics, paints, cutting oils and dust control products.

DISPOSAL PRACTICES

Laberge Environmental Services 1993 notes that there is little information available on disposal practices for organochlorine products in the Yukon. In their opinion, discarded containers would have ended up in local garbage dumps.

Disposal of PCB contaminated material may have occurred by a number of methods:

- waste oil disposal in local sumps or landfills
- applications of waste oil for dust control
- burial of discarded electrical equipment

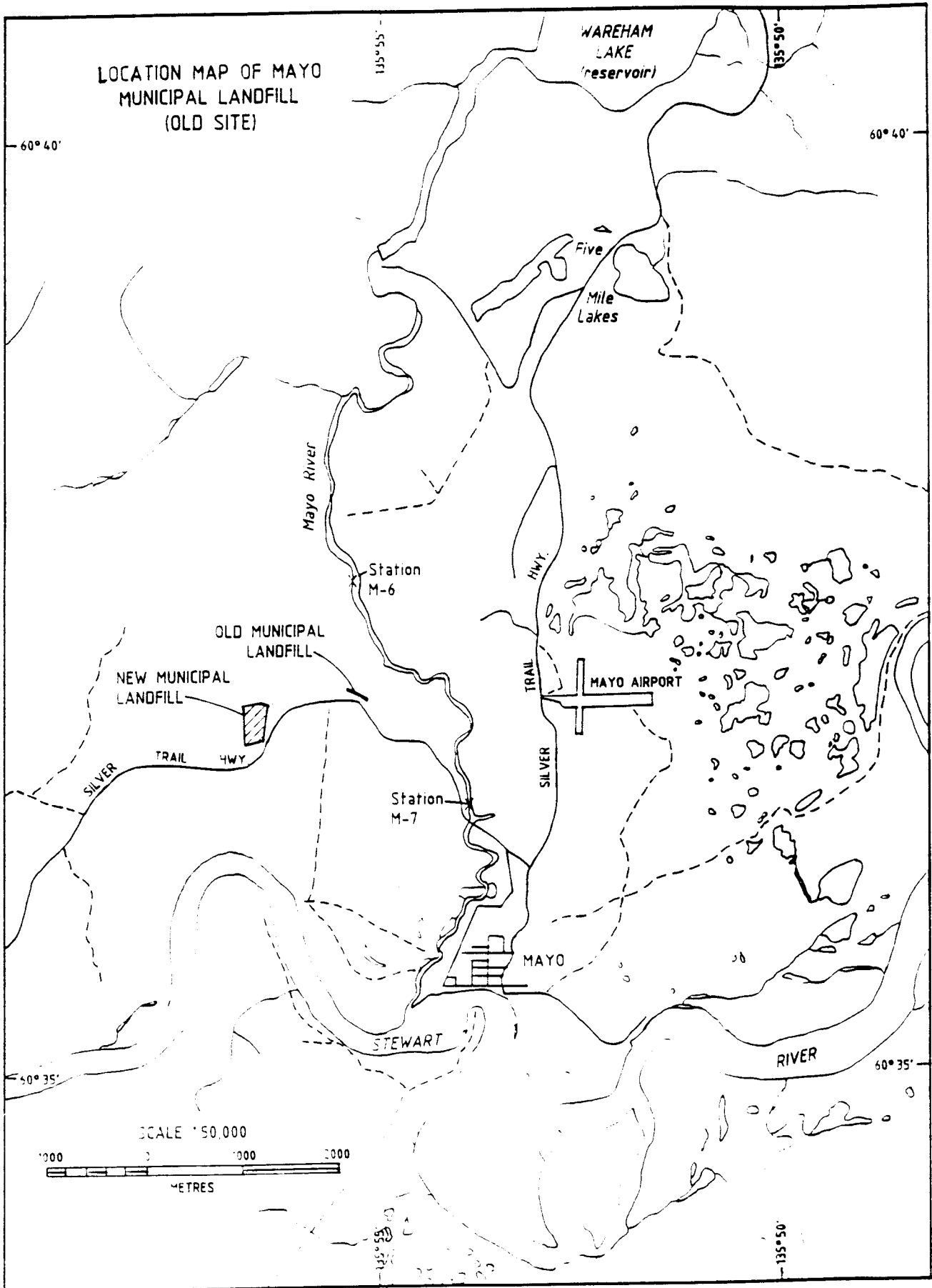
Based on the disposal methods common to the time period that contaminant products were used in the territory, a source and pathway for the contaminants to enter the surrounding environment is established.

INTRODUCTION

The "old Mayo dump" municipal landfill is located on a north facing glacial till bench above the Mayo River approximately four kilometers east of the Village of Mayo (*Figure 1*)

The earliest date on record (*YTG-Municipal Engineering files*) of correspondence concerning the dump is September 1952. From oral interviews conducted with local residents, the dump was likely in operation a few years prior to that date. Prior to this dump being developed, municipal/domestic waste was landfilled in a dump at the present site of the YTG Community and Transportation Services Mayo compound. The old Mayo dump ceased operations in 1983 with the opening of the present municipal landfill located one kilometer to the east. A gravel quarry adjacent to the old dump remained in use for some time after the dump site was closed.

The dump remained closed/abandoned until 1994 when a joint cleanup operation under the Arctic Environmental Strategy between the Mayo First Nations and a local contractor removed the accessible metal waste and graded fill over the site.



METHODS AND PROCEDURES

LITERATURE SEARCH

A literature search of published reports, current and historical public and private files was conducted for data or references to any organochlorine or PCB contamination of the old Mayo dump site. A list of the researched material is contained in Appendix 1.

ORAL INTERVIEWS

In conjunction with the literature search, oral interviews were conducted with people familiar with the dump site and the Mayo area for the period the dump was operational. In addition, private and public employees (past and present) of companies operating in the Mayo area who generated or controlled domestic, municipal or industrial waste were interviewed to determine the types of materials landfilled at the site.

Results of oral interviews are contained in Appendix 2. Each interview is numbered for reference to the main body of the report.

CONTAMINANT SAMPLING AND ANALYSIS

On September 4 and 5, 1994, a site survey was done of the old Mayo dump. The survey consisted of:

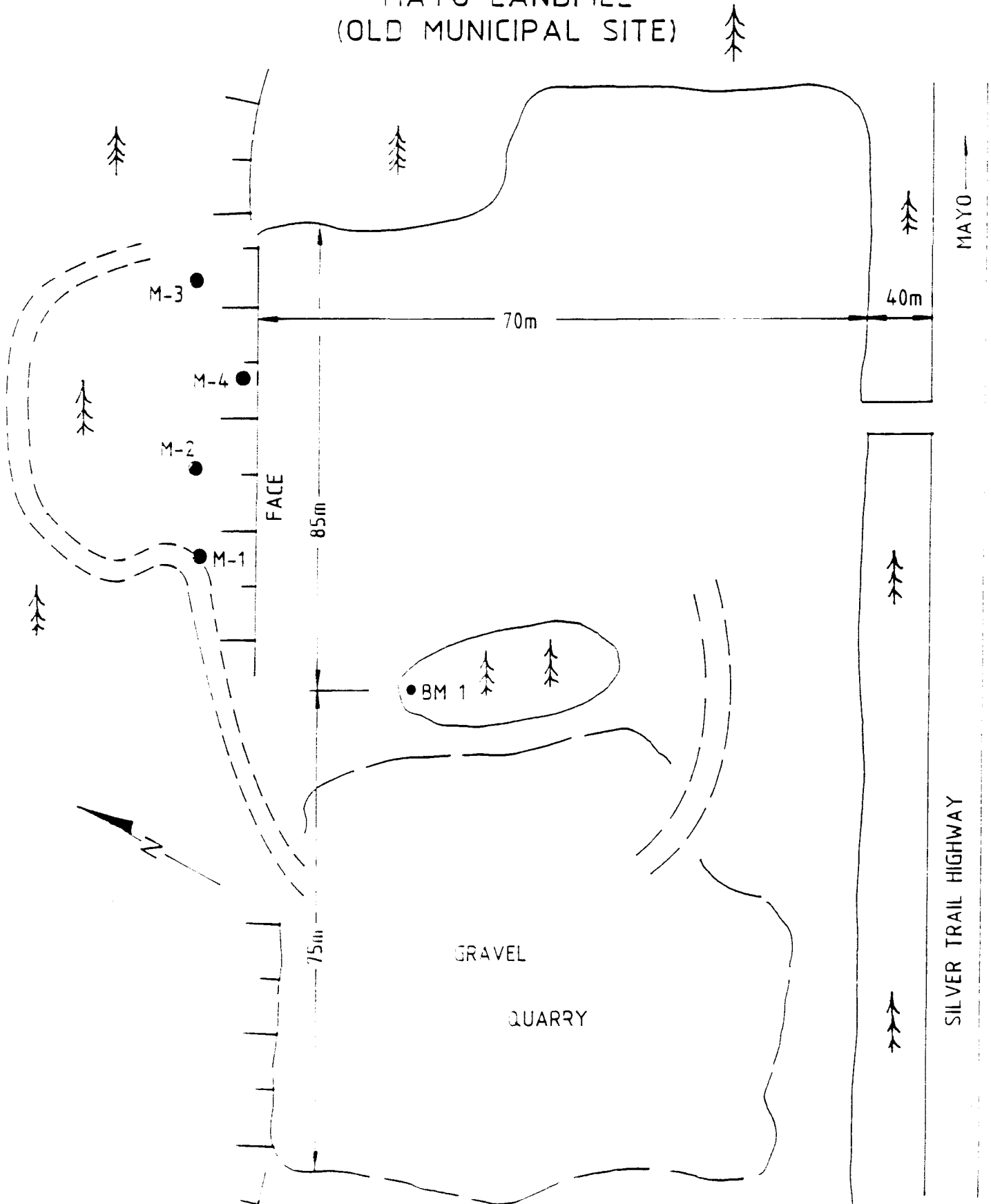
1. Site mapping - document of dump size, visual contents, surrounding topography, surface water flows and groundwater seeps (*Figure 2*). A site profile was done by level circuit (*Figure 3*).
2. Excavation of three test holes at the base of the dump slope.
3. Sampling of soils and water from the immediate and surrounding area for laboratory analysis.

1. Site Mapping

A basic survey of the old Mayo dump and surrounding topographical features was done using topofill and clinometer. The result site map is presented in Figure 2. The dump profile done by level circuit is presented in Figure 3.

As a recent site cleanup/abandonment of the dump was done in July 1994, there were no visible signs of landfilled material. All accessible metal waste had been removed, the site covered and graded with fill. The removed metal waste was stockpiled at the new municipal dump site and consisted of vehicle bodies, domestic and construction metal material, metal drums some of which contained what appears to be concentrate and grinding balls from a mill and a large number of square metal liquid containers of approximately 10 liter size. Labels on some of the containers were intact and contained aviation gas.

MAYO LANDFILL (OLD MUNICIPAL SITE)



MAYO LANDFILL SITE PROFILE

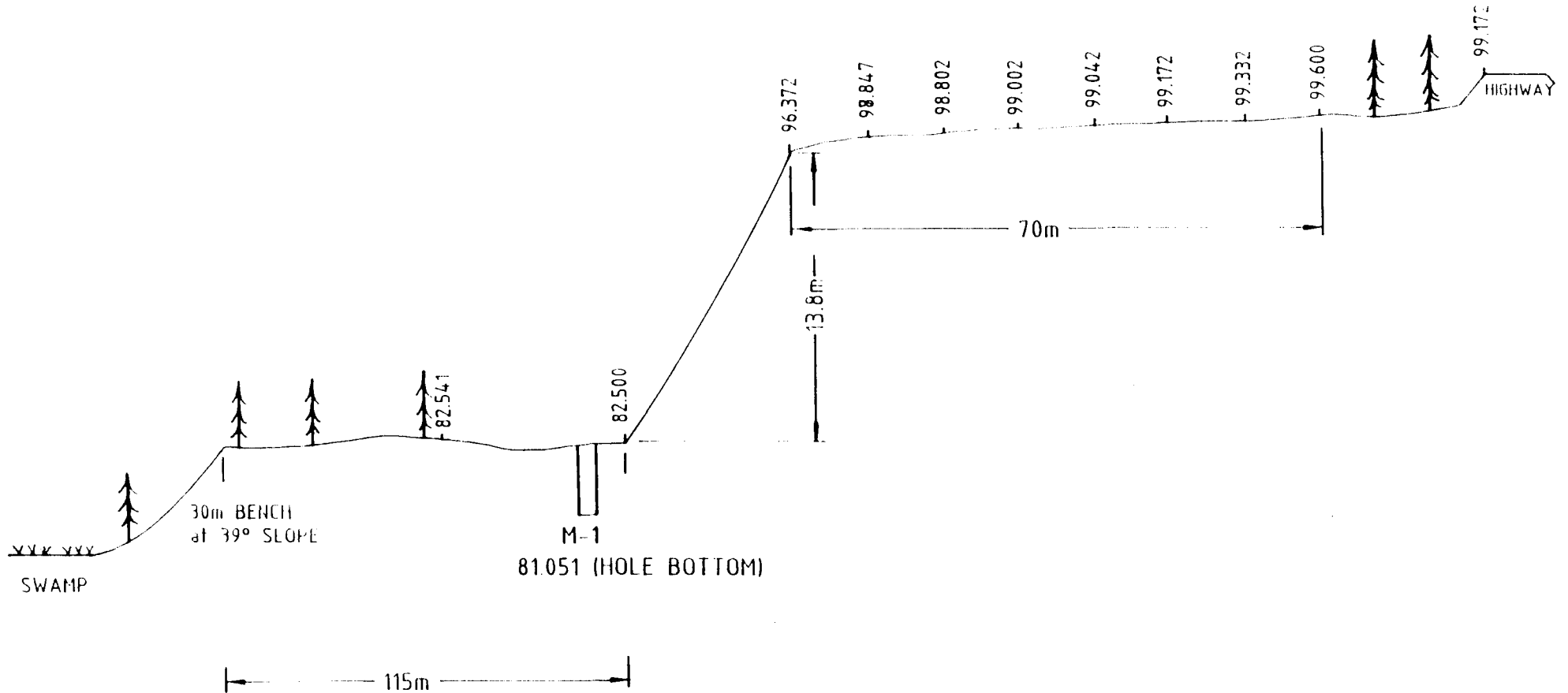




Figure 4. Mayo Landfill - Base of landfill area viewed from dump crest.



Figure 5. Mayo landfill - area at toe of dump slope.



Figure 6. Mayo Landfill - Dump crest with recent fill cover.



Figure 7. Mayo landfill - Dump slope.



Figure 8. Mayo Landfill - Toe of dump slope with test hole sites flagged.



Figure 9. Mayo landfill - Dump face.

2. Test Holes

As there were no surface water flows or evidence of groundwater seeps at or within 200 meters of the dumpsite, three test holes were excavated by hand within 10 meters of the slope toe in an attempt to intercept groundwater flows. The first test hole (M-1) was excavated to 1.5 meters depth on September 4 and allowed to stand overnight. As there was no intercepted flows on September 5, and the glacial till soil horizon was consistent throughout, the remaining two test holes were then excavated to depth of 1.0 meter. It is assumed the glacial till is consistent to a 20 meter depth (estimated height of bench above the Mayo River floodplain).

3. Soil and Water Sampling

Eight sample stations were established at or near the old Mayo dumpsite (Figures 2 and 3). Sample station descriptions are:

- M-1. Soil sample from base of 1.5 meter test hole M-1.
- M-2. Soil sample from base of 1.0 meter test hole M-2.
- M-3. Soil sample from base of 1.0 meter test hole M-3.
- M-4. Soil sample from possible oil stain located on lower dump slope between sites M-2 and M-3.
- M-5. Soil sample composite of "original" dump soil accessible under recent fill cover. Taken from five points along lower dump slope.
- M-6. Water sample from Mayo River upstream of the dumpsite.
- M-7. Water sample from Mayo River downstream of the dumpsite (50 meters upstream of Mayo River bridge).
- M-8. Soil sample composite from soils contained in removed metal waste and stockpiled at the new municipal dump site.

Soil samples taken at sites M-1 through M-5 and M-8 were taken using a plastic garden trowel. A minimum of two kilograms of soil was obtained for each sample and deposited in a new plastic soil sample bag. Due to the glacial till soils at stations M-1, M-2 and M-3, separation of rock material greater than pea size was required. All soil sample bags were labeled on the outside with location, station number, date and required analysis. A waterproof label with the same information was put inside the sample bag prior to sealing. All soil samples were refrigerated before and during shipment to the laboratory.

The two Mayo River water samples at station M-6 and M-7 were sampled using 1 liter amber glass containers. Samples were taken at surface depth from fast flowing water. After sampling, bottle mouths were protected by foil before screwing on the lids. Waterproof labels attached to the bottles were labeled with location, station number, date and required analysis. Water samples were kept refrigerated before and during shipment to the laboratory.

RESULTS

LITERATURE SEARCH AND ORAL INTERVIEWS

Results of the literature search and oral interviews provided no document evidence of material containing organochlorines or PCB's being landfilled at the old Mayo dumpsite.

Community and Transportation Services (YTG) file #MA-5200-3 provided a September 20, 1988 letter from the Village of Mayo Manager (Barry Graham) to the Director of Municipal Engineering in which Mr. Graham states he has knowledge of transformers being deposited in the local dump. A follow up interview with Mr. Graham (Int M-8) clarified that the transformers had been deposited in the new municipal dump.

A possible local source of industrial contaminants was the Wareham Lake hydroelectric station. Interviews with G. Podhora (Int M-1) and V. Parkin (Int M-7) confirmed that the Northern Canada Power Commission (NCPC) and later the Yukon Electrical Company (YEC) have their own dump at the power station. The old Mayo municipal dump would not have been used for any domestic or industrial waste generated at the power station. E. Hunter (Int M-2) noted that NCPC was a federal crown corporation and would have been subject to and complied with all federal regulations on disposal of hazardous wastes. V. Parkin and L. D'aoust (Int M-3) confirmed that YEC conducted a PCB testing and cleanup program of all their facilities between 1985 and 1990. V. Parkin and G. Podhora also noted that neither NCPC or YEC utilized herbicide sprays to control brush on power line corridors but had the work done by hand.

United Keno Hill Mines (UKHM) at both Elsa and Calumet sites had their own dumps and would not have used the Mayo dumpsites. P. Van Bibber Sr. (Int M-4) noted that in addition to using the Elsa and Calumet dumpsites - UKHM industrial waste was also deposited in tailings and waste rock areas. Mr. Van Bibber also noted that former Department of Highways (YTG) didn't use herbicides for brush control on highway right of ways during his time as a highway foreman (1956 - 1985) and that all mosquito control spraying was done by Whitehorse crews and equipment. To the best of his knowledge all equipment and containers were removed to Whitehorse at completion.

In 1964 and 1965, Airspray Limited of Edmonton was contracted to spray a DDT/diesel fuel mixture for mosquito control on a number of Yukon communities including Mayo, Elsa and Calumet. The program was discontinued in 1966 (L.E. S. 1993).

Northwestel utilized a herbicide for brush control at microwave sites until 1979 when the practice was discontinued (L. E. S. 1993). It is assumed the herbicide would have been used on Mayo area sites but there is no evidence of materials being deposited in the Mayo dumpsite.

The amount of pesticide used by local residents in gardening or mosquito control is unknown. Empty containers would have been treated a domestic waste and deposited in the local dump. There is no way of quantifying the amount used or disposal practices. A number of local residents interviewed noted that the materials in question were not known to be toxic or have long range environmental consequences when they were in use.

CONTAMINANT SAMPLING

Laboratory results for poly chlorinated biphenyl and organochlorine analysis for the six soil and two water samples are contained in Table 1.

Polychlorinated Biphenyls

All eight samples (soil and water) had non-detectable levels of PCB's.

Organochlorines

Soil samples taken at sites M-2, M-3, M-4 and M-8 had non-detectable levels of organochlorine parameters included in the gas chromatography scan.

Water samples for the Mayo River sites M-6 and M-7 also had non detectable levels of organochlorines.

The soil sample taken at station M-1 had detectable concentrations of the insecticide 4'4 DDT (0.10 mg/kg)

The soil sample taken at station M-5, a composite of pre-abandonment soils from along the lower dump face had detectable concentrations of the following organochlorine insecticides:

- 4'4 DDT at Trace concentrations
- 2'4 DDT at 0.07 mg/kg concentrations
- 4'4 DDD at 0.28 mg/kg concentrations

Table 1. Laboratory Analysis Results for Mayo Landfill Samples

September 1994.

Parameter	Sample Stations								Detection Limit
	M-1 Soil	M-2 Soil	M-3 Soil	M-4 Soil	M-5 Soil	M-6 Water	M-7 Water	M-8 Soil	
TOTAL PCB	ND	ND	ND	ND	ND	ND	ND	ND	0.02
% Moisture	5.07	7.89	5.87	8.47	15.82	-	-	20.89	
Aldrin	ND	ND	ND	ND	ND	ND	ND	ND	0.01
BHC (alpha)	ND	ND	ND	ND	ND	ND	ND	ND	0.01
4,4 ' DDD	ND	ND	ND	ND	trace	ND	ND	ND	0.01
4,4 ' DDD	ND	ND	ND	ND	ND	ND	ND	ND	0.01
2,4 ' DDT	ND	ND	ND	ND	0.07	ND	ND	ND	0.01
4,4 ' DDT	0.1	ND	ND	ND	0.28	ND	ND	ND	0.02
Dieldrin	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Endosulfan I	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Endosulfan II	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Endrin	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Heptachlor	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Heptachlor Epoxide	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Hexachlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Lindane	ND	ND	ND	ND	ND	ND	ND	ND	0.01
Methoxychlor	ND	ND	ND	ND	ND	ND	ND	ND	0.03
Mirex	ND	ND	ND	ND	ND	ND	ND	ND	0.01
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	ug/L	ug/L	mg/kg	
All soils analyzed to mg/kg / ppm All waters analyzed to ug/L / ppb ND = Not Detectable (Less than detection limit) Trace = Present, but less than Limit of Quantition									

DISCUSSION

All the organochlorine contaminants with concentrations greater than their respective detection limits (4'4 and 2'4 DDT, 4'4 DDD) are isomers of DDT (1,1,1-trichloro-2,2-bis(4 chlorophenyl) ethane) which was a common active ingredient in insecticides manufactured in the United States prior to it being banned in 1972. Although the manufactured of DDT is not banned in Canada, use was restricted in 1974 and suspended in 1985.

The isomer identified as 4'4 DDD in trace concentrations is a metabolite of DDT indicating some degradation of the product. DDT and it's derivatives and metabolites of which DDD and DDE are the most common - are all toxic, persistent in the environment and have widespread global occurrence. Due to the persistent nature of DDT, the pesticide is concentrated by aquatic organisms at all tropic levels, and is biomagnified in the food chain.

DDT is insoluble in water, moderately toxic to mammals (LD50 - oral 113, dermal-2150) and highly toxic to birds and fish (B.C. Ministry of Environment).

The transport mechanisms for DDT are atmospheric dispersion and wind and soil erosion.

The ultimate loss or transformation of DDT and it's metabolites is from biotransformation and indirect photolysis.

The DDT identified in the old Mayo dumpsite was limited to one of the three test holes and a composite sample of soils taken from along the lower dump slope. It is therefore assumed that the contamination is not widespread and may be from a single point source. Mayo River water samples show non-detectable levels of DDT or any other organochlorine, indicating the contamination has not migrated from the dump site due to sorption to the glacial till soil surrounding the site. As there is no surface water or groundwater flows evident on the till bench, a principle transport mechanism (soil erosion) doesn't appear to be a concern.

There is presently no remediation criteria for the organochlorine DDT identified at the old Mayo dumpsite. Criteria established by CCME 1991 does not include DDT in soils. Guideline criteria are presently being developed by Environment Canada (pers comm G. Whitley).

RECOMMENDATIONS

Laboratory analysis of soil samples taken from the old Mayo dump site have identified organochlorine (DDT) contamination of the site. The contaminant was identified in two of the five soil samples taken from the dump face or within 10 meters of the slope toe and therefore appears to be localized. Contamination was not detected in Mayo River water samples adjacent to the site.

The dump site is located on a glacial till bench above the Mayo with no apparent surface water runoff or groundwater seeps.

Abandonment work consisting of waste metal removal and grading / cover of the site was done in the summer of 1994.

Given the known transport mechanisms for DDT (atmospheric dispersion and erosion) and its low solubility in water, the probability of contaminant transport appears low.

As there are no established remediation criteria for DDT in soils, there can be no site specific risk assessment done.

When remediation criteria are established, the risk assessment should include the following downstream resources / users:

1. Stewart Valley Salmon Society Project - a locally based salmon enhancement/ reestablishment project located on the Mayo River approximately 1 kilometer downstream of the dump site.

2. Present salmon use of the Mayo River and downstream in the Stewart River.
3. Mayo River domestic water use by local residents. Shallow water wells in the Village of Mayo are inundated on an almost annual basis during spring freshet flows in the Mayo River. The groundwater table in the village appears to correspond closely to Mayo River surface water levels.

Until remediation criteria are established, continued monitoring of the site is recommended. A monitoring program should be developed to :

1. Verify the September 1994 sample results.
2. Determine the extent of contamination. Initially this could involve:
 - isolating the section of the dump face identified "hot" from the composite soil sample.
 - establishing a deeper test hole at station M-1 (by backhoe) with sampling at 1 meter intervals to determine vertical migration.
 - establish a second test hole 50 m. north of the slope face to determine horizontal migration.
3. Monitor the Mayo River water on an annual basis at the highway bridge, combined with determining the extent of the contamination, river water sampling would allay fears of a public health concern.

REFERENCES

British Columbia Ministry of Environment. **Handbook for Pesticide Applicators and Dispensers.**

Canadian Council of Ministers of the Environment. 1991. **Interm Canadian Environmental Quality Criteria for Contaminated Sites.** Report CCME EPC - CS34.

Canadian Council of Resource and Environment Ministers. **Canadian Water Quality Guidelines**

Laberge Environmental Services. 1993. **Use, Disposal and Transportation of Selected Contaminants in Yukon.** Committee on Contaminants in Northern Ecosystems and Native Diets. Arctic Environmental Strategy.

APPENDIX 1
LITERATURE SEARCH

LITERATURE SEARCHED

REPORTS

Reger, M. 1983. *Compilation of Listing of Known and Probable Abandoned Waste Disposal Sites throughout the Yukon Territory*. EPS Report DSS File # 065B KE 603-3-0282

Wilson, D.M. 1982. *Inventory and Assessment of Polychlorinated Biphenyl (PCB) Use in British Columbia and the Yukon Territory*. EPS Regional Report 82-15
Envirochem, 1993. PCB sources and Pathways in the Yukon.

Laberge Environmental Services, 1993. *Use, Disposal and Transportation of Selected Contaminants in Yukon*. Committee on contaminants in Northern Ecosystems and Native Diets. Arctic Environmental Strategy.

FILES

Environmental Protection Service. Environment Canada, Whitehorse.
Water Quality Municipal Water Systems.
Current file: # 7714-2-82/12-M370
Historical file: # 4782-M370

Environmental Protection Service, Environment Canada, Whitehorse.
Pollution Incident Reports 1973-1986

YTG - community and Transportation services, Whitehorse.
File # MA5200 - M1 91 volume)

Yukon Chamber of Commerce, Whitehorse.
Solids Waste Files.

Yukon Chamber of Mines. Whitehorse.
Solids Waste Files.

Health and Welfare Canada - Environmental & Occupational Health, Whitehorse.
Mayo Municipal Files.

Northern Affairs Program - Water Resources Division, Whitehorse.
Mayo Municipal Files.

APPENDIX 2

ORAL INTERVIEWS

Results of Oral Interviews

Podhora (Int M-1)

"Mr. Podhora was employed by NCPC and YEC as an operator and plant manager from 1963 to 1979 at the Wareham Lake power station."

Mr. Podhora verified that NCPC and later YEC had their own dump near the Wareham Lake power station. The dump was used for all the waste, domestic and industrial generated at the site - there was no reason to transport any waste to the Mayo municipal dump.

All power lines were cleared by hand - no herbicides were used to his knowledge during his time at the plant but is unsure of uses during plant construction in the 1950's.

E. Hunter / D. Buyck (Int M-2)

"E. Hunter is the present YEC Mayo manager (1988-1994). D. Buyck was born and raised in Mayo and has worked for YEC the past six years."

Both Mr. Hunter and Mr. Buyck had no specific knowledge of any contaminants being deposited in the Mayo dump. Mr. Hunter noted that YEC and previously NCPC used the Wareham site dump exclusively. NCPC was a crown corporation and therefore subject to all federal guidelines for waste handling in place at that time.

L. D' aoust (Int M-3)

"Mr. D' aoust has been employed by YEC for the past 20 years."

YEC conducted a PCB cleanup program from 1985 - 1990. All material with greater than 50 ppm PCB was removed and disposed of at the Swan Hills, Alberta disposal site.

Mr. D' aoust noted herbicides were not used on powerline right of ways but are/were used at substations for brush control. Herbicide brand names Urebor and Monobore Chloride were applied once per year at substations. No other herbicide was used in the past 20 years (L.E.S. 1993).

Pat Van Bibber Sr. (Int M-4)

"Mr. Van Bibber was the Mayo foreman for the territorial highways department from 1956 to 1985. Mr. Van Bibber continues to live in Mayo."

Mr. Van Bibber stated no herbicides were used to control brush on highway right of ways - the work was all done by hand.

Mosquito control was handled by Whitehorse staff - everything (equipment and chemicals) brought from Whitehorse and returned there at completion of spraying.

United Keno Hill Mines (UKHM) at Elsa and Calumet used their own town dumps and tailing areas for all municipal and industrial waste.

Mr. Van Bibber noted that prior to NCPC - electrical power in Mayo was supplied by the Kunze brothers diesel plant. The plant and warehouse were located near the present site of the First Nations cafe. All equipment was assumed by NCPC when they purchased the plant.

Oliver Hutton (Int M-5)

"Mr. Hutton moved to Mayo in 1953. As a local contractor he hauled domestic waste to the dumpsite in the late 1950's and the 1960's. Mr. Hutton was later the Mayo manager for Whitepass."

Elsa, Calumet and Wareham Lake all had their own dumps and did not use the Mayo dump on any occasion he could remember. The old Mayo dump was used for municipal waste only and can not remember ever seeing any electrical transformers or containers that would have held pesticides. Mr. Hutton suggested there may be electrical transformers at the Elsa dump.

Cal Lindstrom (Int M-6)

"Mr. Lindstrom is a long time Mayo resident who hauled his personal garbage to the dump through the 1960's and 1970's until he took over the contract for hauling municipal waste in 1976."

Mr. Lindstrom stated that all waste from Mayo went into the dump - so anything could have been deposited. He noted that during the 1960's there was no such thing a "hazardous waste". Mr. Lindstrom remembers pools of oil at the dump a number of occasions but doesn't know where they came from.

Parkin (Int M-7)

"Mr. Parkin was a lineman for NCPC (1966-1987) and later YEC superintendent for the Mayo Faro Dawson district (1987-1993)."

Mr. Parkin confirmed NCPC / YEC used the Wareham plant dump for all waste and had no reason to haul anything to the Mayo dump. Mr. Parkin participated in the YEC PCB cleanup program (1985-1990) and is sure that no contaminated material or equipment was deposited in the Mayo dump.

Graham (Int M-8)

"Mr. Graham is a long time Mayo resident and was Village manager from 1981-1983 and 1984-1994."

Mr. Graham wrote a letter dated September 20, 1988 to the Director of Municipal Engineering (YTG) regarding PCB contamination in the area (transformers in the local dump). During the interview Mr. Graham clarified that the transformers were in the new municipal dump. A local resident had constructed wood stoves out of the equipment. Mr. Graham noted that the old dump was used for all types of waste - garbage separation did not start until the new dump was operating. The old dump was the responsibility of YTG.

Mr. Graham remembers drums and metal waste being dumped but nothing that is now considered a hazardous waste.

Herbicide was used by Transport Canada at the Mayo airport for weed control in the 1960's - the same herbicide used by railways. The airport was sprayed a number of times.

During construction of the Village of Mayo warm water well a number of letters were sent to YEC about possible toxins in groundwater as a result of the Wareham lake power station. *Note: letters located in EPS file #7714-2 82/12-M370 but they do not relate to the Mayo dumpsite.*

Additional interviews were done with a number of Mayo residents and Na-Cho Nyak Dun members but are not recorded as they contained no information about contamination at the dump site.

Interviews were also done with Department of National Defense personnel at CFB Edmonton. Both the Property Records and Environmental Officers had no knowledge or file evidence to indicated military use of PCB's or organochlorines in the Mayo area.

APPENDIX 3

LABORATORY ANALYSIS REPORT SHEETS

Quanta Trace Laboratories Inc.

#401-3700 Gilmore Way
Burnaby, B.C. V5G 4M1

Tel: (604) 438-5226
Fax: (604) 436-0565

ANALYSIS OF INDUSTRIAL SAMPLES

To: J. GIBSON & ASSOCIATES
Site 15, Comp 111, RR2
Whitehorse, Yukon *
Y1A 5W8

Workorder: 24193
Received: 08-Sep-94
Completed: 19-Sep-94

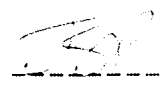
Attn: John Gibson

Re: Mayo Soils and Waters

24193-1	soil #1 Mayo Landfill Site	
24193-2	soil #2	'
24193-3	soil #3	'
24193-4	soil #4	'
24193-5	soil #5	'
24193-6	soil #8	'
24193-7	water #6	'
24193-8	water #7	'

Please refer to Norwest Labs original reports for PCB and organo-chlorine results and methodology.

Test results are for internal use only. Quanta Trace liability is limited to the testing fee paid.

Analyst: 

Norwest Labs



"We Solve Problems"

203 - 20771 Langley By-Pass
Langley, B.C. V3A 5F8
Phone (604) 530-4344
Fax: (604) 534-9996

WO (Lang.) : 9250
WO (Other) : 24193

PO # :
Date Rec'd. : 9-Sep-94
Date Comp. : 16-Sep-94

Client

Received From

Name : Quanta Trace Labs Address : #401 - 3700 Gilmore Way Burnaby, B.C. CANADA V5G 4M1 Phone : (604) 438-5226 Fax : (604) 436-0565 Attn. : Janet Pel Project : Mayo soil	Name : Address : Phone : Fax : Attn. :
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Organo-Chloride Pesticides in Soil

Parameter	9250-1 1	9250-2 2	9250-3 3	Detection Limit
Pesticide				
Aldrin	N.D.	N.D.	N.D.	0.01
BHC (alpha isomer)	N.D.	N.D.	N.D.	0.01
4,4'-DDD	N.D.	N.D.	N.D.	0.01
4,4'-DDE	N.D.	N.D.	N.D.	0.01
2,4'-DDT	N.D.	N.D.	N.D.	0.01
4,4'-DDT	0.10	N.D.	N.D.	0.02
Dieldrin	N.D.	N.D.	N.D.	0.01
Endosulfan I	N.D.	N.D.	N.D.	0.01
Endosulfan II	N.D.	N.D.	N.D.	0.01
Endrin	N.D.	N.D.	N.D.	0.01
Heptachlor	N.D.	N.D.	N.D.	0.01
Heptachlor epoxide	N.D.	N.D.	N.D.	0.01
Hexachlorobenzene	N.D.	N.D.	N.D.	0.01
Lindane	N.D.	N.D.	N.D.	0.01
Methoxychlor	N.D.	N.D.	N.D.	0.03
Mirex	N.D.	N.D.	N.D.	0.01
Percent Moisture	5.07	7.89	5.87	

Results are expressed in ppm (mg/kg), dry weight.
 N.D. = Not Detectable (less than detection limit).
 Trace = Present, but less than Limit of Quantitation.
 ----- = Not Determined.

Norwest Labs



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203 - 20771 Langley Bypass
Langley, B.C. V3A 5E8
Phone (604) 530-4344
Fax: (604) 534-9996

WO (Lang.) : 9250
WO (Other) : 24193

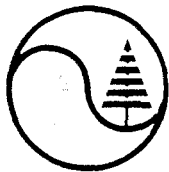
PO # :
Date Rec'd. : 9-Sep-94
Date Comp. : 16-Sep-94

Organo-Chloride Pesticides in Soil (cont.)

Parameter	9250-4 4	9250-5 5	9250-6 6	Detection Limit
<u>Pesticide</u>				
Aldrin	N.D.	N.D.	N.D.	0.01
BHC (alpha isomer)	N.D.	N.D.	N.D.	0.01
4,4'-DDD	N.D.	trace	N.D.	0.01
4,4'-DDE	N.D.	N.D.	N.D.	0.01
2,4'-DDT	N.D.	0.07	N.D.	0.01
4,4'-DDT	N.D.	0.28	N.D.	0.02
Dieldrin	N.D.	N.D.	N.D.	0.01
Endosulfan I	N.D.	N.D.	N.D.	0.01
Endosulfan II	N.D.	N.D.	N.D.	0.01
Endrin	N.D.	N.D.	N.D.	0.01
Heptachlor	N.D.	N.D.	N.D.	0.01
Heptachlor epoxide	N.D.	N.D.	N.D.	0.01
Hexachlorobenzene	N.D.	N.D.	N.D.	0.01
Lindane	N.D.	N.D.	N.D.	0.01
Methoxychlor	N.D.	N.D.	N.D.	0.03
Mirex	N.D.	N.D.	N.D.	0.01
<u>Percent Moisture</u>	8.47	15.82	20.89	

Results are expressed in ppm (mg/kg), dry weight.
N.D. = Not Detectable (less than detection limit).
Trace = Present, but less than Limit of Quantitation.
----- = Not Determined.

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Langley, B.C. V3A 5E8
Phone (604) 530-4344
Fax: (604) 534-9996

WO (Lang.) : 9250
WO (Other) : 24193

PO # :
Date Rec'd. : 9-Sep-94
Date Comp. : 16-Sep-94

Client

Received From

Name : Quanta Trace Labs	Name :
Address : #401 - 3700 Gilmore Way Burnaby, B.C. CANADA V5G 4M1	Address :
Phone : (604) 438-5226	Phone :
Fax : (604) 436-0565	Fax :
Attn. : Janet Pel	Attn. :
Project : Mayo Water	

Organo-Chloride Pesticides in Water

Parameter	9250-7 7	9250-8 8	Detection Limit
Pesticide			
Aldrin	N.D.	N.D.	0.01
BHC (alpha isomer)	N.D.	N.D.	0.01
4,4'-DDD	N.D.	N.D.	0.01
4,4'-DDE	N.D.	N.D.	0.01
2,4'-DDT	N.D.	N.D.	0.01
4,4'-DDT	N.D.	N.D.	0.02
Dieldrin	N.D.	N.D.	0.01
Endosulfan I	N.D.	N.D.	0.01
Endosulfan II	N.D.	N.D.	0.01
Endrin	N.D.	N.D.	0.01
Heptachlor	N.D.	N.D.	0.01
Heptachlor epoxide	N.D.	N.D.	0.01
Hexachlorobenzene	N.D.	N.D.	0.01
Lindane	N.D.	N.D.	0.01
Methoxychlor	N.D.	N.D.	0.03
Mirex	N.D.	N.D.	0.01

Results are expressed in ppb (ug/L).

N.D. = Not Detectable (less than detection limit).

Trace = Present, but less than Limit of Quantitation.

----- = Not Determined.

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Langley, B.C. V3A 5E8
Phone (604) 530-4344
Fax: (604) 534-9996

WO (Lang.) : 9250
WO (Other) : 24193

PO # :
Date Rec'd. : 9-Sep-94
Date Comp. : 16-Sep-94

Organo-Chloride Pesticides in Soil (cont.)

Definitions / Methods

Organo-Chloride Pesticides:

This analysis is carried out in accordance with U. S. Environmental Protection Agency Method 8080 (#SW 846, 3rd Edition, Washington DC 20460) which involves extraction of the components with an organic solvent (EPA 3540) followed by analysis by capillary gas chromatography using an electron capture detector.

Percent Moisture: Percentage of the total wet weight of the sample as received. This analysis is carried out gravimetrically by drying the sample to constant weight at 105 C.

Comments

Quality Control Results

Compound	% Recovery	Analysis	Date	Analyst
lindane	87	O-C Scan	13-Sep-94	Cathy H
DDT	112			
endosulfan I	80			

Supervisor

Note: All samples will be disposed of after 30 days following analysis unless other arrangements are made.

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203 - 20771 Langley Bv-Pass
Langley, B.C. V3A 5E8
Phone (604) 530-4344
Fax: (604) 534-9996

WO (Lang.) : 9250
WO (Other) : 24193

PO # :
Date Rec'd. : 9-Sep-94
Date Comp. : 16-Sep-94

Organo-Chloride Pesticides in Water (cont.)

Definitions / Methods

Organo-Chloride Pesticides:

This analysis is carried out in accordance with U. S. Environmental Protection Agency Method 8080 (#SW 846, 3rd Edition, Washington DC 20460) which involves extraction of the components with an organic solvent (EPA 3540) followed by analysis by capillary gas chromatography using an electron capture detector.

Comments

Quality Control Results

Compound	QA/QC		Analysis	Analyst	
	% Recovery			Date	Analyst
lindane	94		O-C Scan	12-Sep-94	Cathy H
DDT	94				
endosulfan I	110				

Supervisor

Note: All samples will be disposed of after 30 days following analysis unless other arrangements are made.

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203 - 20771 Langlev By-Pass
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Phone (604) 530-4344
Fax: (604) 534-9996

WO (Lang.) : 9250

WO (Other) :

PO # :

Date Rec'd. : 9-Sep-94

Date Comp. : 16-Sep-94

Client

Received From

Name : Quanta Trace Labs	Name :
Address : #401 - 3700 Gilmore Way Burnaby, B.C. CANADA V5G 4M1	Address :
Phone : (604) 438-5226	Phone :
Fax : (604) 436-0565	Fax :
Attn. : Janet Pel	Attn. :
Project : Mayo Soil	

Polychlorinated Biphenyls (PCBs) in Soil

Parameter	9250-1 1	9250-2 2	9250-3 3	Detection Limit
<u>Total PCBs</u>	N.D. *	N.D. *	N.D. *	0.02
<u>Percent Moisture</u>	5.07	7.89	5.87	

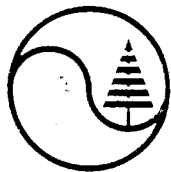
Parameter	9250-4 4	9250-5 5	9250-6 6	Detection Limit
<u>Total PCBs</u>	N.D. *	N.D. *	N.D. *	0.02
<u>Percent Moisture</u>	8.47	15.82	20.89	

Results are expressed in ppm (mg/kg), dry weight.

N.D. = Not Detectable (less than detection limit).

Trace = Present, but less than Limit of Quantitation.

* The chromatogram from this sample was compared to the chromatograms of Aroclors 1248, 1254, 1260 and 1268 at a level comparable to 0.02 ppm, but no match was found.



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 Langley, B.C. V3A 5E8
 Phone (604) 530-4344
 Fax: (604) 534-9996

WO (Lang.) : 9250

WO (Other) :

PO # :

Date Rec'd. : 9-Sep-94

Date Comp. : 16-Sep-94

Polychlorinated Biphenyls (PCBs) in Soil (cont.)

Definitions / Methods

Total PCBs:

This analysis is carried out in accordance with U.S. Environmental Protection Agency Methods 3540/8080 (#SW 846, 3rd Edition, Washington DC) which involves extraction of the sample with methylene chloride then cleanup of the sample using a silica gel column followed by analysis by capillary gas chromatography using an electron capture detector.

Percent Moisture:

Percentage of the total wet weight of the sample as received. This analysis is carried out gravimetrically by drying the sample to constant weight at 105 C.

Comments

Quality Control Results

Compound	% Recovery	Analysis	Date	Analyst
PCB Aroclor-1254	70	PCBs	13-Sep-94	Cathy H

[Signature]

 Supervisor

Note: All samples will be disposed of after 30 days following analysis unless other arrangements are made.

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Langley, B.C. V3A 5E8
Phone (604) 530-4344
Fax: (604) 534-9996

WO (Lang.) : 9250
WO (Other) : 24193

PO # :
Date Rec'd. : 9-Sep-94
Date Comp. : 16-Sep-94

Client

Received From

Name : Quanta Trace Labs Address : #401 - 3700 Gilmore Way Burnaby, B.C. CANADA V5G 4M1 Phone : (604) 438-5226 Fax : (604) 436-0565 Attn. : Janet Pel Project : Mayo Water	Name : Address : Phone : Fax : Attn. :
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------

Polychlorinated Biphenyls (PCBs) in Water

Parameter	9250-7 7	9250-8 8	Detection Limit
<u>Total PCBs</u>	N.D.*	N.D.*	0.2

Results are expressed in ppb (ug/L).

N.D. = Not Detectable (less than detection limit).

Trace = Present, but less than Limit of Quantitation.

* The chromatogram from this sample was compared to the chromatograms of Aroclors 1248, 1254, 1260 and 1268 at a level comparable to 0.2 ppb, but no match was found.

Norwest Labs



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203 - 20771 Langley By-Pass
Langley, B.C. V3A 5E8
Phone (604) 530-4344
Fax: (604) 534-9996

WO (Lang.) : 9250
WO (Other) : 24193

PO # :
Date Rec'd. : 9-Sep-94
Date Comp. : 16-Sep-94

Polychlorinated Biphenyls (PCBs) in Water (cont.)

Definitions / Methods

Total PCBs:

This analysis is carried out in accordance with U.S. Environmental Protection Agency Methods 3510/8080 (#SW 846, 3rd Edition, Washington DC) which involves extraction of the sample with methylene chloride then cleanup of the sample using a silica gel column followed by analysis by capillary gas chromatography using an electron capture detector.

Comments

Quality Control Results

Compound	% Recovery	Analysis	Date	Analyst
PCB Aroclor-1254	107	PCBs	12-Sep-94	Cathy H

Supervisor

Note: All samples will be disposed of after 30 days following analysis unless other arrangements are made.