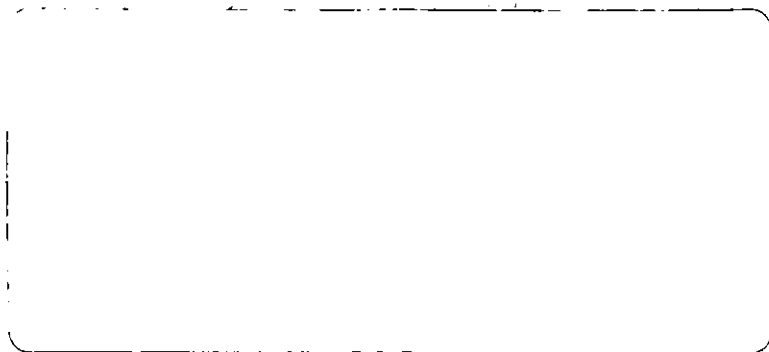


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 MORROW  
ENVIRONMENTAL  
CONSULTANTS INC.

A DECADE OF SERVICE 

**PHASE II ENVIRONMENTAL  
SITE ASSESSMENT**

**Winnipeg Diesel Shops  
& Weston Shops  
Winnipeg, MB**

**Canadian Pacific Railway**

**Prepared By:**

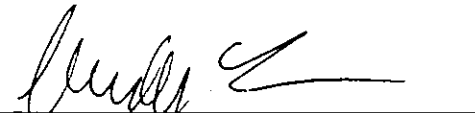


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**W8140B  
2000 02 25**

## EXECUTIVE SUMMARY

On behalf of Canadian Pacific Railway (CPR), Morrow Environmental Consultants Inc. (MECI) has completed a Phase II Environmental Site Assessment (ESA) at the CPR Winnipeg Diesel Shops and Weston Shops in Winnipeg, MB. The purpose of the assessment was to investigate the soil and groundwater quality at areas of potential environmental concern which were identified in a Phase I ESA completed by the CPR Office of the Chief Engineer in 1991. The Phase I ESA is summarized in the Office of the Chief Engineer's report entitled: *CP Rail, Phase I - Site Assessment, Weston Yard, Winnipeg, Manitoba, December 1991*.

The Phase II ESA included drilling 68 boreholes to depths ranging from 4.6 m to 6.1 m below grade, excavating 29 test pits to depths ranging from 0.9 m to 3.2 m below grade, soil sample collection and analyses, installation of groundwater monitoring wells in 50 of the 68 boreholes, and groundwater monitoring, sampling and analyses. Stratigraphy across the site generally consisted of fill material which ranged in depth from 0.3 m to 4.0 m below grade and was underlain by clay which was underlain by silt. The clay ranged in thickness from 0.2 m to 1.0 m and the silt varied in depth from 0.8 m to 4.3 m below grade. Beneath the silt was a clay which extended to the maximum depth of investigation (6.1 m below grade).

Groundwater was encountered in the monitoring wells at depths ranging from 0.4 m below grade (1999 08 31/09 01) in the former locomotive fuelling area to 5.9 m below grade (1999 12 01/02) in the active locomotive fuelling area. The apparent direction of groundwater flow varied across the site and is likely influenced by local underground structures and buried utilities. The apparent direction of groundwater flow for the specific areas of concern are presented below.

| Area of Concern                     | Apparent Direction of Groundwater Flow |                   | Hydraulic Gradient (m/m) |                  |
|-------------------------------------|----------------------------------------|-------------------|--------------------------|------------------|
|                                     | 1998 12 01/02                          | 1999 08 31/09 01  | 1998 12 01/02            | 1999 08 31/09 01 |
| Former Locomotive Fuelling Facility | northeast to northwest                 | northeast to west | 0.03                     | 0.05             |
| Active Locomotive Fuelling Facility | northeast                              | east              | 0.03                     | 0.05             |
| Above Ground Diesel Tanks           | indeterminate                          | east              | -                        | 0.003            |
| Frog Shop                           | indeterminate                          | indeterminate     | -                        | -                |
| Former Tank Car Cleaning Area       | northwest                              | west              | 0.007                    | 0.03             |
| Former Leaking Tank Car Area        | southeast                              | southeast         | 0.009                    | 0.01             |
| Soil Stockpiling Area               | north                                  | north             | 0.004                    | 0.003            |
| Component Shop                      | indeterminate                          | indeterminate     | -                        | -                |
| Wheel Shop                          | indeterminate                          | southwest         | -                        | 0.02             |
| Diesel Heavy Repair Shop            | indeterminate                          | indeterminate     | -                        | -                |

Based on the rising head bail tests conducted, the horizontal hydraulic conductivities were estimated to be  $9 \times 10^{-9}$  m/s (clay) and  $1 \times 10^{-8}$  m/s (clay) for two monitoring wells located in the former locomotive fuelling facility and  $8 \times 10^{-7}$  m/s (silt) for one monitoring well located in the former tank car cleaning area.

Soil samples containing xylenes (X), total volatile hydrocarbons (TVH), total extractable hydrocarbons (TEH), polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), mineral oil and grease (MOG), arsenic (As), copper (Cu), nickel (Ni), lead (Pb), and/or zinc (Zn) at concentrations greater than the applicable Canadian Council of Ministers of the Environment (CCME) (1999) Industrial land use guidelines and/or the Manitoba Environment (1993) Level III criteria (applicable for Industrial land use) were identified in a number of the investigated areas as presented in the following table.

| Area of Concern                        | Parameter in Exceedance                      | Depth (m)   |
|----------------------------------------|----------------------------------------------|-------------|
| Former Locomotive Fuelling Facility    | X, TVH, TEH, MOG                             | 0.6 to 2.4  |
| Active Locomotive Fuelling Facility    | TVH, TEH, MOG                                | 1.4 to 2.9  |
| Above Ground Diesel Fuel Storage Tanks | X, TEH, PAHs                                 | 0.7 to 1.5  |
| Frog Shop                              | TEH                                          | 1.7 and 1.8 |
| Former Leaking Tank Car Area           | X, TVH, TEH, As, Cu, Ni, Pb, Zn              | 0.4 to 1.5  |
| Soil Stockpiling Area                  | TEH                                          | 0.4 to 1.2  |
| Component Shop                         | VOCs (trichloroethene and tetrachloroethene) | 3.8         |
| Wheel Shop                             | VOCs (tetrachloroethene)                     | 2.4 and 3.8 |
| Diesel Heavy Repair Shop               | TEH                                          | 0.6         |

There are currently no applicable CCME or Manitoba Conservation (formerly Manitoba Environment) guidelines/criteria for groundwater analytical results. However, elevated dissolved hydrocarbon, VOCs and/or metals concentrations were detected in groundwater samples collected from monitoring wells located in the former locomotive fuelling area, the former tank car cleaning area, the former leaking tank car area, the Component Shop, and the Wheel Shop.

Liquid phase hydrocarbons were detected in two monitoring wells located in the active locomotive fuelling area, and in three monitoring wells located in the former locomotive fuelling area. The maximum apparent thicknesses were 344 mm and 530 mm in the two monitoring wells in the active locomotive fuelling area and 5 mm, 28 mm and 1 mm in the three wells in the former locomotive fuelling area.

Dense non-aqueous phase liquids (DNAPL), related to the solvents used in the degreasers formerly located in the Component Shop and Wheel Shop, have not been detected in any of the wells monitored to date.

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## 1. INTRODUCTION

On behalf of Canadian Pacific Railway (CPR), Morrow Environmental Consultants Inc. (MECI) has completed a Phase II Environmental Site Assessment (ESA) of CPR's Winnipeg Diesel Shops and Weston Shops (the "Yard") in Winnipeg, MB. The scope of work was based on MECI's proposals, dated 1998 10 16 and 1999 02 12, submitted to CPR by MECI.

### 1.1. Phase II Objectives and Scope of Investigation

The purpose of the Phase II ESA was to assess the impact of historic and current activities on the soil and groundwater at the Winnipeg Diesel Shops and Weston Shops focusing on the areas of concern discussed below. The scope of the investigation was based on the objectives presented in the documents entitled *CPR, Environmental Affairs, Standardized Phase II Environmental Site Assessment Terms of Reference, 1998* and *Request for Proposal, Limited Phase II Environmental Assessment, Winnipeg Diesel Shops and Weston Shops* (dated 1998 10 05) and summarized below:

- to investigate the soil and groundwater conditions in the areas of environmental concern identified in Table 1 and to determine the presence or absence of hydrocarbon and other types of contamination in these areas; and
- to determine the direction and estimate the rate of groundwater flow and seepage velocity.

The scope of work completed for the Phase II ESA is summarized below.

- Sixty-eight boreholes (50 completed with monitoring wells) and 29 test pits were installed in specific areas of concern as referenced in Table 1. The distribution of the boreholes and test pits per area of concern is presented in Table 2. Soil samples were recovered from the boreholes and test pits, and selected soil samples were submitted for laboratory analysis of organic and inorganic parameters.
- The monitoring wells were surveyed with respect to geodetic datum and monitored for liquid levels and subsurface vapour concentrations. Groundwater samples were collected from selected monitoring wells and submitted for laboratory analyses of organic and inorganic parameters.

- This report was prepared summarizing the findings of the investigation.

## **1.2. Site Description**

The CPR Winnipeg Diesel Shops and Weston Shops are located in Winnipeg, MB, and are bounded by Selkirk Avenue to the north, McPhillips Street to the east, Keewatin Street to the west, and the CPR main lines to the south. Surrounding land uses are residential to the north (20m), commercial and parkland to the east (50 m), residential and parkland to the south (20 m) and commercial to the west (70 m) as shown on the Key Plan, Drawing W8140B-001, Appendix I. The general configuration of the Yard is shown on the Site Location Plan, Drawing W8140B-002, Appendix I. The nearest surface water is a man-made stormwater retention pond, located approximately 450 m to the west, in Woodsworth Park. In addition, Omand's Creek is approximately 1.7 km west of the western boundary of the Yard and the Red River is approximately 3.2 km east of the eastern boundary.

A search of the Manitoba Department of Natural Resources, Water Resources Branch water well records database identified four registered water wells located within 1,600 m of the Winnipeg Diesel Shops and Weston Shops. The water well records indicated that of the four wells, two are registered for industrial use, one is registered for air conditioning use, and one is registered as an observation well. The wells are cased through the overburden to depths of 14.3 m to 28.3 m below grade and completed as open holes in the carbonate bedrock to depths ranging from 29 m to 100 m below grade. The present status of these wells is unknown, but expected to be active.

Based on available geological maps of the area including the Yard, the major surficial units in the area were identified as deep basin deposits of clay and silt up to 30 m thick forming extensive lake plains and a discontinuous veneer reflecting the form of the underlying topography. The clay and silt deposits are underlain by carbonate bedrock.

Potable water for the residents of Winnipeg is supplied via a piped distribution system drawn from Shoal Lake, located approximately 150 km southeast of Winnipeg.

Temperature and precipitation data for the site were obtained from the *Canadian Climate Normals* (1951-1980), Environment Canada. Daily average temperatures at Winnipeg range from approximately 20°C in July to -19°C in January. The daily average temperature is below

0°C from November to March. Total annual precipitation at Winnipeg is approximately 525 mm, of which approximately 410 mm is rain with the remaining portion being snow.

### **1.3. Areas of Environmental Concern**

A Phase I ESA was conducted at the Winnipeg Diesel Shops and Weston Shops by the CPR Office of the Chief Engineer in December 1991. The results of the Phase I ESA are summarized in a report entitled: *CP Rail, Phase I - Site Assessment, Weston Yard, Winnipeg, Manitoba, December 1991*. The objective of the Phase I ESA was to assess the potential for soil and groundwater impact of the Winnipeg Diesel Shops and Weston Shops due to current and historic activities. The areas of potential environmental concern identified in the Phase I ESA report are listed on Table 1 and shown on Drawing W8140B-002, Appendix I, and are described in the following sections.

#### **1.3.1. Former Locomotive Fuelling Facility**

The former locomotive fuelling facility was located approximately 120 m east of the current locomotive fuelling facility and operated starting from between 1963 and 1967 to 1984, when it was decommissioned. The former facility consisted of three above ground storage tanks (volumes unknown), earth containment berms around the tanks, fuelling stations, and drip trays. All of the former facility equipment has been removed with the exception of the drip trays and a portion of their associated piping.

#### **1.3.2. Active Locomotive Fuelling Facility**

The current locomotive fuelling facility is located adjacent to the south side of the Diesel Shop and was constructed in approximately 1984. The facility consists of fuelling stations, drip trays, concrete aprons graded to direct surface drainage into the drip trays, and an oil/water separator connected to the drip trays. Photograph 1 in Appendix II shows the active locomotive fuelling facility at the time of the investigation.

#### **1.3.3. Above Ground Diesel Fuel Storage Tank Areas**

Several historical and current diesel fuel above ground storage tanks (ASTs) were identified in the Phase I ESA report. The areas investigated as part of this assessment are as follows: three 886,500 L diesel fuel ASTs, located northeast of the Diesel Shop, which supply the active

locomotive fuelling facility through underground piping; a 3,600 L diesel fuel AST, located west of the Mobile Equipment Repair Facility (MERF), which is used for various CPR vehicles; and a 3,600 L diesel fuel AST, located in the west end of the Yard, which is used for various track equipment. Photographs 2, 3 and 4 in Appendix II show the condition of the diesel fuel ASTs at the time of the investigation.

#### *1.3.4. Frog Shop*

Two heating oil ASTs (volumes unknown) were formerly located at the southwest corner of the Frog Shop. They were removed between 1969 and 1974. Photograph 5 in Appendix II shows the area where the former heating oil tanks were located.

#### *1.3.5. Former Tank Car Cleaning Area*

Tank car cleaning was formerly conducted on a designated track located northeast of the Freight Car Shop. The wash effluent was collected and directed to the Tank Car Cleaning Sump House. The track has been removed; however, the wash effluent catchment piping remains in the subsurface. Currently, barrel cleaning is conducted adjacent to the east side of the Sump House. The barrels are steam cleaned and the wash effluent is directed to the oil/water separator located within the Sump House. Photograph 6 in Appendix II shows the tank car cleaning area at the time of the investigation.

#### *1.3.6. Former Leaking Tank Car Area*

Leaking tank cars that required repair were historically moved to designated tracks located northwest of the former One Spot Repair Shop, where the tank cars were stored until their contents could be removed. A concrete pad is present in the former leaking tank car area; however, no fluid collection system is evident. Photograph 7 in Appendix II shows the former leaking tank car area at the time of the investigation.

#### *1.3.7. Soil Stockpiling Area*

The soil stockpiling area, located in the northwest corner of the Weston Shops, east of the CPR Winnipeg Intermodal Facility, has been used historically and currently as a soil stockpiling area for excavated fill materials such as sand, gravel, concrete, clay, etc. Materials excavated during various facility upgrades and repairs, such as construction of the Diesel Shop and renovation of the Diesel Heavy Repair Shop, have reportedly been deposited in this area.

#### 1.3.8. *Component Shop*

Chlorinated solvent storage tanks and an underground solvent-type vapour degreaser were formerly located in the north portion of the Component Shop. The vapour degreaser was used to clean heavy-end hydrocarbons (i.e. greases, oil, etc.) from locomotive and rail car parts. The process consisted of washing the components with solvent to dissolve heavy-end hydrocarbons and then vapourizing the solvent/oil mixture. The heavy-end hydrocarbons subsequently separated from the solvent vapour and were collected as a sludge for disposal. The solvent vapour was then condensed and reused. The storage tanks and vapour degreasing equipment have been removed; however, the pit in which the vapour degreaser was situated has been covered with metal plates and has reportedly not been backfilled. Photograph 8 in Appendix II shows the former vapour degreaser location.

#### 1.3.9. *Wheel Shop*

Chlorinated solvent storage tanks and a solvent-type vapour degreaser, similar to that described above, were formerly located in the north portion of the Wheel Shop. The storage tanks and vapour degreaser have been removed and a hot water degreaser presently occupies the same area. The water from the current degreaser is reportedly directed to a dissolved air flotation waste water treatment unit located at the Power House and subsequent to treatment is discharged to the City of Winnipeg sewer system. The sludge is reportedly incinerated at the Power House.

#### 1.3.10. *Diesel Heavy Repair Shop*

Upon completion of the repair of a locomotive, the locomotive is moved outdoors where it can be load tested. During the load tests, lubricating and fuel oil leaks may occur. One of the potential load test areas identified in the Phase I ESA report was located adjacent to the east end of the Diesel Heavy Repair Shop. During the current assessment, staining was noted in this area and CPR employees reported that during times of precipitation surface water runoff collects in this area.

## 2. REGULATORY FRAMEWORK

Soil and groundwater quality for the current field investigation have been assessed based on a regulatory framework of federal and provincial guidelines for the target parameters. The guidelines used for comparison of soil and groundwater quality are discussed below, with respect to their application and relevance to the investigation and the data obtained.

### 2.1. Soil

The site was assessed in accordance with the protocols outlined in: *Guideline for Environmental Site Investigations in Manitoba*, Manitoba Environment, June 1998. The document outlines the evaluative process that applies risk-based protocol to sites in Manitoba. The process consists of a Site Investigation, Site Classification and a three tier Evaluation component to establish target levels based on the risk to public health and safety and the physical environment.

A Tier II Evaluation (Site Specific Objectives), which involves limited modification to existing Environmental Quality Guidelines (EQG), was selected for the subject site. The EQG referred to by Manitoba Environment is the document entitled: *Recommended Canadian Soil Quality Guidelines*, Canadian Council of Ministers of the Environment (CCME), March 1997. However, this document has been superseded by the document entitled: *Canadian Environmental Quality Guidelines*, CCME, 1999. Based on the current land use, the CCME (1999) Industrial land use guidelines are considered to be applicable. However, the most sensitive "limiting pathway" for toluene, phenols, pentachlorophenol, and benzo(a)pyrene is ingestion of groundwater used for drinking water and for benzene is groundwater recharge to surface water used by aquatic life. Since shallow groundwater in Winnipeg is not used as a source of drinking water and since the four registered water wells located within 1,600 m of the site are cased to at least 14.3 m below grade, the pathway for ingestion of groundwater is not considered applicable for the subject site. As the nearest surface water is approximately 450 m west of the site, the pathway for protection of aquatic life is not considered applicable. The most probable "limiting pathway" for benzene, toluene, phenols, pentachlorophenol, and benzo(a)pyrene is by physical soil contact. Accordingly, the CCME (1999) Industrial land use provisional guidelines of 39 mg/kg for benzene, 14 mg/kg for toluene, 128 mg/kg for phenols, 28 mg/kg for pentachlorophenols, and 1.4 mg/kg for benzo(a)pyrene, are considered to be applicable to the subject site. It should be noted that the CCME (1999) guideline for the most sensitive "limiting pathway" for ethylbenzene

(groundwater recharge to surface water used by aquatic life) of 20 mg/kg is the same as the provisional guideline for physical soil contact.

For constituents not referenced in the CCME (1999) guidelines, the guidelines presented in the document entitled: *A Guideline for the Environmental Investigation and Remediation of Petroleum Storage Sites in Manitoba*, Manitoba Environment, July 1993, have been used for comparison purposes. Since CCME (1999) does not have guidelines for total volatile hydrocarbons (TVH) and total extractable hydrocarbons (TEH), the Manitoba Environment (1993) Level III criteria (applicable for Industrial land use) are referenced.

A summary of the Site Information appears in Appendix III.

## **2.2. Groundwater**

Manitoba Conservation (formerly Manitoba Environment) does not currently have guidelines for groundwater quality. However, concentrations of benzene, toluene, ethylbenzene and xylenes (BTEX) components should not exceed drinking water guidelines at the point of withdrawal. As there are no registered domestic water wells located within 1,600 m of the site, the four registered water wells located within 1,600 m of the site are cased to at least 14.3 m below grade and since shallow groundwater is not used as a potable resource in the Winnipeg area, the CCME (1999) *Canadian Environmental Quality Guidelines* Drinking Water (DW) guidelines do not apply to the shallow groundwater quality at the site. In addition, as the nearest surface water is a man-made stormwater retention pond, located 450 m west of the site, the CCME (1999) *Freshwater Aquatic Life* (FWAL) guidelines are also not considered to be applicable to shallow groundwater quality at the site. However, the CCME (1999) DW and FWAL guidelines are included in the tables presenting the groundwater analytical data. The guidelines are included for informational purposes only and are not included for comparison purposes.

### 3. INVESTIGATION AND METHODOLOGY

#### 3.1. Intrusive Subsurface Investigation

MECI's investigation included the advancement of 68 boreholes (50 boreholes completed with the installation of a monitoring well) and the excavation of 29 test pits. To assess the soil and groundwater conditions at the site, boreholes/monitoring wells and test pits were placed at the areas of concern listed in Table 1, and soil and groundwater samples were collected for laboratory analysis. A summary of the analytical program is presented in Table 2. The borehole/monitoring well and test pit locations are shown on drawings as listed in the table below.

| Potential Area of Concern                   | No. of<br>BHs/MWs | No. of Test<br>Pits | Site Plan Drawing No.  |
|---------------------------------------------|-------------------|---------------------|------------------------|
| Former Locomotive Fuelling Facility         | 19                | 0                   | W8140B-003             |
| Active Locomotive Fuelling Facility         | 8                 | 0                   | W8140B-004             |
| Above Ground Diesel Fuel Storage Tank Areas | 10                | 5                   | W8140B-005, W8140B-006 |
| Frog Shop                                   | 5                 | 0                   | W8140B-006             |
| Former Tank Car Cleaning Area               | 4                 | 0                   | W8140B-007             |
| Former Leaking Tank Car Area                | 9                 | 2                   | W8140B-008             |
| Soil Stockpiling Area                       | 3                 | 18                  | W8140B-009             |
| Component Shop                              | 5                 | 0                   | W8140B-010             |
| Wheel Shop                                  | 4                 | 0                   | W8140B-010             |
| Diesel Heavy Repair Shop                    | 1                 | 4                   | W8140B-004             |

##### 3.1.1. Drilling Investigation

The drilling investigation was conducted by MECI personnel on 1998 11 09 to 17, 1999 07 13 to 21 and 1999 10 29, and included observing the drilling of 68 boreholes, the installation of monitoring wells in selected boreholes, and the recovery of soil samples for field screening and potential laboratory analysis. Prior to initiating the drilling program, underground utilities in the area, including telecommunications, natural gas, power, water and sewer lines, were identified by representatives of the appropriate utilities and/or by drawings provided by the appropriate utility companies. In addition, each borehole location was cleared with various CPR personnel and by a private utility locating contractor. Copies of available CPR utility drawings were

obtained from CPR personnel. The approximate locations of underground utilities, as obtained from the available information, are shown on Drawings W8140B-003 through W8140B-010.

Boreholes were drilled to depths ranging from 4.6 m to 6.1 m below ground surface using a truck-mounted or backhoe-mounted drilling rig operated by Maple Leaf Enterprises of Winnipeg, MB. Based on the cohesive soils encountered at the Winnipeg Diesel Shops and Weston Shops, the boreholes were advanced using 130 mm diameter solid stem continuous flight augers. The boreholes were located in the following potential areas of concern.

| Potential Area of Concern                   | Borehole ID                                                               |
|---------------------------------------------|---------------------------------------------------------------------------|
| Former Locomotive Fuelling Facility         | 98-1 through 98-9, 99-36 through 99-40, 99-57, 99-58, 99-66 through 99-68 |
| Active Locomotive Fuelling Facility         | 98-10 through 98-13, 99-41 through 99-44                                  |
| Above Ground Diesel Fuel Storage Tank Areas | 98-15 through 98-19, 98-32, 99-45 through 99-48                           |
| Frog Shop                                   | 98-20, 98-34, 99-49, 99-64, 99-65                                         |
| Former Tank Car Cleaning Area               | 98-21 through 98-24                                                       |
| Former Leaking Tank Car Area                | 98-25 through 98-28, 99-50 through 99-54                                  |
| Soil Stockpiling Area                       | 98-29 through 98-31                                                       |
| Component Shop                              | 98-35, 99-60 through 99-63                                                |
| Wheel Shop                                  | 98-33, 99-55, 99-56, 99-59                                                |
| Diesel Heavy Repair Shop                    | 98-14                                                                     |

Each borehole was advanced in 0.75 m to 1.5 m intervals to allow for the recovery of samples of the subsurface soils. Representative soil samples were collected at various depth intervals from the solid stem auger flights for field screening of soil headspace vapour concentrations and potential laboratory analysis. As the boreholes were advanced, the soil conditions were logged in detail with respect to soil composition, relative density, moisture content, and any visible staining.

The soil samples were handled in accordance with the following protocols:

- Soil samples were recovered and placed into a sealable polyethylene bag for field screening. Selected samples were recovered in duplicate, with a portion of the sample being transferred to laboratory supplied sample containers. Prior to transferring the soil samples to the polyethylene bags and/or sampling containers, the samples were trimmed to

remove any smeared or loose materials which may have contacted the sampling devices or auger flights;

- The bagged portion of the sample was field screened for hydrocarbon vapour concentrations using a standardized headspace technique. The headspace analysis of soil samples involved allowing the bagged sample to warm to ambient air temperature. The bag was then punctured using the monitoring probe and screened for hydrocarbon vapours using a portable hydrocarbon vapour analyser (calibrated to a hexane standard) set for no methane response. The results were recorded in parts per million (ppm); and
- The soil recovered collected for potential laboratory analyses were placed into laboratory supplied 125 mL clear glass jars with Teflon<sup>®</sup>-lined lids for BTEX, TVH and volatile organic compounds (VOC) analyses and into 250 mL amber glass jars for TEH, polycyclic aromatic hydrocarbons (PAH), mineral oil and grease (MOG), phenols, and inorganic analyses. The soil samples were stored in ice-chilled coolers and shipped, via courier, to Philip Analytical Services Corporation (PASC) in Mississauga, ON, within 24 hours of sample collection. Selection of soil samples for laboratory analyses was based on several factors including the location, depth, visual appearance, and/or headspace screening results. A summary of the soil analyses performed is provided in Table 2. A description of the analytical methodologies and procedures is included in the Certificate of Analysis presented in Appendix IV.

For laboratory quality control/quality assurance (QA/QC), four blind duplicate soil samples were submitted for BTEX, TVH and TEH analysis.

Soil cuttings generated during drilling were screened for evidence of visible liquid hydrocarbon impact. The soil samples recovered during the assessment did not contain any evidence of liquid hydrocarbon impact and, as a result, the soil cuttings were placed on, and covered with, polyethylene sheeting in the soil stockpiling area, near Monitoring Well 98-30. The cuttings generated during the assessment were not used to backfill the boreholes.

To minimize the possibility of cross contamination, the solid stem augers used during drilling were pressure washed after completion of each borehole. The wash water did not contain any evidence of visible liquid hydrocarbon accumulations and, as such, was discharged to a catch basin located south of the Diesel Heavy Repair Shop. It is our understanding that water

discharged to catch basins at the Yard, enters an oil/water separator prior to discharge to the City of Winnipeg sewer system. No wash water was discharged into, or adjacent to, any surface bodies of water.

### *3.1.2. Test Pitting Investigation*

The test pitting investigation was conducted by MECI personnel on 1998 11 18, 1999 10 07 and 1999 10 28, and included observing the excavation of 29 test pits and the recovery of soil samples for field screening and potential laboratory analysis. Prior to initiating the test pitting program, underground utilities in the area were identified by the appropriate utility companies, CPR personnel and a private utility locating contractor. In addition, copies of available CPR utility drawings were obtained from CPR personnel. The approximate locations of underground utilities, as obtained from the available information, are shown on Drawings W8140B-003 through W8140B-010.

Test pits were excavated to depths ranging from 0.9 m to 3.2 m below ground surface using a rubber-tired backhoe operated by Ken Palson Enterprises Ltd. of Winnipeg, MB. The test pits were located in the following potential areas of concern.

| Potential Area of Concern                   | Test Pit ID                             |
|---------------------------------------------|-----------------------------------------|
| Above Ground Diesel Fuel Storage Tank Areas | 98-1, 99-12 through 99-15               |
| Former Leaking Tank Car Area                | 99-28, 99-29                            |
| Soil Stockpiling Area                       | 98-2 through 98-11, 99-16 through 99-23 |
| Diesel Heavy Repair Shop                    | 99-24 through 99-27                     |

Each test pit was advanced in approximately 0.3 m intervals to allow for the recovery of samples of the subsurface soils. Representative soil samples were recovered, at various depth intervals, directly from the excavator's bucket for field screening of soil headspace vapour concentrations and potential laboratory analysis. As the test pits were advanced, the soil conditions were logged in detail with respect to soil composition, relative density, moisture content, and any visible staining. Upon completion of the test pit, the test pit was backfilled with the excavated materials and compacted with the excavator bucket.

The soil samples were handled in accordance with the protocols outlined in Section 3.1.1. A summary of the soil analytical testing program is presented in Table 2.

For laboratory QA/QC, one blind duplicate soil sample was submitted for BTEX, TVH and TEH analyses.

### **3.2. Monitoring Well Installation**

Upon completion of the drilling, 50 mm diameter threaded PVC monitoring wells with machine slotted screen, void of glue and solvent, were installed in selected boreholes to allow for future monitoring of the subsurface conditions and collection of groundwater samples for laboratory analysis. Each monitoring well was constructed with a screened section ranging in lengths from 2.4 m to 5.0 m, with the base of the screen set at depths ranging from 4.6 m to 6.1 m. The screened sections were installed to isolate the monitoring wells from the surficial fill materials and organic deposits and to minimize the potential for impact of the monitoring wells from surficial impacts. The screen sections were installed based on anticipated groundwater levels of 2 m to 3 m below grade, which typically corresponds to levels found at other sites throughout Winnipeg. In each monitoring well, the annulus around the well screen was backfilled with silica sand to approximately 0.15 m to 0.3 m above the top of the screened section. The remainder of the annulus above the sand was sealed with bentonite chips to minimize the potential for the infiltration of surface water into the monitoring well. Flush mount bolt-down road boxes were set in concrete to protect the well installation and provide future access in all monitoring well installations except Monitoring Wells 98-29 through 98-31. In Monitoring Wells 98-29 through 98-31, above ground steel casings were installed to protect the well installations.

Monitoring wells installed in areas where the potential for dense non-aqueous phase liquids (DNAPLs) exists (i.e. Component Shop and Wheel Shop) were screened across the apparent impacted zone based on field observations. As such, DNAPLs, if any, present in these areas could potentially accumulate in the bottom of the well.

The completion details for the monitoring wells are presented in the Borehole Logs in Appendix V.

### **3.3. Groundwater Monitoring and Sampling**

On 1998 12 01/02 and 1999 08 31/1999 09 01, all of the groundwater monitoring wells were measured for depth to water, presence or absence of liquid phase hydrocarbons and hydrocarbon vapour concentration. In addition, on 1999 11 26, Monitoring Wells 99-66 through 99-68 were monitored for the above listed parameters. A dedicated Waterra® type inertial

pump with a surge block attached and tubing were used for well development. The development procedure consisted of placing the inertial pump, surge block and tubing into the well and then slowly moving the surge block and pump in 0.3 m to 0.5 m long sections through the screened portion of the monitoring well. Each section was developed for approximately one minute and then the surge block and inertial pump was lowered to develop the next section of screened pipe. This began at the top of the saturated well screen and continue to the bottom of the well. Upon completion of development, the surge block was removed and the well was purged dry using the inertial pump and tubing to remove the water containing suspended solids.

On 1998 12 15 and 1999 09 14, groundwater samples were collected from selected monitoring wells using a peristaltic pump. Conventional groundwater sample collection techniques using Waterra® type inertial pumps and tubing commonly result in excessive draw down in the well's sand pack in low permeability formations such as clay and silt. This effect can result in artificial aeration of, and entrainment of particulates in, the groundwater sample. A peristaltic pump avoids this by sampling from the screened portion of the well at a flow rate that approaches the natural groundwater flux. However, the peristaltic pump could not obtain sufficient hydraulic head to collect samples from Monitoring Wells 98-24 and 98-33, and therefore, samples from these wells were collected using Waterra® type inertial pumps and tubing. The samples were field filtered and/or preserved as specified by the laboratory, and submitted to PASC for analysis of one or more of BTEX, TVH, TEH, VOCs, PAHs, and dissolved metals. Samples were collected and stored in containers provided by PASC in accordance with the following guidelines.

| Analytical Parameter | Preparation/Preservations                        | Storage Container                                 |
|----------------------|--------------------------------------------------|---------------------------------------------------|
| BTEX, TVH, VOCs      | NaHSO <sub>4</sub> , chilled                     | 40 mL purge and trap vials with Teflon®-lined lid |
| TEH                  | HCl, chilled                                     | 250 mL amber glass container with lid             |
| Dissolved Metals     | in-line 45 µm filter, HNO <sub>3</sub> , chilled | 250 mL plastic container                          |
| PAHs                 | chilled                                          | 1 L amber glass container                         |

The groundwater samples were packed in an ice-chilled cooler and shipped, via courier, to PASC within 24 hours of sample collection. A summary of the groundwater analytical testing program is presented in Table 2. A description of the analytical methodologies and procedures is included in the Certificate of Analysis presented in Appendix IV.

The slow recharge of groundwater in the monitoring wells at the time of sampling made the measurement of field parameters (i.e. dissolved oxygen, pH, temperature and conductivity) for stability impracticable (i.e. not enough water could be purged to attain stabilized field parameter measurements).

Purge water generated during the well development and groundwater sampling was collected and screened for evidence of visible liquid hydrocarbon accumulations. The purge water collected during the assessment did not contain any evidence of visible liquid hydrocarbon accumulations and, as such, was discharged onto the ground in a location adjacent to the monitoring well from which it was purged. No purge water was discharged into, or adjacent to, any surface water bodies.

For laboratory QA/QC, two blind duplicate groundwater samples were submitted for BTEX, TVH and TEH analyses. In addition, three blind duplicate groundwater samples were submitted for VOC analysis and one blind duplicate groundwater sample was submitted for dissolved metals analysis.

### **3.4. Monitoring Well Survey**

On 1998 12 01/02, 1999 08 31 and 1999 11 26, the monitoring well elevations were surveyed by MECI personnel relative to geodetic datum using City of Winnipeg benchmarks. The survey data are included in Appendix VI. The boreholes/monitoring wells and test pits were horizontally surveyed with respect to local physical features during the drilling and test pitting investigations.

### **3.5. Hydraulic Conductivity and LPH Baildown Testing**

Rising head bail tests were performed on monitoring wells screened in the clay, located in the former locomotive fuelling facility area (Monitoring Wells 98-2 and 98-9) and in a monitoring well screened in the silt, the former tank car cleaning area (Monitoring Well 98-24), to estimate hydraulic conductivity. The tests were performed by bailing the monitoring wells dry and manually monitoring the subsequent rise in water level in the well over time. The data was subsequently analysed using the Bouwer and Rice (1976, 1989) method for unconfined aquifers.

Purge water generated during the hydraulic conductivity tests was collected and screened for evidence of visible liquid hydrocarbon accumulations. The purge water collected during the assessment did not contain any evidence of visible liquid hydrocarbon accumulations and, as such, was discharged onto the ground in a location adjacent to the monitoring well from which it was purged. No purge water was discharged into, or adjacent to, any surface water bodies.

LPH baildown tests were conducted in two monitoring wells containing measured LPH thicknesses of 344 mm on 1998 12 03 (Monitoring Well 98-10) and 429 mm on 1999 10 29 (Monitoring Well 98-13). The test was conducted by rapidly removing LPH and as little water as possible from the well. The rates of recovery of both the LPH and the water in the well were subsequently measured. The procedure and interpretation followed the method described by Hughes *et al*<sup>1</sup> and Huntley<sup>2</sup>. The proposed theory is that after LPH is removed, the water table that had been artificially depressed (due to density differences between water and LPH) will rebound, and then will return to the original depressed level as the LPH re-enters the well. During recovery, there is a piezometric response to unloading of hydrocarbon from the formation into the well, which generates an observed inflection point in the curve of water level and LPH thickness. Assessment of the difference between the water level in the well and the height of LPH in the well at the inflection point is considered by Gruszczenski<sup>3</sup> to be the "true" thickness of mobile LPH in the formation.

Additionally, Huntley suggests that the response of the LPH is proportional to the response of the groundwater affected by removal of the slug of water/hydrocarbon. As a result, the baildown test data for the water phase can be interpreted using the method of Bouwer and Rice<sup>4, 5</sup> for slug test analysis in water, and the resulting hydraulic conductivity can be used to calculate a transmissivity of the hydrocarbon phase by multiplying by a factor that corrects for the density differences. The transmissivity can then be qualitatively compared to results from

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<sup>1</sup> Hughes, J.P., C.R. Sullivan and R.E. Zinner. *Two Techniques for Determining the True Hydrocarbon Thickness in an Unconfined Aquifer*. Proceedings, Petroleum Hydrocarbons and Organic Chemicals in Ground Water. Prevention, Detection and Restoration. National Water Well Association, Houston, Texas, 1998. Pp. 291-314.

<sup>2</sup> Huntley, David, *Analytic Determination of Hydrocarbon Transmissivity From Bail Down Tests*, Petroleum Hydrocarbons and Organic Chemicals in Groundwater: Prevention, Detection and Remediation; symposium, Houston, Texas, November 12 - 14 1997, pp. 183-195.

<sup>3</sup> Gruszczenski, T.S., 1987, *Determination of a Realistic Estimate of an Actual Formation Thickness Using Monitoring Wells: A Field Bailout Test*. Proceedings, Petroleum Hydrocarbons and Organic Chemicals in Ground Water. Prevention, Detection and Restoration, National Water Well Association, Houston, Texas, pp. 235-254.

<sup>4</sup> Bouwer, H., & R.C. Rice, 1976. *A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells*. Water Resources Research, pp. 12:423-28.

<sup>5</sup> Groundwater, V. 27, No. 3, 1989, *The Bouwer-Rice slug test - an update*.

other wells containing LPH, or can be applied to a determination of potential product recoverability from the well.

## 4. RESULTS OF ASSESSMENT

### 4.1. Stratigraphy

The following sections provide information on the general stratigraphy encountered in each investigated area of concern. Detailed geological information obtained during the drilling and test pitting program can be found in the Borehole and Test Pit Logs in Appendix V.

#### 4.1.1. *Former Locomotive Fuelling Facility*

Surficial fill material was encountered at the former locomotive fuelling facility area with observed thicknesses ranging from approximately 0.7 m to 1.8 m. The fill material generally consisted of sand, gravel, silt, clay, and/or ballast. Beneath the fill material, light brown silt with some clay was encountered at depths ranging from 1.0 m to 2.9 m below grade, except in Borehole 99-57 in which the silt was not intersected. In Borehole 98-7, the silt was encountered at depths of 1.3 m to 2.1 m below grade and 3.0 m to 3.8 m below grade. Beneath the silt in the boreholes in which silt was encountered, (and beneath the fill materials in Borehole 99-57) brown clay extended to the maximum depth of investigation in this area (6.1 m). In Boreholes 98-6 through 98-8, 99-36 through 99-40, 99-58, and 99-66 through 99-68, a black to greyish brown clay layer, with thicknesses ranging from 0.2 m to 0.8 m, was encountered between the fill material and the silt. Grey or black staining was observed in Boreholes 99-36 and 99-38 from 1.8 m to 2.2 m and 1.5 m to 1.8 m below grade, respectively.

Grain-size analysis was completed on a sample collected from Borehole 98-3 (Sample BH98-3-3) from a depth of 2.4 m below grade. The grain-size distribution curve is presented in Appendix VII. According to the data obtained from the hydrometer test, this sample was classified as a silt with some clay and trace fine sand. The field description corresponds to the classification determined by grain-size analysis.

Stratigraphic cross sections of the former locomotive fuelling area are presented on Drawings W8140B-011 and W8140B-012 in Appendix I.

#### 4.1.2. *Active Locomotive Fuelling Facility*

The fill material in Boreholes 98-10 and 98-13, located east and north, respectively, of the active locomotive fuelling facility, consisted of sand and gravel to depths of 3.0 m and 4.0 m

below grade, respectively. The fill material in these boreholes was underlain by brown clay to approximately 5.3 m below ground surface. The fill material in the remaining boreholes (Boreholes 98-11, 98-12 and 99-41 through 99-44) ranged in depth from 1.0 m to 2.1 m below grade. Beneath the fill in Boreholes 98-11, 98-12 and 99-41, a brown to black clay layer was encountered, ranging in thickness from 0.2 m to 0.6 m. Underlying the clay in these boreholes and the fill in Borehole 99-43, was a light brown silt layer, ranging in thickness from 0.3 m to 0.9 m. Beneath the silt in Boreholes 98-11, 98-12, 99-41, and 99-43 and the fill materials in Boreholes 99-42 and 99-44 was brown clay to the maximum depth of investigation in this area (6.1 m). Black stained silt inclusions were observed in Borehole 99-42 from 2.1 m to 2.4 m below grade.

Grain-size analysis was completed on a sample collected from Borehole 99-43 (Sample BH99-43-3) from a depth of 1.7 m below grade. The grain-size distribution is presented in Appendix VII. According to the sieve analysis, this sample was classified as fine grained (i.e.  $D_{50} < 75 \mu\text{m}$  sieve). The soil type of Sample BH99-43-3 could not be confirmed as a hydrometer test was not conducted for this sample. The field description (silt) corresponds to the classification determined by grain-size analysis.

#### *4.1.3. Above Ground Diesel Fuel Storage Tank Areas*

The surficial material in the areas adjacent to the diesel fuel ASTs, located northeast of the Diesel Shop and west of the MERF building, consisted of clay, crushed rock, sand, gravel, and/or silt fill to approximately 1.2 m below grade. In Boreholes 98-15 through 98-19, 98-32, 99-45, 99-47, and 99-48, the fill material was underlain by a clay layer approximately 0.3 m thick. Beneath the clay in these boreholes and beneath the fill in Borehole 99-46, was clayey silt which extended to depths ranging from 1.8 m to 2.4 m below grade. Beneath the silt in all boreholes was brown clay which extended to the maximum depth of investigation (5.2 m) in these areas.

The stratigraphy observed in the test pits excavated adjacent to the diesel fuel AST located in the west end of the Yard consisted of sand and/or gravel fill to approximately 0.8 m below grade, underlain by a silt and/or clay to the maximum depth of excavation (2.1 m).

#### 4.1.4. *Frog Shop*

The stratigraphy encountered in the former heating oil AST area, located adjacent to the southwest corner of the Frog Shop, consisted of sand and gravel and/or clay fill materials which ranged from 0.6 m to 1.7 m thick. Underlying the fill materials was a black clay layer approximately 0.3 m thick, except in Borehole 98-34. Beneath the fill in Borehole 98-34 and the clay in the remaining boreholes was light brown silt which extended to depths ranging from 1.7 m to 3.2 m below grade. Beneath the silt was brown clay which extended to the maximum depth of investigation in this area (4.6 m).

#### 4.1.5. *Former Tank Car Cleaning Area*

Sand, gravel, clay, and/or silt fill materials were encountered from grade to approximately 1.3 m below grade in the former tank car cleaning area. The fill materials were underlain by light brown silt which extended to a depth of approximately 2.6 m below grade. Beneath the silt was brown clay which extended to the maximum depth of investigation in this area (4.9 m).

Grain-size analysis was completed on a sample obtained from Borehole 98-24 (Sample BH98-24-5), located in the former tank car cleaning area, from a depth of 3.8 m below grade. The grain-size distribution curve is presented in Appendix VII. According to the data obtained from the hydrometer test, this sample was classified as a silty clay. The field description corresponds to the classification determined by grain-size analysis.

#### 4.1.6. *Former Leaking Tank Car Area*

At the former leaking tank car area, the surficial fill materials consisted of sand, gravel, clay, and/or silt which extended to depths of 1.1 m to 1.7 m below grade, except in Borehole 99-53 where the fill extended to 2.8 m below grade. Clay was encountered beneath the fill materials and extended to depths ranging from 1.3 m to 2.6 m below grade, except in Borehole 99-53, where the clay extended to the maximum depth of investigation in this borehole (4.6 m). Beneath the clay in the remaining boreholes, light brown silt with some clay was encountered and extended to approximately 2.4 m below grade. Underlying the silt was brown clay to the maximum depth of investigation in this area (5.3 m).

The stratigraphy observed in the test pits excavated in the former leaking tank car area consisted of sand, gravel, silt, clay, and/or apparent semi-solidified waste paint to depths

ranging from 1.0 m to 1.7 m below grade. Beneath the fill materials was a clay which extended to the maximum depth of excavation in this area (1.8 m).

#### *4.1.7. Soil Stockpiling Area*

The stockpiled fill material in the soil stockpiling area extended to an average depth of 1.8 m below grade and consisted of sand, gravel, silt, and/or clay. In Test Pits 98-6, 98-8 and 99-23, the fill extended to depths of 2.6 m, 3.2 m and 2.4 m below grade, respectively. Beneath the fill materials, an organic layer approximately 0.3 m thick was encountered. The organic layer consisted of either organic clay (Boreholes 98-29 through 98-31, Test Pits 98-2 through 98-4, 98-7, 98-8, 98-10 and 99-16 through 99-23), organic silt (Test Pits 98-5 and 98-11) or peat (Test Pits 98-6 and 98-9). Beneath the organic layer, brown clay was encountered to approximately 2.3 m below ground surface. Beneath the clay was light brown clayey silt to a depth of approximately 3.6 m. Brown clay extended to the maximum depth of investigation in this area (5.2 m).

#### *4.1.8. Component Shop*

In Boreholes 99-60 through 99-62, the fill material consisted of clay, gravel, sand, crushed limestone, and concrete rubble and extended from 0.2 m to 0.7 m below grade. Beneath the fill material in these boreholes was a clay layer, ranging in thickness from 0.2 m to 0.9 m, beneath which was light brown silt that extended to approximately 2.3 m below grade. Beneath the silt was brown clay which extended to the maximum depth of investigation in these boreholes (4.6 m). In Boreholes 98-35 and 99-63, the fill extended to 2.0 m and 2.8 m below grade, respectively, beneath which was brown clay that extended the maximum depth of investigation in these boreholes (5.2 m).

Grain-size analysis was completed on a sample obtained from Borehole 99-61 from a depth of 2.1 m below grade (Sample BH99-61-3). The grain-size distribution is presented in Appendix VII. According to the sieve analysis, Sample BH99-61-3 was classified as fine grained (i.e.  $D_{50} < 75 \mu\text{m}$ ). The soil type of Sample BH99-61-3 could not be confirmed as a hydrometer test was not conducted for this sample. The field description (silt) corresponds to the classification determined by grain-size analysis.

#### *4.1.9. Wheel Shop*

The fill materials in the Wheel Shop area consisted of clay, silt, sand, and/or gravel and extended to depths ranging from 1.1 m to 2.7 m below grade. Beneath the fill was a light brown silt layer, ranging in thickness from 0.3 m to 0.6 m, except in Boreholes 99-55 and 99-56. In Borehole 99-55, there was a clay layer (0.3 m thick) between the fill and the silt and, in Borehole 99-56, the silt layer was not intersected. Beneath the silt in Boreholes 98-33, 99-55 and 99-59 and the fill in Borehole 99-56, was brown clay which extended to the maximum depth of investigation in this area (4.9 m). In addition, a second silt layer was encountered in Borehole 98-33 from 2.0 m to 2.6 m.

Grain-size analysis was completed on samples obtained from Borehole 98-33 from depths of 2.4 m (Sample BH98-33-3) and 3.8 m (Sample BH98-33-5) below grade. The grain-size distribution curves are presented in Appendix VII. According to the distribution curves, Sample BH98-33-3 (sieve test) was classified as fine grained (i.e.  $D_{50} < 75 \mu\text{m}$ ) and Sample BH98-33-5 (hydrometer test) was classified as a silty clay. The soil type of Sample BH98-33-3 could not be confirmed as a hydrometer test was not conducted for this sample. The field descriptions of silt for Sample BH98-33-3 and silty clay for Sample BH98-33-5 corresponds to the classification determined by grain-size analysis.

#### *4.1.10. Diesel Heavy Repair Shop*

The stratigraphy encountered in the Diesel Heavy Repair Shop consisted of sand, ballast, clay, and/or gravel fill to depths ranging from 0.6 m to 1.1 m below grade, beneath which was light brown silt that extended to 2.4 m below grade. Underlying the silt, brown clay extended to the maximum depth of investigation in this area (6.1 m).

### **4.2. Hydrogeology**

#### *4.2.1. Site Monitoring*

Liquid levels and subsurface vapour concentrations in the monitoring wells were measured on 1998 12 01/02 and 1999 08 31/1999 09 01. In addition, Monitoring Wells 99-66 through 99-68 were monitored on 1999 11 26. The monitoring results are included in Appendix VIII. The ranges in depth to groundwater across the investigated areas of concern for each monitoring period are shown in the table below.

|         | 1998 12 01/02   |           | 1999 08 31/09 01 |           |
|---------|-----------------|-----------|------------------|-----------|
|         | Monitoring Well | Depth (m) | Monitoring Well  | Depth (m) |
| Minimum | 98-2            | 0.6       | 98-8             | 0.4       |
| Maximum | 98-12           | 5.9       | 99-43            | 2.6       |

The average depth to groundwater increased approximately 0.4 m from 1998 12 01/02 to 1999 08 31/1999 09 01.

Based on the water levels measured in the monitoring wells on 1998 12 01/02 and 1999 08 31/1999 09 01, groundwater contours have been inferred for the former locomotive fuelling facility, the active locomotive fuelling facility, the above ground diesel storage tank area, the former tank car cleaning area, the former leaking tank car area, the soil stockpiling area, and the Wheel Shop. The inferred groundwater contours for these areas are presented on Drawings W8140B-013 through W8140B-024. The apparent groundwater flow direction and inferred groundwater contours for the remaining investigated areas of concern could not be calculated as the groundwater levels for the wells had not stabilized, there were insufficient data points (i.e. could not triangulate groundwater elevations) and/or no average gradient was apparent.

Using the data obtained during this investigation, the apparent direction of groundwater flows and average hydraulic gradients for each monitoring period are presented in the table below.

| Area of Concern                     | Apparent Direction of Groundwater Flow |                   | Hydraulic Gradient (m/m) |                  |
|-------------------------------------|----------------------------------------|-------------------|--------------------------|------------------|
|                                     | 1998 12 01/02                          | 1999 08 31/09 01  | 1999 12 01/02            | 1999 08 31/09 01 |
| Former Locomotive Fuelling Facility | northeast to northwest                 | northeast to west | 0.03                     | 0.05             |
| Active Locomotive Fuelling Facility | northeast                              | east              | 0.03                     | 0.05             |
| Above Ground Diesel Tanks           | indeterminate                          | east              | -                        | 0.003            |
| Frog Shop                           | indeterminate                          | indeterminate     | -                        | -                |
| Former Tank Car Cleaning Area       | northwest                              | west              | 0.007                    | 0.03             |
| Former Leaking Tank Car Area        | southeast                              | southeast         | 0.009                    | 0.01             |
| Soil Stockpiling Area               | north                                  | north             | 0.004                    | 0.003            |
| Component Shop                      | indeterminate                          | indeterminate     | -                        | -                |
| Wheel Shop                          | indeterminate                          | southwest         | -                        | 0.02             |
| Diesel Heavy Repair Shop            | indeterminate                          | indeterminate     | -                        | -                |

Subsurface hydrocarbon vapour concentrations greater than 10,000 parts per million (ppm) were measured in monitoring wells located in the former locomotive fuelling area on 1998 12 02 (Monitoring Wells 98-1, 98-4, 98-7, and 98-8) and 1999 08 31 (Monitoring Wells 98-1, 98-2 and 99-36), and in the active locomotive fuelling area on 1998 12 02 (Monitoring Well 98-12) and 1999 08 31 (Monitoring Wells 99-43 and 99-44). Elevated vapour concentrations (i.e. greater than 1,000 ppm) were measured in Monitoring Well 98-3 on 1998 12 02 and 1999 08 31 (1,200 ppm and 1,540 ppm, respectively) and in Monitoring Wells 98-10 (4,620 ppm) and 98-13 (1,540 ppm) on 1999 08 31. Subsurface vapour concentrations in the remaining wells did not exceed 660 ppm on both monitoring dates. In addition, as Monitoring Wells 99-66 through 99-68 were installed after the July 1999 drilling program (1999 10 29), these wells were monitored on 1999 11 26 and had measured vapour concentrations greater than 10,000 ppm (Monitoring Wells 99-66 and 99-67) and 2,640 ppm (Monitoring Well 99-68).

Based on the rising head bail tests performed on Monitoring Wells 98-2, 98-9 and 98-24, the horizontal hydraulic conductivity was estimated to be  $9 \times 10^{-9}$  m/s for Monitoring Well 98-2 (clay),  $1 \times 10^{-8}$  m/s for Monitoring Well 98-9 (clay) and  $8 \times 10^{-7}$  m/s for Monitoring Well 98-24 (silt). The test results and calculations are provided in Appendix IX. Using the hydraulic conductivities measured in the rising head bail tests, the measured hydraulic gradients at the former locomotive fuelling facility and the former tank car cleaning area and an assumed effective porosity of 0.2 (approximate value for silts and clays), the groundwater seepage velocities are estimated to be in the order of  $25 \times 10^{-9}$  m/s (0.1 m/year) to  $2 \times 10^{-9}$  (0.07 m/year) beneath the former locomotive fuelling area and  $1 \times 10^{-8}$  m/s (0.3 m/year) beneath the former tank car cleaning area.

#### *4.2.2. Liquid Phase Hydrocarbons*

Liquid phase hydrocarbons (LPH) were detected in Monitoring Wells 98-10 on 1998 12 02 and 1999 08 31, in Monitoring Well 99-13 on 1998 12 02, 1998 12 03, 1999 08 31, and 1999 10 29, in Monitoring Wells 98-3 and 98-4 on 1999 08 31 and in Monitoring Well 99-66 on 1999 11 26. The apparent LPH thicknesses on these dates are shown below.

| Date       | Apparent LPH Thickness (mm) |                 |                  |                  |                 |
|------------|-----------------------------|-----------------|------------------|------------------|-----------------|
|            | MW 98-3                     | MW 98-4         | MW 98-10         | MW 98-13         | MW 99-66        |
| 1999 12 02 | 0                           | 0               | 344              | 4                | NM <sup>3</sup> |
| 1999 12 03 | NM <sup>1</sup>             | NM <sup>1</sup> | 344 <sup>2</sup> | 108              | NM <sup>3</sup> |
| 1999 08 31 | 5                           | 28              | 97               | 530              | NM <sup>3</sup> |
| 1999 10 29 | NM <sup>4</sup>             | NM <sup>4</sup> | NM <sup>4</sup>  | 429 <sup>2</sup> | NM <sup>3</sup> |
| 1999 11 26 | NM <sup>5</sup>             | NM <sup>5</sup> | NM <sup>5</sup>  | NM <sup>5</sup>  | 1               |

NM - not measured

<sup>1</sup> - Monitoring well monitored on 1999 12 02

<sup>2</sup> - LPH baildown test conducted.

<sup>3</sup> - Monitoring Well 99-66 installed on 1999 10 29.

<sup>4</sup> - Only Monitoring Well 98-13 monitored on this date

<sup>5</sup> - Only Monitoring Wells 99-66 through 99-68 monitored on this date.

In monitoring wells where LPH was detected, the LPH was bailed from the well using a disposable polyethylene bailer and the thickness immediately after bailing was measured. All LPH bailed was disposed of into the drip trays at the active locomotive fuelling facility. The volumes bailed from each well are shown in the table below.

| Date       | Volume of LPH Bailed (mL) |         |          |          |          |
|------------|---------------------------|---------|----------|----------|----------|
|            | MW 98-3                   | MW 98-4 | MW 98-10 | MW 98-13 | MW 99-66 |
| 1998 12 03 | -                         | -       | 1,700    | 100      | -        |
| 1999 08 31 | 10                        | 30      | 105      | 1,200    | -        |
| 1999 10 29 | -                         | -       | -        | 1,100    | -        |
| 1999 11 26 | -                         | -       | -        | -        | -        |
| Total      | 10                        | 30      | 1,805    | 2,400    | 0        |

It should be noted that at the time of the investigation, the screen sections were installed to intersect the impacted area, if any, and to straddle an anticipated groundwater level of 2 m to 3 m below grade, which typically corresponds to levels found at other sites throughout Winnipeg. However, during site monitoring, water levels were elevated and, in several monitoring wells, measured water levels measured were above the top of the screened section. As such, any LPH potentially present in the soils surrounding the monitoring well would be trapped in the soil as residual hydrocarbons until the groundwater elevation decreases. Based on MECI's experience in the Winnipeg area, the greatest LPH thickness measured in a given monitoring well generally correlates to periods of low groundwater elevation (i.e. winter).

The monitoring wells located adjacent to the degreasers formerly located in the Component Shop (Monitoring Wells 98-35 and 99-60 through 99-63) and the Wheel Shop (Monitoring Wells 98-33, 99-55, 99-56, and 99-59) were monitored for DNAPLs using an ORS Interface Probe™. The probe was lowered to the bottom of the well to detect any DNAPL that may have accumulated at the bottom of the well. DNAPLs have not been detected to date in the wells located in the Component Shop and adjacent to the Wheel Shop.

LPH baildown tests were conducted on Monitoring Well 98-10 on 1998 12 03 and on Monitoring Well 98-13 on 1999 10 29. The baildown test data, including the curves for LPH, water and potentiometric elevations and a plot of log drawdown versus time, are included in Appendix X.

The baildown test results were examined using three methods. The simplest and most qualitative is the measurement of recovery rate as a determination of LPH mobility and potential recovery from the well. After approximately three hours, the LPH in Monitoring Well 98-10 recovered to 44% of the original bailed thickness. After approximately two hours, the LPH in Monitoring Well 98-13 recovered to 48% of the original bailed thickness.

Gruszczenski (1987) provides an empirical inflection point method for estimating the thickness of mobile LPH in the formation from baildown test data. The term "true" is used by MECI in quotations, as the LPH is actually spread through a greater thickness of the formation at variable oil saturations, rather than the simplified layer of 100% oil saturation assumed by Gruszczenski. However, this method does provide a measure of the total LPH in the formation. Based on Figure 1, Appendix X, the "true" mobile LPH thickness at Monitoring Well 98-10 was determined to be approximately 105 mm. Based on Figure 2 in Appendix X, the "true" mobile LPH thickness at Monitoring Well 98-13 was determined to be approximately 60 mm.

Huntley provides a methodology for estimating LPH transmissivity from baildown test data using the Bouwer and Rice bail test method. The assumptions inherent in the calculations are that the LPH density is 0.85 g/mL (diesel fuel) and that the radius of influence for the test is similar for both the LPH phase and the water phase. Since the Bouwer and Rice analysis provides estimates of hydraulic conductivity and not transmissivity, the estimates were converted to transmissivity by multiplying by the oil saturated screen length used in the Bouwer and Rice calculation. The estimated LPH transmissivity at Monitoring Wells 98-10 and 98-13 was  $4.5 \times 10^{-6} \text{ m}^2/\text{s}$  and  $1.4 \times 10^{-6} \text{ m}^2/\text{s}$ , respectively. These values are consistent with the qualitative interpretation of recovery data, indicating relatively high LPH mobility and

recoverability in the granular fill materials in which Monitoring Wells 98-10 and 98-13 are screened.

### **4.3. Analytical Results**

The soil and groundwater analytical program is summarized in Table 2. Laboratory results are summarized in Tables 3 to 10 for the soil analyses and in Tables 11 to 14 for the groundwater analyses, along with the applicable guidelines/criteria for comparison and/or information purposes, as discussed in Section 2.0 of this report. The detailed analytical reports are provided in Appendix IV, which include information on the laboratory analytical methodology. Table 1 presents a summary of analytes which exceeded the applicable guidelines/criteria.

#### *4.3.1. Former Locomotive Fuelling Facility*

##### **4.3.1.1. Soil Quality**

Eighteen samples collected from boreholes located at the former locomotive fuelling facility were analysed for BTEX, TVH and TEH. Six of the samples were analysed for MOG and one sample was analysed for PAHs. Xylenes were detected at concentrations greater than the CCME (1999) Industrial land use guideline in samples collected from Boreholes 98-1, 98-3, 98-4, 99-36, and 99-39 at depths ranging from 2.1 m to 2.4 m below grade. TVH and/or TEH concentrations measured in samples recovered from Boreholes 98-1 through 98-4, 98-6, 98-8, 98-9, 99-36 through 99-40, 99-57, 99-58, and 99-68 at depths ranging from 0.6 m to 2.4 m below grade, were greater than the Manitoba Environment (1993) Level III criteria. In addition, a sample recovered from Borehole 98-6 from a depth of 0.6 m below grade, contained MOG at a concentration greater than the Manitoba Environment (1993) Level III criterion. The remaining parameters were not detected in the samples analysed at concentrations greater than the referenced guidelines/criteria.

##### **4.3.1.2. Groundwater Quality**

Groundwater samples collected from Monitoring Wells 98-2, 98-4 and 98-8 were analysed for BTEX, TVH and TEH. In addition, the sample recovered from Monitoring Well 98-2 was analysed for PAHs. Dissolved toluene, TVH and TEH were detected in the sample collected from Monitoring Well 98-2 at concentrations that appeared to be elevated compared to concentrations detected in the remaining groundwater samples from this area of concern. In

addition, five PAH components (fluorene, naphthalene, 1-methylnaphthalene, 2-methylnaphthalene, and phenanthrene) were detected in this sample; however, there are no applicable guidelines for these parameters. The remaining PAH components in this sample were not detected at concentrations greater than the laboratory limit of quantitation.

#### *4.3.2. Active Locomotive Fuelling Facility*

##### *4.3.2.1. Soil Quality*

Six soil samples from the active locomotive fuelling facility area were analysed for BTEX, TVH and TEH. In addition, two samples were analysed for MOG. The samples collected from Boreholes 98-10, 98-13 and 99-43 at depths ranging from 1.4 m to 2.9 m below grade contained TVH and/or TEH at concentrations greater than the Manitoba Environment (1993) Level III criteria. In addition, the samples analysed from Boreholes 98-10 and 99-43 contained MOG at concentrations greater than the referenced Level III criterion. The concentrations of the remaining parameters in the samples analysed were less than the referenced guidelines/criteria.

##### *4.3.2.2. Groundwater Quality*

A groundwater sample collected from Monitoring Well 98-11 was analysed for BTEX, TVH and TEH. In addition, LPH samples were collected from Monitoring Wells 98-10 and 98-13 and submitted for LPH characterization analysis. Dissolved hydrocarbons were not detected at concentrations greater than the laboratory limit of quantitation in the sample collected from Monitoring Well 98-11. The LPH samples collected from Monitoring Wells 98-10 and 98-13 contained hydrocarbons primarily in the diesel fuel range (i.e. C<sub>11</sub> to C<sub>20</sub>) with some heavy-end hydrocarbons (i.e. C<sub>21</sub> to C<sub>32</sub>) present.

#### *4.3.3. Above Ground Diesel Fuel Storage Tank Areas*

##### *4.3.3.1. Soil Quality*

Nine soil samples recovered from the diesel AST areas were analysed for BTEX, TVH and TEH. Five samples were recovered from Boreholes 98-16, 98-17, 98-19, 99-46, and 99-48, located adjacent to the ASTs situated to the northeast of the Diesel Shop, one sample was recovered from Borehole 98-32, located adjacent to the AST situated west of the MERF building, and three samples were collected from Test Pits 98-1, 99-12 and 99-14, located

adjacent to the AST situated in the west end of the Yard. In addition, the blind duplicate sample (Sample BH98-19-12) for the sample analysed from Borehole 98-19 was analysed for PAHs and polychlorinated biphenyls (PCBs). All of the samples analysed from the above ground diesel storage tank areas, with the exception of the samples from Boreholes 98-32 and 99-48, contained TEH at concentrations greater than the Manitoba Environment (1993) Level III criterion at depths ranging from 0.7 m to 1.5 m below grade. In addition, the sample analysed from Test Pit 99-14 contained xylenes at a concentration greater than the referenced guideline. Sample BH98-19-12 contained several PAHs at concentrations greater than the CCME (1999) Industrial land use guidelines. The concentrations of the remaining parameters in the samples analysed were less than the referenced guidelines/criteria.

#### 4.3.3.2. Groundwater Quality

Groundwater samples collected from Monitoring Wells 98-17 and 98-19, located adjacent to the diesel ASTs situated northeast of the Diesel Shop, were analysed for BTEX, TVH and TEH. In addition, the sample collected from Monitoring Well 98-19 was analysed for PAHs. BTEX, TVH and TEH were not detected at concentrations greater than the laboratory limit of quantitation in the samples analysed. Three PAH components (benzo(a)pyrene, fluoranthene and pyrene) were detected in the sample collected from Monitoring Well 98-19; however, there are no applicable guidelines for these parameters. The remaining PAH components in this sample were not detected at concentrations greater than the laboratory limit of quantitation.

#### 4.3.4. Frog Shop

##### 4.3.4.1. Soil Quality

Five samples recovered from boreholes located southwest of and inside the Frog Shop were analysed for BTEX, TVH and TEH. Samples from Boreholes 98-34 and 99-49, collected from depths of 1.7 m and 1.8 m below grade, respectively, contained TEH at concentrations greater than the referenced Level III criterion. The concentrations of the remaining parameters in the samples analysed were less than the referenced guidelines/criteria.

#### 4.3.4.2. Groundwater Quality

A groundwater sample collected from Monitoring Well 98-34 was analysed for BTEX, TVH and TEH. Concentrations of toluene, ethylbenzene, xylenes, TVH, and TEH were detected; however, there are no applicable guidelines for these parameters.

#### 4.3.5. *Former Tank Car Cleaning Area*

##### 4.3.5.1. Soil Quality

Soil samples recovered from Boreholes 98-22 and 98-24, located east and west of the former tank car cleaning area, respectively, were analysed for BTEX, TVH and TEH. In addition, one sample from Borehole 98-22 was analysed for phenols and PCBs, and the sample recovered from Borehole 98-24 was analysed for PAHs, MOG and metals. The parameter concentrations in all of the samples analysed were less than the referenced guidelines/criteria.

##### 4.3.5.2. Groundwater Quality

Groundwater samples were collected from Monitoring Wells 98-22 and 98-24 and analysed for BTEX, TVH and TEH. The sample collected from Monitoring Well 98-24 was also analysed for PAHs and metals. TEH was detected in the sample collected from Monitoring Well 98-24 at a concentration that appeared to be elevated compared to the concentration detected in the remaining groundwater sample from this area of concern. BTEX and TVH were not detected in the samples collected at concentrations greater than the laboratory limit of quantitation. Sixteen PAH components and nine metals were detected in the sample collected from Monitoring Well 98-24; however, there are no applicable guidelines for these parameters.

#### 4.3.6. *Former Leaking Tank Car Area*

##### 4.3.6.1. Soil Quality

Soil samples recovered from Boreholes 98-25, 98-26 and 98-28, and Test Pit 99-28 were analysed for BTEX, TVH and TEH. Soil samples recovered from Boreholes 99-50, 99-51 and 99-53, and from Test Pit 99-29 were analysed for TEH. In addition, a sample recovered from Borehole 98-25 was analysed for PAHs. VOC analysis was completed on samples recovered from Boreholes 98-25 and 98-26 and from Test Pit 99-28. Metals analyses was conducted on soil samples recovered from Boreholes 98-25, 98-26, 99-50, 99-51, and 99-53, and from Test

Pits 99-28 and 99-29. Phenols analysis was also conducted on a sample recovered from Borehole 98-26. Soil samples recovered from Boreholes 98-25, 98-26, 99-50, 99-51 and from Test Pits 99-28 and 99-29, at depths ranging from 0.4 m to 1.4 m below grade, contained TEH at concentrations greater than the Manitoba Environment (1993) Level III criterion. In addition, the sample recovered from Test Pit 99-28 contained xylenes and TVH at concentrations greater than the CCME (1999) Industrial land use guideline and the referenced Level III criterion, respectively. Arsenic, copper, lead, nickel, and/or zinc concentrations greater than the CCME (1999) Industrial land use guidelines were detected in samples collected from Boreholes 98-25, 98-26 and 99-50, and from Test Pits 99-28 and 99-29, at depths ranging from 0.4 m to 1.4 m below grade. The concentrations of the remaining parameters in the samples analysed were less than the referenced guidelines/criteria.

#### 4.3.6.2. Groundwater Quality

Groundwater samples collected from Monitoring Wells 98-25 and 98-26 were analysed for concentrations of BTEX, TVH, TEH, VOCs, and metals. The sample collected from Monitoring Well 98-25 was also analysed for PAH concentrations. Dissolved BTEX, TVH and TEH were not detected at concentrations greater than the laboratory limit of quantitation in these samples. PAHs in the sample collected from Monitoring Well 98-25 were not detected at concentrations greater than the laboratory limit of quantitation. VOCs were not detected at concentrations greater than the laboratory limit of quantitation in the samples analysed, with the exception of one VOC component (1,2-dichloroethane) in the sample collected from Monitoring Well 98-25. Dissolved manganese was detected in the sample collected from Monitoring Well 98-26 at a concentration that appeared to be elevated compared to a concentration detected in the remaining groundwater sample from this area of concern.

#### 4.3.7. *Soil Stockpiling Area*

##### 4.3.7.1. Soil Quality

Thirteen soil samples, recovered from Borehole 98-31 and Test Pits 98-2, 98-4 through 98-8, 98-11, 99-16, 99-19, 99-20, and 99-21, were analysed for BTEX, TVH and/or TEH. Four of the samples analysed (Samples TP98-2-1, TP98-7-1, TP99-20-3, and TP99-21-2), recovered from depths ranging from 0.4 m to 1.2 m below grade, contained TEH at concentrations greater than

the Manitoba Environment (1993) Level III criterion. The concentrations of the remaining parameters in the samples analysed were less than the referenced guidelines/criteria.

#### 4.3.8. *Component Shop*

##### 4.3.8.1. Soil Quality

Four samples recovered from Boreholes 98-35, 99-61, and 99-63, located near the former vapour degreaser pit in the Component Shop, were analysed for BTEX, TEH and VOCs. One sample, recovered at a depth of 3.8 m below grade from Borehole 98-35, contained two VOC components (trichloroethene and tetrachloroethene) at concentrations greater than the CCME (1999) Industrial land use guideline. The concentrations of the remaining parameters in the samples analysed were less than the referenced guidelines/criteria.

##### 4.3.8.2. Groundwater Quality

Groundwater samples were collected from Monitoring Wells 98-35, 99-60, 99-61, and 99-63 and analysed for BTEX and VOCs. In addition, the sample collected from Monitoring Well 98-35 was analysed for TVH and TEH and the samples collected from Monitoring Wells 98-35, 99-61 and 99-63 were analysed for dissolved metals. BTEX and TEH were not detected at concentrations greater than the laboratory limit of quantitation in the groundwater samples analysed. TVH was detected at a concentration greater than the laboratory limit of quantitation in the sample collected from Monitoring Well 98-35; however, there is no guideline for TVH.

Chloroform, tetrachloroethene (i.e. perchloroethene) and/or trichloroethene were detected in the samples collected from Monitoring Wells 98-35, 99-61 and 99-63 at concentrations that appeared to be elevated compared to concentrations detected in the remaining groundwater samples from the Component Shop. Degradation by-products of these solvents, including 1,1-dichloroethene and/or vinyl chloride, were also detected in the groundwater samples from all of the monitoring wells sampled. Additionally, the chlorinated hydrocarbon 1,1,1-trichloroethane and one of its degradation by-products 1,1-dichloroethane were detected in all of the samples collected from the wells located in the Component Shop. However, there are no applicable guidelines/criteria for these parameters.

Several dissolved metals parameters were detected in the samples analysed; however, there did not appear to be any trends in the concentrations when compared to one another.

#### 4.3.9. *Wheel Shop*

##### 4.3.9.1. Soil Quality

Soil samples recovered from Boreholes 98-33, 99-56, and 99-59, at depths ranging from 1.8 m to 3.8 m, were analysed for BTEX and VOCs. In addition, the samples recovered from Borehole 98-33 were analysed for TVH and TEH. Two samples from Borehole 98-33, at depths of 2.4 m and 3.8 m below grade, respectively, contained tetrachloroethene at concentrations greater than the CCME (1999) Industrial land use guideline. The concentrations of the remaining parameters in the samples analysed were less than the referenced guidelines/criteria.

##### 4.3.9.2. Groundwater Quality

Groundwater samples were collected from Monitoring Wells 98-33, 99-55, 99-56, and 99-59, and analysed for BTEX and VOCs. In addition, the sample collected from Monitoring Well 98-33 was analysed for TVH and TEH, and the samples collected from Monitoring Wells 98-33, 99-56 and 99-59 were analysed for dissolved metals. BTEX and TEH were not detected at concentrations greater than the laboratory limit of quantitation. TVH was detected in the sample collected from Monitoring Well 98-33; however, there is no applicable guideline for this parameter. Tetrachloroethene was detected in the sample collected from Monitoring Well 98-33 at a concentration that was elevated compared to concentrations in the remaining samples analysed for VOCs. The dissolved tetrachloroethene concentration measured in the sample collected from Monitoring Well 98-33 is approximately 90% of the aqueous solubility of tetrachloroethene. This, combined with the high residual tetrachloroethene soil concentration in this borehole, suggests that DNAPL may be present in the vicinity of Monitoring Well 98-33.

Relatively elevated dissolved iron was detected in the groundwater sample recovered from Monitoring Well 99-59 which may be a result of organic compound biodegradation in the vicinity of the well. However, the elevated iron concentration is not considered to be a significant environmental concern.

#### *4.3.10. Diesel Heavy Repair Shop*

##### *4.3.10.1. Soil Quality*

Soil samples recovered from Borehole 98-14 and Test Pits 99-24 through 99-27, located east of the Diesel Heavy Repair Shop, at depths ranging from 0.5 m to 0.8 m, were analysed for BTEX, TVH and TEH. All of the samples analysed contained TEH at concentrations greater than the Manitoba Environment (1993) Level III criterion. The concentrations of the remaining analysed parameters in this sample were less than the referenced guidelines/criteria.

##### *4.3.10.2. Groundwater Quality*

A sample of the groundwater was collected from Monitoring Well 98-14 and analysed for BTEX, TVH and TEH. Benzene, ethylbenzene and xylenes were detected; however, there are no applicable guidelines for these parameters. TVH and TEH were not detected at concentrations exceeding the laboratory limit of quantitation.

#### **4.4. Quality Assurance/Quality Control**

QA/QC procedures were followed by MECI and PASC to ensure the analytical results were accurate and representative. Chain of custody records were maintained to track sample handling between the field and the laboratory. The laboratory QA/QC program included the analysis of laboratory method blanks, trip blanks, sample duplicates, surrogate recovery and chemical spikes. The laboratory method blank analysis is used to detect interferences or impurities introduced by the laboratory equipment, reagents or solvents. The trip blank analysis is used to detect interferences or impurities introduced during storage and submission of the samples to the laboratory. The analysis of selected samples in duplicate is used to evaluate the sample variance of the analytical method. Surrogate recovery is analysed by spiking samples with known quantities of surrogate chemicals which have similar chemical properties to the parameters being analysed and reporting the recovery as an indication of the analytical method accuracy. Chemical spikes are conducted by adding known concentrations of the analyte of interest to a sample to evaluate the effects of the sample matrix on the analytical method.

The results of the laboratory QA/QC program are as follows:

- Analyte concentrations measured in the laboratory method blank samples were within the acceptable limits established by the laboratory QA/QC program;
- Analyte concentrations measured in the trip blank sample were below the laboratory limits of quantitation. The analytical results of the trip blank analysis are presented in Appendix IV;
- Analyte concentrations in the samples analysed in duplicate were within the acceptable limits established by the laboratory QA/QC program; and
- Surrogate recoveries measured in soil and groundwater samples were within the acceptable limits established by the laboratory QA/QC program.

Upon reviewing the chemical spike recoveries, a poor recovery was observed for the spiked method blank conducted for the VOC analysis of soil sample BH98-26-1. The percent recovery for m-xylene and p-xylene was 14% which does not fall within the PASC established limits of 70% to 130%. PASC was issued a Corrective Action Report (CAR), which is a generic account (i.e. no names are to be used) that briefly summarizes the observed problem, identifies the cause of the problem, and presents the measures that have been taken to prevent the recurrence of the problem. CARs formalize the data validation/verification process by requiring a response in writing, and provide a means to identify and track problems as they occur. The CAR submitted and the response by PASC are presented in Appendix XI. After re-issue of the correctly transcribed percent recovery, the value was 104%, which is considered acceptable.

Blind duplicate samples were submitted to PASC by MECI as an external review of PASC's performance. The measurement used for comparison of two different laboratory results of the blind duplicate samples is the relative percent difference ( $RPD_{DUP}$ ), which is defined as the absolute value of the difference between the two samples, divided by the average. Analytical error increases near the minimum limit of quantitation, therefore,  $RPD_{DUP}$  should only be applied where the concentrations are above the practical quantitation limit (defined as five times the limit of quantitation). For the parameters measured in soil, a  $RPD_{DUP}$  value of less than 50% is considered acceptable. For the parameters measured in water, a  $RPD_{DUP}$  value of less than 30% is considered acceptable. The calculated  $RPD_{DUP}$  values for the blind duplicate soil and groundwater samples submitted are presented in Tables 15 through 18. Only the samples for which  $RPD_{DUP}$  values could be calculated are presented in the tables.

Blind duplicate soil samples recovered from Boreholes 98-3, 98-19, 99-36, and 99-58 and from Test Pit 98-1 were submitted for BTEX, TVH and TEH analyses. The calculated  $RPD_{DUP}$  value for the duplicate from Test Pit 98-1 for xylenes was 54%. Although this  $RPD_{DUP}$  value is considered unacceptable, corrective action was not taken as the xylenes concentrations were less than the applicable guideline and the interpretation of the data was not affected. In addition, the calculated  $RPD_{DUP}$  value for the duplicate soil sample from Borehole 99-36 for ethylbenzene, xylenes and TVH were 136%, 116% and 52%, respectively. PASC was issued a CAR. The response by PASC and the associated CAR are presented in Appendix XI. PASC response stated that the variability was due to sample non-homogeneity. The remaining calculated  $RPD_{DUP}$  values for the blind duplicate soil samples analysed ranged from 9% to 40%, which are considered acceptable.

Blind duplicate water samples were collected from Monitoring Wells 98-2, 98-33 through 98-35, 99-59, and 99-63 for BTEX, TVH, TEH, VOC, and/or metals analyses. The calculated  $RPD_{DUP}$  values for xylenes and TEH for the blind duplicate from Monitoring Well 98-34 were 31% and 48%, respectively. Additionally, the calculated  $RPD_{DUP}$  values for tetrachloroethene for the blind duplicate from Monitoring Well 98-35 was 32%. Although the above  $RPD_{DUP}$  values are considered unacceptable, corrective action was not taken as there are no applicable guidelines for these components and, therefore, the variability of the xylenes, TEH and tetrachloroethene concentrations did not influence the interpretation of the results.  $RPD_{DUP}$  values for barium and zinc for the blind duplicate collected from Monitoring Well 99-59 were 44% and 95%, respectively. PASC was issued a CAR. The CAR and the response from PASC are included in Appendix XI. PASC re-analysed the samples and could determine no analytical explanation for the variability. The remaining calculated  $RPD_{DUP}$  values for the blind duplicate groundwater samples analysed ranged from 2% to 29%, which are considered acceptable.

## 5. SUMMARY OF RESULTS

### 5.1. Former Locomotive Fuelling Facility

- Residual xylenes at concentrations greater than the CCME (1999) Industrial land use guidelines were detected in samples recovered from boreholes located in approximately the centre and northern portions of the former locomotive fuelling facility area (Boreholes 98-1, 98-3, 98-4, 99-36, and 99-39).
- Concentrations of TVH and/or TEH in soil greater than the Manitoba Environment (1993) Level III criteria were detected in boreholes located across the former fuelling area (Boreholes 98-1 through 98-4, 98-6, 98-8, 98-9, 99-36 through 99-40, 99-57, 99-58, and 99-68).
- A residual MOG concentration in soil greater than the referenced Level III criterion was detected in Borehole 98-6, located on approximately the eastern edge of the former locomotive fuelling area.
- Based on the laboratory results, hydrocarbon vapour concentrations in soil and field observations, the vertical extent of the residual hydrocarbon impacted soil is approximately 0.5 m to 2.6 m below grade. The lateral extent of the impacted soil is unknown; however, it does not appear to extend to the north beyond Borehole 98-5. Drawing W8140B-025, Appendix I, presents the inferred extent of soil with residual hydrocarbons at concentrations greater than the applicable guidelines/criteria.
- Concentrations of dissolved hydrocarbons were detected in the groundwater samples collected and analysed from this area; however, there are no applicable guidelines for these parameters. Groundwater samples for laboratory analysis were not collected for monitoring wells with a measurable thickness of LPH since it is expected that dissolved hydrocarbons will be present.
- The apparent direction of groundwater flow on 1998 12 02 was towards the northwest to northeast at a gradient of 0.03 m/m and on 1999 08 31 was towards the northeast to west at a gradient of 0.05 m/m. The groundwater seepage velocity was estimated to be 0.04 m/year to 0.06 m/year.

- Maximum apparent LPH thicknesses measured to date in the former locomotive fuelling area were 28 mm, 5 mm and 1 mm in Monitoring Wells 98-4, 98-3 and 99-66, respectively. Drawing W8140B-025, Appendix I, presents the inferred extent of the LPH plume.

## **5.2. Active Locomotive Fuelling Facility**

- Soil samples recovered from boreholes located southeast and north of the active locomotive fuelling facility (Boreholes 98-10, 98-13 and 98-43) contained TVH and/or TEH at concentrations greater than the Manitoba Environment (1993) Level III criteria.
- MOG at concentrations greater than the referenced Level III criterion was detected in soil samples recovered from Boreholes 98-10 and 99-43.
- Based on laboratory results and field observations, the vertical extent of soil with hydrocarbon concentrations greater than the applicable guidelines ranges from approximately 0.6 m to 4.0 m below grade. The lateral extent of the residual hydrocarbon impacted soil has been delineated to the south (Boreholes 98-12 and 99-41) and east (Boreholes 99-42 and 99-44), but not to the north and west and may extend beneath the Diesel Shop to the north. Drawing W8140-026 in Appendix I, shows the approximate inferred extent of soil with residual hydrocarbon impact.
- Dissolved hydrocarbons were not detected at concentrations exceeding the laboratory limits of quantitation in a groundwater sample collected from a well located west of the active fuelling facility (Monitoring Well 98-11). Groundwater samples for laboratory analysis were not collected from monitoring wells with a measurable thickness of LPH since it is expected that dissolved hydrocarbons will be present.
- The apparent direction of groundwater flow on 1998 12 02 beneath the active locomotive fuelling facility was towards the northeast at a gradient of 0.03 m/m, and on 1999 08 31 was towards the east at a gradient of 0.05 m/m.
- Maximum apparent LPH thicknesses measured in the active locomotive fuelling area were 344 mm in Monitoring Well 98-10 on 1999 12 02 and 530 mm in Monitoring Well 98-13 on 1999 08 31.

- LPH samples collected from Monitoring Wells 98-10 and 98-13 were classified as primarily diesel fuel with some heavy-end hydrocarbons present.
- LPH baildown tests on Monitoring Wells 98-10 and 98-13 indicated that after approximately three hours, the LPH in Monitoring Well 98-10 had recovered to 44% of the original bailed thickness and after approximately two hours, the LPH in Monitoring Well 98-13 had recovered to 48% of the original bailed thickness. In addition, the "true" mobile LPH thickness was estimated to be approximately 105 mm in Monitoring Well 98-10 and 60 mm in Monitoring Well 98-13 with estimated LPH transmissivities of  $4.5 \times 10^{-6} \text{ m}^2/\text{s}$  and  $1.4 \times 10^{-6} \text{ m}^2/\text{s}$ , respectively.
- The lateral extent of the LPH identified in this area has been delineated to the west (Monitoring Wells 98-11 and 98-12), the east (Monitoring Wells 99-42 and 99-44) and to the south (Monitoring Well 99-41) but not to the north. The potential exists for the LPH to migrate beneath the Diesel Shop to the north. Drawing W8140B-026, Appendix I, presents the approximate inferred extent of the LPH plume in the active locomotive fuelling area.

### **5.3. Above Ground Diesel Fuel Storage Tank Areas**

- Soil samples recovered from Boreholes 98-16, 98-17, 98-19, and 99-46 (located adjacent to the ASTs to the northeast of the Diesel Shop) and from Test Pits 98-1, 99-12 and 99-14, (located adjacent to the AST in the west end of the Yard), contained TEH concentrations which exceeded the Manitoba Environment (1993) Level III criterion.
- Xylenes were detected in a soil sample collected from Test Pit 99-14 at a concentration greater than the CCME (1999) Industrial land use guideline.
- Several PAHs in a soil sample recovered from Borehole 98-19 were detected at concentrations greater than the CCME (1999) Industrial guidelines.
- Based on the laboratory results, field measurements and visual observations, the vertical extent of hydrocarbon impacted soil in the area of the ASTs located northeast of the Diesel Shop is approximately 0.8 m to 1.5 m below grade. The vertical extent of the impacted soil identified adjacent to the AST in the west end of the Yard is from grade to approximately 2.1 m below grade. The lateral extent of the residual hydrocarbon impacted soil at the ASTs located northeast of the Diesel Shop appears to have been delineated partially to the

south (Boreholes 99-47), partially to the east (Boreholes 98-18 and 99-45) and to the north (Borehole 99-48) but not to the west. The lateral extent of hydrocarbon impacted soil adjacent the AST in the west end of the Yard has been delineated to the west (Test Pits 99-13 and 99-15) but not to the north, east and south. The approximate inferred extent of residual hydrocarbon impacted soil in these areas are shown on Drawings W8140B-027 and W8140B-028 in Appendix I. Dissolved BTEX, TVH and TEH were not detected at concentrations greater than the laboratory limits of quantitation in wells located south and north of the ASTs located northeast of the Diesel Shop (Monitoring Wells 98-17 and 98-19, respectively).

- Three PAH components were detected in the groundwater sample collected from Monitoring Well 98-19; however, there are no applicable guidelines for dissolved PAHs.
- The apparent direction of groundwater flow beneath the above ground diesel fuel storage tanks to the northeast of the Diesel Shop was indeterminate on 1998 12 01/02 and towards the east at a gradient of 0.003 m/m on 1999 08 31.

#### **5.4. Frog Shop**

- TEH in soil samples recovered from boreholes located near the southwest corner of the Frog Shop (Boreholes 98-34 and 99-49) was detected at concentrations greater than the Manitoba Environment (1993) Level III criterion.
- Based on laboratory data and field observations, the vertical extent of soil with hydrocarbon concentrations greater than the referenced guidelines/criteria is approximately 1.5 m to 2.1 m below grade. The lateral extent of hydrocarbon impacted soil in this area has been delineated to the northeast (Borehole 99-65), the southeast (Borehole 99-64) and to the northwest (Borehole 98-20) but not to the southwest. Drawing W8140B-028 shows the approximate inferred extent of residual hydrocarbon impacted soil.
- Dissolved hydrocarbon components were detected in the groundwater sample collected from Monitoring Well 98-34; however, there are no applicable guidelines for these parameters in groundwater.
- The apparent direction of groundwater flow beneath the Frog Shop area was indeterminate on 1998 12 01 and 1999 08 31.

### **5.5. Former Tank Car Cleaning Area**

- Analyte concentrations in the soil samples analysed were less than the applicable guidelines/criteria.
- TEH and sixteen PAH components were detected in the groundwater sample collected from Monitoring Well 98-24; however, there are no applicable guidelines for these parameters.
- The apparent direction of groundwater flow on 1998 12 01 was towards the northwest at a gradient of 0.007 m/m and towards the west at a gradient of 0.03 m/m on 1999 08 31. The seepage velocity at Monitoring Well 98-24 is estimated to be 0.3 m/year.

### **5.6. Former Leaking Tank Car Area**

- Soil samples recovered from boreholes and test pits located south and east of the former leaking tank car area (Boreholes 98-25, 99-50 and 99-51 and Test Pits 99-28 and 99-29, and Borehole 98-26, respectively) contained TEH at concentrations which exceeded the Manitoba Environment (1993) Level III criterion, and/or arsenic, copper, lead, nickel and/or zinc at concentrations which exceeded the CCME (1999) Industrial land use guidelines.
- A soil sample recovered from Test Pit 99-28 contained xylenes at a concentration greater than the CCME (1999) Industrial land use guideline and TVH at a concentration greater than the referenced Level III criterion.
- Based on laboratory results, hydrocarbon vapour concentrations in soil and field observations, the vertical extent of the hydrocarbon impacted soil in this area is approximately 0.4 m to 1.5 m below grade. The lateral extent of the impacted soil has been delineated partially to the north (Boreholes 98-27 and 98-28), to the west (Boreholes 99-52 and 99-54) and partially to the south (Borehole 99-53) but not to the east. The approximate inferred extent of residual hydrocarbon and metals impacted soil is presented on Drawing W8140B-029 in Appendix I.
- A VOC component (1,2-dichloroethane) was detected in a groundwater sample collected from Monitoring Well 98-25; however, there is no applicable guideline for this parameter.
- The apparent direction of groundwater flow was towards the southeast at gradients of 0.009 m/m and 0.01 m/m on 1998 12 01 and 1999 08 31, respectively.

### **5.7. Soil Stockpiling Area**

- Soil samples containing TEH at concentrations greater than the Manitoba Environment (1993) Level III criterion were recovered from Test Pits 98-2, 98-7, 99-20, and 99-21.
- Based on laboratory data and field measurements and observations, the vertical extent of the hydrocarbon impacted soil in this area ranged from approximately grade to 1.5 m below grade. However, due to the heterogeneous fill materials in this area, the depth of impact could vary greatly across the site. The lateral extent of the hydrocarbon impacted soil identified at Test Pit 98-2 has been delineated to the north, south, east and west. The lateral extent of hydrocarbon impacted soil identified at Test Pits 98-7, 99-20 and 99-21 has been delineated partially to the north and east but not to the south and west. Drawing W8140B-030, Appendix I, presents the approximate inferred extent of residual hydrocarbon impacted soil in the soil stockpiling area.
- The apparent direction of groundwater flow was towards the north at gradients of 0.004 m/m and 0.003 m/m on 1998 12 01 and 1999 08 31, respectively.

### **5.8. Component Shop**

- A soil sample recovered from a borehole (Borehole 98-35) located within the Component Shop contained two VOC components (tetrachloroethene and trichloroethene) at concentrations greater than the CCME (1999) Industrial land use guidelines.
- The lateral extent of the VOC impacted soil has been delineated to the north, south, east, and west. The vertical extent of VOC impacted soil has not been determined. The approximate inferred lateral extent of residual VOC impacted soil is presented on Drawing W8140B-031 in Appendix I.
- VOC components (chloroform, tetrachloroethene and/or trichloroethene) were detected in groundwater samples collected from Monitoring Wells 98-35, 99-61 and 99-63 at concentrations that appeared to be elevated compared to concentrations detected in the remaining groundwater samples analysed from the Component Shop. There are currently no groundwater guidelines for these parameters.

- Degradation by-products of tetrachloroethene and trichloroethene, including 1,1-dichloroethene and/or vinyl chloride, were detected in all of the groundwater samples collected and analysed from monitoring well installed in the Component Shop. Currently, there are no guidelines for these degradation by-products.
- The apparent direction of groundwater flow was indeterminate on 1998 12 01 and 1999 09 01.
- DNAPL has not been detected in any of the monitoring wells located in the Component Shop to date.

### **5.9. Wheel Shop**

- Tetrachloroethene at concentrations greater than the applicable CCME (1999) Industrial land use guideline was detected in two soil samples recovered from a borehole located adjacent the north side of the Wheel Shop (Borehole 98-33).
- The lateral extent of the tetrachloroethene identified in the soil has been delineated to the north (Borehole 99-55), to the east (Borehole 99-56) and to the west (Borehole 99-59) but not to the south. The vertical extent of the tetrachloroethene impact in soil has not been determined. The potential exists for VOC impacted soil to be present beneath the Wheel Shop building to the south of Borehole 98-33. The approximate inferred lateral extent of residual VOC impacted soil is presented on Drawing W8140B-031 in Appendix I.
- Tetrachloroethene was detected in the groundwater sample recovered from Monitoring Well 98-33 at a concentration that appeared to be elevated compared to concentrations in the remaining samples analysed. The concentration measured was approximately 90% of the aqueous solubility for tetrachloroethene. This, combined with the elevated residual tetrachloroethene soil concentration, suggests that DNAPL may be present in the vicinity of Monitoring Well 98-33; however, DNAPL has not been detected in any of the monitoring wells located adjacent the Wheel Shop to date.
- The apparent direction of groundwater flow on 1998 12 01 was indeterminate and towards the southwest at a gradient of 0.02 m/m on 1999 09 01.

### **5.10. Diesel Heavy Repair Shop**

- Soil samples recovered from test pits and a borehole located east of the Diesel Heavy Repair Shop (Test Pits 99-24 through 99-27 and Borehole 98-14) contained TEH at concentrations which exceeded the Manitoba Environment (1993) Level III criterion.
- Concentrations of dissolved BTEX were detected in the groundwater sample collected from Monitoring Well 98-14; however, there are no applicable guidelines for these parameters.
- Based on laboratory results and field observation, the vertical extent of hydrocarbon impacted soil to the east of the Diesel Heavy Repair Shop is from grade to approximately 1.1 m below grade. The lateral extent of hydrocarbon impacted soil in this area is unknown.
- The apparent direction of groundwater flow on 1998 12 02 and 1999 08 31 was indeterminate.

### **5.11. Quality Assurance/Quality Control**

- Five blind duplicate soil samples (Boreholes 98-3, 98-19, 99-36, and 99-58 and Test Pit 98-1) were submitted for laboratory analysis of BTEX, TVH and TEH. Variability of the xylenes concentration was noted for the soil sample from Test Pit 98-1; however, corrective action was not taken as the concentrations of xylenes were less than the applicable guideline. In addition, variability of the ethylbenzene, xylenes and TVH was noted for the soil sample from Borehole 99-36. A corrective action report was issued to PASC and their response stated that the poor results were due to sample non-homogeneity.
- Six blind duplicate water samples (Monitoring Well 98-2, 98-33 through 98-35, 99-59, and 99-63) were submitted for laboratory analysis of BTEX, TVH, TEH, and/or VOCs. Variability was noted for the concentrations of xylenes and TEH in the sample from Monitoring Well 98-34, and tetrachloroethene in the sample collected from Monitoring Well 98-35. Corrective action was not taken as there are no applicable guidelines for these parameters and therefore, the variability did not influence the interpretation of the results. In addition, variability was noted for the barium and zinc concentrations in the sample collected from Monitoring Well 99-59. A corrective action report was issued to PASC and their response stated that they could determine no analytical explanation for the poor results.

## 6. CONCLUSIONS

Based on the results of this Phase II ESA, the following conclusions are made regarding the CPR Winnipeg Diesel Shops and Weston Shops in Winnipeg, MB.

- Stratigraphy across the site generally consisted of clay, silt, sand, gravel and/or ballast fill material which ranged in depth from 0.3 m to 4.0 m below grade and was underlain by clay which was underlain by silt. The clay ranged in thickness from 0.2 m to 1.0 m and the silt varied in depth from 0.8 m to 4.3 m below grade. Beneath the silt, clay extended to the maximum depth of investigation (6.1 m below grade).
- Depths to groundwater ranged from 0.6 m to 5.9 m below grade on 1998 12 01/02 and from 0.4 m to 2.6 m below grade on 1999 08 31/09 01. The apparent direction of groundwater flow varied across the site and is likely influenced by local underground structures and buried utilities.
- Residual hydrocarbon concentrations in soil exceeding the CCME (1999) guidelines and/or the Manitoba Environment (1993) Level III criteria were identified beneath the former locomotive fuelling area, the active locomotive fuelling area, the above ground diesel fuel storage tank areas, the Frog Shop, the former leaking tank car area, the soil stockpiling area, and the Diesel Heavy Repair Shop.
- Metals in soil were identified at concentrations exceeding the applicable guidelines beneath the former leaking tank car area.
- VOCs (i.e. trichloroethene and/or tetrachloroethene) in soil at concentrations exceeding the referenced guidelines were identified beneath the Component Shop and adjacent to the Wheel Shop.
- Elevated dissolved hydrocarbons and/or metals concentrations were detected in groundwater samples collected from monitoring wells located in the former locomotive fuelling area, the former tank car cleaning area, and the former leaking tank car area.
- Elevated dissolved VOC components (chloroform, tetrachloroethene and/or trichloroethene) were detected in groundwater samples collected from monitoring wells located beneath the Component Shop and adjacent to the Wheel Shop.

- LPH has been detected in three monitoring wells in the former locomotive fuelling facility and two monitoring wells located in the active locomotive fuelling facility. Measured thicknesses have ranged from 1 mm to 530 mm.
- DNAPL has not been detected in any of the wells monitored to date. However, based on the elevated tetrachloroethene concentrations in soil and groundwater samples collected from a borehole/monitoring well located adjacent to the Wheel Shop, the potential exists for DNAPL to be present in the vicinity of this borehole/monitoring well.
- Based on the analytical results and monitoring data, the potential exists for residual hydrocarbons and/or LPH to be present beneath the Diesel Shop, located to the north of the active locomotive fuelling facility.

## 7. CLOSURE

This report has been prepared by Morrow Environmental Consultants Inc. (MECI) for the exclusive use of Canadian Pacific Railway, who has been party to the development of the scope of work for this project and understands its limitations.

This report is intended to provide information to Canadian Pacific Railway to assist it in making business decisions. MECI is not a party to the various considerations underlying the business decisions, and does not make recommendations regarding such business decisions. In providing this report, MECI accepts no liability or responsibility in respect of the site described in this report or for any business decisions relating to the site, including decisions in respect of the purchase, sale or investment in the site.

Any use, reliance on, or decision made by a third party based on this report is the sole responsibility of such third party. MECI accepts no liability or responsibility for any damages that may be suffered or incurred by any third party as a result of the use of, reliance on, or any decision made based on this report.

The findings, conclusions and recommendations in this report have been developed in a manner consistent with the level of skill normally exercised by environmental professionals currently practising under similar conditions in the area. The findings contained in this report are based, in part, upon information provided by others. If any of the information is inaccurate, modifications to the findings, conclusions and recommendations may be necessary.

The findings, conclusions and recommendations presented by MECI in this report reflect MECI's best judgement based on the site conditions at the time of the site inspection on the date(s) set out in this report and on information available at the time of preparation of this report. They have been prepared for specific application to this site and are based, in part, upon visual observation of the site, subsurface investigation at discrete locations and depths, and specific analysis of specific materials as described in this report during a specific time interval. The findings cannot be extended to previous or future site conditions or to portions of the site which were unavailable for direct observation, subsurface locations which were not investigated directly, or materials or analysis which were not specified. Substances other than those described may exist within the site, reported substance parameters may exist in areas of

the site not investigated, and concentrations of substances greater than those reported may exist between sample locations.

If site conditions change or if any additional information becomes available at a future date, modifications to the findings, conclusions and recommendations may be necessary.

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**TABLE 1: Summary of Environmental Concerns and Exceedances**

| Specific Location <sup>1</sup>              | Activity of Potential Environmental Concern <sup>1</sup>                       | Samples Analysed                                                       |                      | Exceedances <sup>2,3</sup>                                                                                                                                                                             |                                                                                                                |
|---------------------------------------------|--------------------------------------------------------------------------------|------------------------------------------------------------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
|                                             |                                                                                | Soil                                                                   | Groundwater          | Soil                                                                                                                                                                                                   | Groundwater <sup>4</sup>                                                                                       |
| Former Locomotive Fuelling Facility         | fuelling of locomotives (diesel fuel)                                          | BHs 98-1 through 98-9, 99-36 through 99-40, 99-57, 99-58, 99-68        | MWs 98-2, 98-4, 98-8 | X - BHs 98-1, 98-3, 98-4, 99-36, 99-39<br><br>TVH - BHs 98-2, 98-3, 98-4, 99-36, 99-39<br><br>TEH - BHs 98-1 through 98-4, 98-6, 98-8, 98-9, 99-36 through 99-40, 99-57, 99-58, 99-68<br>MOG - BH 98-6 | LPH measured in MWs 98-3, 98-4, 99-66<br><br>Elevated dissolved toluene, TVH and TEH concentrations in MW 98-2 |
| Active Locomotive Fuelling Facility         | fuelling of locomotives (diesel fuel)                                          | BHs 98-10, 99-12, 98-13, 99-42 through 99-44                           | MW 98-11             | TVH - BHs 98-10, 98-13<br><br>TEH - BHs 98-10, 98-13, 99-43<br>MOG - BH 98-10, 99-43                                                                                                                   | LPH measured in MWs 98-10, 98-13                                                                               |
| Above Ground Diesel Fuel Storage Tank Areas | storage and transfer of diesel fuel (diesel fuel)                              | BHs 98-16, 98-17, 98-19, 98-32, 98-46, 98-48<br>TPs 98-1, 99-12, 99-14 | MWs 98-17, 98-19     | X - TP 99-14<br><br>TEH - BHs 98-16, 98-17, 98-19, 99-46, TP 98-1, 99-12, 99-14<br>PAHs - BH 98-19                                                                                                     |                                                                                                                |
| Frog Shop                                   | storage of heating oil (heating oil)                                           | BHs 98-20, 98-34, 99-49, 99-64, 99-65                                  | MW 98-34             | TEH - BH 98-34, 99-49                                                                                                                                                                                  |                                                                                                                |
| Former Tank Car Cleaning Area               | cleaning of tank cars and barrels (diesel fuel, grease, oil, metals, solvents) | BHs 98-22, 98-24                                                       | MWs 98-22, 98-24     | none                                                                                                                                                                                                   | Elevated dissolved TEH concentrations in MW 98-24                                                              |

TVH - total volatile hydrocarbons

TEH - total extractable hydrocarbons

MOG - mineral oil and grease

LPH - liquid phase hydrocarbons

PAHs - polycyclic aromatic hydrocarbons

BH - Borehole

MW - Monitoring Well

T - toluene

X - xylenes

As - arsenic

Cu - copper

Pb - lead

Zn - zinc

<sup>1</sup> - CP Rail, Phase I - Site Assessment, Western Yard, Winnipeg, Manitoba, December 1991

<sup>2</sup> - Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment (CCME), 1999

<sup>3</sup> - A Guideline for the Environmental Investigation and Remediation of Petroleum Storage Sites in Manitoba, Manitoba Environment, July 1993

<sup>4</sup> - There are no applicable groundwater guidelines/criteria for the Winnipeg Diesel Shops and Weston Shops

**TABLE 1: Summary of Environmental Concerns and Exceedances**

| Specific Location <sup>1</sup> | Activity of Potential Environmental Concern <sup>1</sup>                                                | Samples Analysed                                                           |                                | Exceedances <sup>2,3</sup>                                                                                                                                                                                                                               |                                                                                                            |
|--------------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
|                                |                                                                                                         | Soil                                                                       | Groundwater                    | Soil                                                                                                                                                                                                                                                     | Groundwater <sup>4</sup>                                                                                   |
| Former Leaking Tank Car Area   | storage of leaking tank cars (diesel fuel, grease, oil, metals, solvents)                               | BHs 98-25, 98-26, 99-50, 99-51, 99-53<br>TPs 99-28, 99-29                  | MWs 98-25, 98-26               | X - TP 99-28<br>TVH - TP 99-28<br><br>TEH - BHs 98-25, 98-26, 99-50, 99-51, TPs 99-28, 99-29<br>As - TP 99-29<br>Cu - BHs 98-25, 98-26, 99-50, TP 99-29<br>Ni - BH 99-50, TP 99-29<br>Pb - BHs 98-25, 98-50, TPs 99-28, 99-29<br>Zn - BH 99-50, TP 99-29 | Elevated dissolved manganese concentrations in MW 98-26                                                    |
| Soil Stockpiling Area          | dumping of fill material excavated from various locations on the Weston Yard (diesel fuel, grease, oil) | BH 98-31<br>TPs 98-2, 98-4 through 98-8, 98-11, 99-16, 99-19, 99-20, 99-21 |                                | TEH - TPs 98-2, 98-7, 99-20, 99-21                                                                                                                                                                                                                       |                                                                                                            |
| Component Shop                 | former vapour degreaser (solvents)                                                                      | BHs 98-35, 99-61, 99-63                                                    | MWs 98-35, 99-60, 99-61, 99-63 | tetrachloroethene - BH 98-35<br>trichloroethene - BH 98-35                                                                                                                                                                                               | Elevated chloroform, tetrachloroethene and/or trichloroethene concentrations in MWs 98-35, 99-61 and 99-63 |
| Wheel Shop                     | vapour degreaser (solvents)                                                                             | BHs 98-33, 99-56, 99-59                                                    | MWs 98-33, 99-55, 99-56, 99-59 | tetrachloroethene - BH 98-33                                                                                                                                                                                                                             | Elevated tetrachloroethene concentrations in MW 98-33                                                      |
| Diesel Heavy Repair Shop       | load test area for repaired locomotives (diesel fuel, grease, oil)                                      | BH 99-14<br>TPs 99-25 through 99-27                                        | MW 98-14                       | TEH - BH 98-14, TPs 99-24 through 99-27                                                                                                                                                                                                                  |                                                                                                            |

TVH - total volatile hydrocarbons

TEH - total extractable hydrocarbons

MOG - mineral oil and grease

LPH - liquid phase hydrocarbons

PAHs - polycyclic aromatic hydrocarbons

BH - Borehole

MW - Monitoring Well

T - toluene

X - xylenes

As - arsenic

Cu - copper

Pb - lead

Zn - zinc

<sup>1</sup> - CP Rail, Phase I - Site Assessment, Western Yard, Winnipeg, Manitoba, December 1991

<sup>2</sup> - Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment (CCME), 1999

<sup>3</sup> - A Guideline for the Environmental Investigation and Remediation of Petroleum Storage Sites in Manitoba, Manitoba Environment, July 1993

<sup>4</sup> - There are no applicable groundwater guidelines/criteria for the Winnipeg Diesel Shops and Weston Shops

**TABLE 2: Phase II Investigation and Analytical Program**

| Area of Concern                     | No. of BHs | No. of TPs | Soil Analyses |     |     |     |     |        |     |         |            | Groundwater Analyses |     |     |     |        | LPH Characterization |
|-------------------------------------|------------|------------|---------------|-----|-----|-----|-----|--------|-----|---------|------------|----------------------|-----|-----|-----|--------|----------------------|
|                                     |            |            | BTEX/TVH      | TEH | MOG | PAH | VOC | Metals | PCB | Phenols | Grain Size | BTEX/TVH             | TEH | PAH | VOC | Metals |                      |
| Former Locomotive Fuelling Facility | 19         | 0          | 18            | 18  | 6   | 1   |     |        |     |         | 1          | 3                    | 3   | 1   |     |        | 4                    |
| Active Locomotive Fuelling Facility | 8          | 0          | 6             | 6   | 2   |     |     |        |     |         | 1          | 1                    | 1   |     |     |        |                      |
| Above Ground Diesel Tanks           | 10         | 5          | 8             | 9   |     | 2   |     |        | 1   |         |            | 2                    | 2   | 1   |     |        |                      |
| Frog Shop                           | 5          | 0          | 3             | 5   |     |     |     |        |     |         |            | 1                    | 1   |     |     |        |                      |
| Former Tank Car Cleaning Area       | 4          | 0          | 3             | 3   | 1   | 1   |     | 1      | 1   | 1       | 1          | 2                    | 2   | 2   |     | 1      | 2                    |
| Former Leaking Tank Car Area        | 9          | 2          | 1             | 8   |     | 1   | 3   | 7      | 1   | 1       |            |                      |     |     | 2   | 2      |                      |
| Soil Stockpiling Area               | 3          | 18         | 11            | 13  |     |     |     |        |     |         |            |                      |     |     |     |        |                      |
| Component Shop                      | 5          | 0          |               | 2   |     |     | 4   |        |     |         | 1          |                      |     |     | 4   | 3      |                      |
| Wheel Shop                          | 4          | 0          |               | 2   |     |     | 4   |        |     |         | 3          |                      |     |     | 4   | 3      | 4                    |
| Diesel Heavy Repair Shop            | 1          | 4          | 5             | 5   |     |     |     |        |     |         |            | 1                    | 1   |     |     |        |                      |
| Subtotal                            | 68         | 29         | 55            | 71  | 9   | 5   | 11  | 8      | 3   | 2       | 7          | 10                   | 10  | 4   | 10  | 9      |                      |
| QA/QC                               | -          | -          | 5             | 5   | 0   | 0   | 0   | 0      | 0   | 0       | 0          | 2                    | 2   |     | 3   | 1      | 0                    |
| TOTAL <sup>1</sup>                  | 68         | 29         | 60            | 76  | 9   | 5   | 11  | 8      | 3   | 2       | 7          | 12                   | 12  | 4   | 13  | 10     | 4                    |
| TOTAL PROPOSED <sup>2</sup>         | 85         | 36         | 83            | 92  | 9   | 6   | 15  | 8      | 0   | 0       | 9          | 19                   | 19  | 4   | 17  | 8      | 2                    |

<sup>1</sup> - Based on discussions with CP Rail, the proposed analytical program and number of boreholes and test pits was revised subsequent to issuance of MECI's proposals.

<sup>2</sup> - MECI proposals dated 1998 10 16 and 1999 02 12

BHs - boreholes

TPs - test pits

BTEX - benzene, toluene, ethylbenzene, xylenes

TVH - total volatile hydrocarbons

TEH - total extractable hydrocarbons

QA/QC - quality assurance/quality control

MOG - mineral oil and grease

PAH - polycyclic aromatic hydrocarbons

VOC - volatile organic hydrocarbons

PCB - polychlorinated biphenyls

LPH - liquid phase hydrocarbons

**TABLE 3: Summary of Analytical Results for Hydrocarbons in Soil - Drilling Investigation**

| TABLE 3. Summary of Analytical Data |                                                             |                 |                 |                     |                 |                 |                      |                 |                 | Environmental Quality Guidelines <sup>1</sup> |                     |
|-------------------------------------|-------------------------------------------------------------|-----------------|-----------------|---------------------|-----------------|-----------------|----------------------|-----------------|-----------------|-----------------------------------------------|---------------------|
| Area of Concern:                    | Former Locomotive Fuelling Facility<br>(Drawing W8140B-003) |                 |                 |                     |                 |                 |                      |                 |                 |                                               |                     |
| Borehole No.:                       | 98-1                                                        | 98-2            | 98-3            | 98-3                | 98-4            | 98-5            | 98-6                 | 98-7            | 98-8            |                                               |                     |
| Sample No.:                         | BH98-1-3-981109                                             | BH98-2-9-981109 | BH98-3-3-981109 | BH98-3-9-981109     | BH98-4-3-981109 | BH98-5-9-981109 | BH98-6-1-981110      | BH98-7-3-981110 | BH98-8-3-981110 |                                               |                     |
| Depth (m):                          | 2.3                                                         | 1.8             | 2.4             | 2.4                 | 2.4             | 1.9             | 0.6                  | 1.9             | 1.8             |                                               |                     |
| Soil Vapour Concentration (ppm):    | 1,210                                                       | 1,100           | 990             | duplicate of 98-3-3 | 1,210           | 660             | 500                  | 660             | 550             |                                               |                     |
| Visual Soil Classification:         | silt                                                        | silt            | silt            | silt                | silt            | silt            | sand and gravel fill | silt            | silt            |                                               |                     |
| Parameter                           |                                                             |                 |                 |                     |                 |                 |                      |                 |                 | Limit of Quantitation                         | Industrial Land Use |
| Benzene                             | 0.14                                                        | 0.84            | 0.24            | 0.16                | 0.16            | <0.02           | <0.02                | <0.02           | <0.02           | 0.02                                          | 39 <sup>6</sup>     |
| Toluene                             | 0.06                                                        | 5.44            | 0.47            | 0.43                | <0.02           | 0.17            | 0.02                 | 0.03            | 0.04            | 0.02                                          | 14 <sup>6</sup>     |
| Ethylbenzene                        | 4.36                                                        | 13.6            | 6.60            | 5.79                | 4.63            | 1.06            | 0.11                 | 0.56            | 0.70            | 0.02                                          | 20                  |
| Xylene(s)                           | 20.8                                                        | 11.8            | 35.8            | 24.8                | 40.0            | 2.69            | 0.61                 | 1.43            | 1.60            | 0.04                                          | 20                  |
| TVH <sup>2</sup>                    | 537                                                         | 4,500           | 857             | 784                 | 953             | 241             | 40                   | 144             | 96              | 10                                            | 800 <sup>7</sup>    |
| TEH <sup>3</sup>                    | 4,540                                                       | 52,600          | 7,830           | 6,010               | 9,250           | 1,410           | 3,560                | 1,290           | 3,200           | 10                                            | 2,000 <sup>7</sup>  |
| Mineral Oil & Grease                | 2,540                                                       | NA              | 1,960           | NA                  | NA              | NA              | 6,650                | NA              | NA              | 100                                           | 5,000 <sup>7</sup>  |
| PCBs                                | NA                                                          | NA              | NA              | NA                  | NA              | NA              | NA                   | NA              | NA              | 0.05                                          | 33                  |

Results expressed in milligrams per dry kilogram (mg/kg)

TVH - total volatile hydrocarbons      PCBs - polychlorinated biphenyls      NA - not analysed

TEH - total extractable hydrocarbons      TR - trace level less than detection limit

<sup>1</sup> - Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment (CCME), 1999

<sup>2</sup> - C<sub>5</sub> to C<sub>10</sub>

<sup>3</sup> - C<sub>11</sub> to C<sub>32</sub>

<sup>4</sup> - limit of quantitation lower due to BTEX components analysed as part of volatile organic compound analyses

<sup>5</sup> - limit of quantitation raised due to sample dilution

<sup>6</sup> - Provisional Soil Quality Guideline for Environmental Health (SQGE), CCME, 1999

<sup>7</sup> - A Guideline for the Environmental Investigation and Remediation of Petroleum Storage Sites in Manitoba, Manitoba Environment, July 1993

**BOLD** - value exceeds referenced guideline/criterion  
MORROW ENVIRONMENTAL CONSULTANTS INC.

**TABLE 3: Summary of Analytical Results for Hydrocarbons in Soil - Drilling Investigation**

| Area of Concern:                    | Former Locomotive Fuelling Facility<br>(Drawing W8140B-003) |                      |                         |                      |                      |                      |                      |                      | Environmental<br>Quality<br>Guidelines <sup>1</sup> |                        |
|-------------------------------------|-------------------------------------------------------------|----------------------|-------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|-----------------------------------------------------|------------------------|
| Borehole No.:                       | 98-9                                                        | 99-36                | 99-36                   | 99-37                | 99-38                | 99-39                | 99-40                | 99-57                |                                                     |                        |
| Sample No.:                         | BH98-9-3-<br>981110                                         | BH99-36-3-<br>990713 | BH99-36-8-<br>990713    | BH99-37-3-<br>990713 | BH99-38-3-<br>990713 | BH99-39-3-<br>990713 | BH99-40-3-<br>990713 | BH99-57-2-<br>990720 |                                                     |                        |
| Depth (m):                          | 2.1                                                         | 2.1                  | 2.1                     | 2.0                  | 1.7                  | 2.1                  | 2.3                  | 1.4                  |                                                     |                        |
| Soil Vapour<br>Concentration (ppm): | 375                                                         | 1,000                | duplicate of<br>99-36-3 | 800                  | 460                  | 980                  | 2,100                | 490                  |                                                     |                        |
| Visual Soil<br>Classification:      | silt                                                        | silt                 | silt                    | silt                 | silt                 | silt                 | silt                 | clay & silt fill     |                                                     |                        |
| Parameter                           |                                                             |                      |                         |                      |                      |                      |                      |                      | Limit of<br>Quantitation                            | Industrial<br>Land Use |
| Benzene                             | <0.02                                                       | <0.02                | <0.02                   | <0.02                | <0.02                | 0.14                 | <0.02                | <0.02                | 0.02                                                | 39 <sup>6</sup>        |
| Toluene                             | 0.04                                                        | 0.84                 | 0.74                    | 0.38                 | 0.23                 | 1.03                 | <0.02                | <0.02                | 0.02                                                | 14 <sup>6</sup>        |
| Ethylbenzene                        | 0.65                                                        | 6.51                 | 1.24                    | 3.25                 | 1.39                 | 6.93                 | 0.27                 | 2.64                 | 0.02                                                | 20                     |
| Xylene(s)                           | 0.73                                                        | <b>30.7</b>          | 8.20                    | 3.97                 | 1.07                 | <b>33.4</b>          | 0.32                 | 12.0                 | 0.04                                                | 20                     |
| TVH <sup>2</sup>                    | 83                                                          | <b>1,090</b>         | 638                     | 451                  | 150                  | <b>1,210</b>         | 20                   | 275                  | 10                                                  | 800 <sup>7</sup>       |
| TEH <sup>3</sup>                    | <b>2,980</b>                                                | <b>6,160</b>         | <b>4,240</b>            | <b>5,680</b>         | <b>2,130</b>         | <b>6,610</b>         | <b>2,010</b>         | <b>23,200</b>        | 10                                                  | 2,000 <sup>7</sup>     |
| Mineral Oil & Grease                | NA                                                          | NA                   | NA                      | NA                   | 437                  | NA                   | 146                  | NA                   | 100                                                 | 5,000 <sup>7</sup>     |
| PCBs                                | NA                                                          | NA                   | NA                      | NA                   | NA                   | NA                   | NA                   | NA                   | 0.05                                                | 33                     |

Results expressed in milligrams per dry kilogram (mg/kg)

TVH - total volatile hydrocarbons

PCBs - polychlorinated biphenyls

NA - not analysed

TEH - total extractable hydrocarbons

TR - trace level less than detection limit

<sup>1</sup> - *Canadian Environmental Quality Guidelines*, Canadian Council of Ministers of the Environment (CCME), 1999<sup>2</sup> - C<sub>5</sub> to C<sub>10</sub><sup>3</sup> - C<sub>11</sub> to C<sub>32</sub><sup>4</sup> - limit of quantitation lower due to BTEX components analysed as part of volatile organic compound analyses<sup>5</sup> - limit of quantitation raised due to sample dilution<sup>6</sup> - Provisional Soil Quality Guideline for Environmental Health (SQGE), CCME, 1999<sup>7</sup> - *A Guideline for the Environmental Investigation and Remediation of Petroleum Storage Sites in Manitoba*, Manitoba Environment, July 1993**BOLD** - value exceeds referenced guideline/criterion

MORROW ENVIRONMENTAL CONSULTANTS INC.

**TABLE 3: Summary of Analytical Results for Hydrocarbons in Soil - Drilling Investigation**

| Area of Concern:                    | Former Locomotive Fuelling Facility<br>(Drawing W8140B-003) |                          |                      |                      | Active Locomotive Fuelling Facility<br>(Drawing W8140B-004) |                         |                         | Environmental<br>Quality<br>Guidelines <sup>1</sup> |                        |
|-------------------------------------|-------------------------------------------------------------|--------------------------|----------------------|----------------------|-------------------------------------------------------------|-------------------------|-------------------------|-----------------------------------------------------|------------------------|
| Borehole No.:                       | 99-58                                                       | 99-58                    | 99-68                | 99-68                | 98-10                                                       | 98-12                   | 98-13                   |                                                     |                        |
| Sample No.:                         | BH99-58-3-<br>990720                                        | BH99-58-8-<br>990720     | BH99-68-1-<br>991029 | BH99-68-3-<br>991029 | BH98-10-3-<br>981110                                        | BH98-12-1-<br>981110    | BH98-13-4-<br>981112    |                                                     |                        |
| Depth (m):                          | 1.8                                                         | 1.8                      | 0.6                  | 1.8                  | 2.1                                                         | 0.6                     | 2.9                     |                                                     |                        |
| Soil Vapour<br>Concentration (ppm): | 800                                                         | duplicate of 99-<br>58-3 |                      | 875                  | 645                                                         | 770                     | 290                     | 660                                                 |                        |
| Visual Soil<br>Classification:      | silt                                                        |                          | sand fill            | clay                 | sand and<br>gravel fill                                     | sand and<br>gravel fill | sand and<br>gravel fill |                                                     |                        |
| Parameter                           |                                                             |                          |                      |                      |                                                             |                         |                         | Limit of<br>Quantitation                            | Industrial<br>Land Use |
| Benzene                             | <0.02                                                       | <0.02                    | 0.12                 | <0.02                | <0.02                                                       | <0.02                   | <0.02                   | 0.02                                                | 39 <sup>6</sup>        |
| Toluene                             | <0.02                                                       | <0.02                    | 0.37                 | 0.14                 | 0.26                                                        | 0.03                    | <0.02                   | 0.02                                                | 14 <sup>6</sup>        |
| Ethylbenzene                        | 1.86                                                        | 2.28                     | 3.23                 | 0.76                 | 2.66                                                        | 0.05                    | 9.88                    | 0.02                                                | 20                     |
| Xylene(s)                           | 8.11                                                        | 10.9                     | 11.3                 | 0.55                 | 17.3                                                        | 0.29                    | 17.4                    | 0.04                                                | 20                     |
| TVH <sup>2</sup>                    | 253                                                         | 332                      | 399                  | 179                  | 933                                                         | <10                     | 1,310                   | 10                                                  | 800 <sup>7</sup>       |
| TEH <sup>3</sup>                    | 6,040                                                       | 7,550                    | 19,900               | 5,830                | 11,800                                                      | 1,700                   | 21,100                  | 10                                                  | 2,000 <sup>7</sup>     |
| Mineral Oil & Grease                | 2,310                                                       | NA                       | NA                   | NA                   | 7,650                                                       | NA                      | NA                      | 100                                                 | 5,000 <sup>7</sup>     |
| PCBs                                | NA                                                          | NA                       | NA                   | NA                   | NA                                                          | NA                      | NA                      | 0.05                                                | 33                     |

Results expressed in milligrams per dry kilogram (mg/kg)

TVH - total volatile hydrocarbons

PCBs - polychlorinated biphenyls

NA - not analysed

TEH - total extractable hydrocarbons

TR - trace level less than detection limit

<sup>1</sup> - Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment (CCME), 1999

<sup>2</sup> - C<sub>5</sub> to C<sub>10</sub>

<sup>3</sup> - C<sub>11</sub> to C<sub>32</sub>

<sup>4</sup> - limit of quantitation lower due to BTEX components analysed as part of volatile organic compound analyses

<sup>5</sup> - limit of quantitation raised due to sample dilution

<sup>6</sup> - Provisional Soil Quality Guideline for Environmental Health (SQGE), CCME, 1999

<sup>7</sup> - A Guideline for the Environmental Investigation and Remediation of Petroleum Storage Sites in Manitoba, Manitoba Environment, July 1993

**BOLD** - value exceeds referenced guideline/criterion

MORROW ENVIRONMENTAL CONSULTANTS INC.

**TABLE 3: Summary of Analytical Results for Hydrocarbons in Soil - Drilling Investigation**

| Area of Concern:                    | Active Locomotive Fuelling Facility<br>(Drawing W8140B-004) |                      |                      | Above Ground Diesel Fuel<br>Storage Tanks<br>(Drawing W8148-005) |                      |                      |                         |                      | Environmental<br>Quality<br>Guidelines <sup>1</sup> |                        |
|-------------------------------------|-------------------------------------------------------------|----------------------|----------------------|------------------------------------------------------------------|----------------------|----------------------|-------------------------|----------------------|-----------------------------------------------------|------------------------|
| Borehole No.:                       | 99-42                                                       | 99-43                | 99-44                | 98-16                                                            | 98-17                | 98-19                | 98-19                   | 98-32                |                                                     |                        |
| Sample No.:                         | BH99-42-4-<br>990713                                        | BH99-43-2-<br>990714 | BH99-44-4-<br>990714 | BH98-16-2-<br>981112                                             | BH98-17-2-<br>981112 | BH98-19-8-<br>981112 | BW98-19-<br>981112      | BH98-32-1-<br>981116 |                                                     |                        |
| Depth (m):                          | 2.3                                                         | 1.4                  | 2.3                  | 1.4                                                              | 1.4                  | 1.1                  | 1.1                     | 0.6                  |                                                     |                        |
| Soil Vapour<br>Concentration (ppm): | 100                                                         | 780                  | 430                  | 170                                                              | 660                  | 230                  | duplicate<br>of 98-19-8 | 145                  |                                                     |                        |
| Visual Soil<br>Classification:      | clay                                                        | sand fill            | clay                 | sand and<br>gravel fill                                          | sand fill            | sand fill            | sand fill               | sand fill            |                                                     |                        |
| Parameter                           |                                                             |                      |                      |                                                                  |                      |                      |                         |                      | Limit of<br>Quantitation                            | Industrial<br>Land Use |
| Benzene                             | <0.02                                                       | <0.02                | <0.02                | <0.02                                                            | <0.02                | 0.03                 | 0.04                    | <0.02                | 0.02                                                | 39 <sup>6</sup>        |
| Toluene                             | <0.02                                                       | 0.14                 | <0.02                | 0.02                                                             | 0.07                 | 0.06                 | 0.08                    | <0.02                | 0.02                                                | 14 <sup>6</sup>        |
| Ethylbenzene                        | <0.02                                                       | 0.98                 | 0.15                 | <0.02                                                            | 1.76                 | 0.06                 | 0.14                    | <0.02                | 0.02                                                | 20                     |
| Xylene(s)                           | 0.18                                                        | 6.50                 | 0.62                 | <0.04                                                            | 9.49                 | 0.20                 | 0.27                    | <0.04                | 0.04                                                | 20                     |
| TVH <sup>2</sup>                    | <10                                                         | 446                  | 94                   | <10                                                              | 610                  | <10                  | <10                     | <10                  | 10                                                  | 800 <sup>7</sup>       |
| TEH <sup>3</sup>                    | 1,490                                                       | 6,720                | 1,300                | 2,670                                                            | 9,770                | 26,600               | 36,100                  | 234                  | 10                                                  | 2,000 <sup>7</sup>     |
| Mineral Oil & Grease                | NA                                                          | 5,010                | NA                   | NA                                                               | NA                   | NA                   | NA                      | NA                   | 100                                                 | 5,000 <sup>7</sup>     |
| PCBs                                | NA                                                          | NA                   | NA                   | NA                                                               | NA                   | NA                   | <0.05                   | NA                   | 0.05                                                | 33                     |

Results expressed in milligrams per dry kilogram (mg/kg)

TVH - total volatile hydrocarbons

PCBs - polychlorinated biphenyls

NA - not analysed

TEH - total extractable hydrocarbons

TR - trace level less than detection limit

<sup>1</sup> - Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment (CCME), 1999<sup>2</sup> - C<sub>5</sub> to C<sub>10</sub><sup>3</sup> - C<sub>11</sub> to C<sub>32</sub><sup>4</sup> - limit of quantitation lower due to BTEX components analysed as part of volatile organic compound analyses<sup>5</sup> - limit of quantitation raised due to sample dilution<sup>6</sup> - Provisional Soil Quality Guideline for Environmental Health (SQGE), CCME, 1999<sup>7</sup> - A Guideline for the Environmental Investigation and Remediation of Petroleum Storage Sites in Manitoba, Manitoba Environment, July 1993**BOLD** - value exceeds referenced guideline/criterion

MORROW ENVIRONMENTAL CONSULTANTS INC.

**TABLE 3: Summary of Analytical Results for Hydrocarbons in Soil - Drilling Investigation**

| Area of Concern:                    | Above Ground Diesel Fuel<br>Storage Tanks<br>(Drawing W8140B-005) |                      | Frog Shop<br>(Drawing W8140B-006) |                      |                      |                      | Former<br>Tank Car<br>Cleaning<br>Area<br>(Drawing<br>W8140B-<br>007) |                       | Environmental Quality<br>Guidelines <sup>1</sup> |                        |
|-------------------------------------|-------------------------------------------------------------------|----------------------|-----------------------------------|----------------------|----------------------|----------------------|-----------------------------------------------------------------------|-----------------------|--------------------------------------------------|------------------------|
| Borehole No.:                       | 99-46                                                             | 99-48                | 98-20                             | 98-34                | 99-49                | 99-64                | 99-65                                                                 | 98-22                 |                                                  |                        |
| Sample No.:                         | BH99-46-2-<br>990714                                              | BH99-48-1-<br>990714 | BH98-20-1-<br>981112              | BH98-34-3-<br>981117 | BH99-49-3-<br>990714 | BH99-64-3-<br>990721 | BH99-65-3-<br>990721                                                  | BH98-22-1-<br>981113  |                                                  |                        |
| Depth (m):                          | 1.3                                                               | 0.6                  | 0.6                               | 1.7                  | 1.8                  | 1.7                  | 2.9                                                                   | 0.6                   |                                                  |                        |
| Soil Vapour<br>Concentration (ppm): | 200                                                               | 76                   | 175                               | 550                  | 400                  | 940                  | 240                                                                   | 275                   |                                                  |                        |
| Visual Soil<br>Classification:      | sand fill                                                         | sand fill            | sand and<br>gravel fill           | silt                 | silt                 | silt                 | silt                                                                  | clay and<br>silt fill |                                                  |                        |
| Parameter                           |                                                                   |                      |                                   |                      |                      |                      |                                                                       |                       | Limit of<br>Quantitation                         | Industrial<br>Land Use |
| Benzene                             | <0.02                                                             | NA                   | <0.02                             | <0.02                | <0.02                | NA                   | NA                                                                    | <0.02                 | 0.02                                             | 39 <sup>6</sup>        |
| Toluene                             | <0.02                                                             | NA                   | <0.02                             | 0.12                 | 0.14                 | NA                   | NA                                                                    | <0.02                 | 0.02                                             | 14 <sup>6</sup>        |
| Ethylbenzene                        | 0.16                                                              | NA                   | <0.02                             | 0.60                 | 1.97                 | NA                   | NA                                                                    | <0.02                 | 0.02                                             | 20                     |
| Xylene(s)                           | 0.71                                                              | NA                   | <0.04                             | 0.79                 | 4.39                 | NA                   | NA                                                                    | 0.11                  | 0.04                                             | 20                     |
| TVH <sup>2</sup>                    | 155                                                               | NA                   | <10                               | 136                  | 289                  | NA                   | NA                                                                    | <10                   | 10                                               | 800 <sup>7</sup>       |
| TEH <sup>3</sup>                    | <b>5,260</b>                                                      | 521                  | 62.1                              | <b>2,790</b>         | <b>2,050</b>         | 1,160                | 590                                                                   | <10                   | 10                                               | 2,000 <sup>7</sup>     |
| Mineral Oil & Grease                | NA                                                                | NA                   | NA                                | NA                   | NA                   | NA                   | NA                                                                    | NA                    | 100                                              | 5,000 <sup>7</sup>     |
| PCBs                                | NA                                                                | NA                   | NA                                | NA                   | NA                   | NA                   | NA                                                                    | <0.05                 | 0.05                                             | 33                     |

Results expressed in milligrams per dry kilogram (mg/kg)

TVH - total volatile hydrocarbons

PCBs - polychlorinated biphenyls

NA - not analysed

TEH - total extractable hydrocarbons

TR - trace level less than detection limit

<sup>1</sup> - Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment (CCME), 1999

<sup>2</sup> - C<sub>5</sub> to C<sub>10</sub>

<sup>3</sup> - C<sub>11</sub> to C<sub>32</sub>

<sup>4</sup> - limit of quantitation lower due to BTEX components analysed as part of volatile organic compound analyses

<sup>5</sup> - limit of quantitation raised due to sample dilution

<sup>6</sup> - Provisional Soil Quality Guideline for Environmental Health (SQGE), CCME, 1999

<sup>7</sup> - A Guideline for the Environmental Investigation and Remediation of Petroleum Storage Sites in Manitoba, Manitoba Environment, July 1993

**BOLD** - value exceeds referenced guideline/criterion

MORROW ENVIRONMENTAL CONSULTANTS INC.

**TABLE 3: Summary of Analytical Results for Hydrocarbons in Soil - Drilling Investigation**

| Area of Concern:                 | Former Tank Car Cleaning Area<br>(Drawing W8140B-007) |                  | Former Leaking Tank Car Area<br>(Drawing W8140B-008) |                      |                  |                  |                  |                  | Soil Stockpiling Area<br>(Drawing W8140B-009) | Environmental Quality Guidelines <sup>1</sup> |                     |
|----------------------------------|-------------------------------------------------------|------------------|------------------------------------------------------|----------------------|------------------|------------------|------------------|------------------|-----------------------------------------------|-----------------------------------------------|---------------------|
| Borehole No.:                    | 98-22                                                 | 98-24            | 98-25                                                | 98-26                | 98-28            | 99-50            | 99-51            | 99-53            | 98-31                                         |                                               |                     |
| Sample No.:                      | BH98-22-4-981113                                      | BH98-24-3-981113 | BH98-25-2-981113                                     | BH98-26-1-981113     | BH98-28-3-981113 | BH99-50-2-990716 | BH99-51-1-990716 | BH99-53-4-990716 | BH98-31-3-981116                              |                                               |                     |
| Depth (m):                       | 2.6                                                   | 2.3              | 1.4                                                  | 0.5                  | 1.9              | 1.4              | 0.6              | 2.7              | 2.3                                           |                                               |                     |
| Soil Vapour Concentration (ppm): | 100                                                   | 75               | 110                                                  |                      | 125              | 92               | 48               | 79               | 205                                           |                                               |                     |
| Visual Soil Classification:      | silt                                                  | silt             | clay fill                                            | sand and gravel fill | silt             | sand fill        | clay fill        | sand fill        | organic clay                                  |                                               |                     |
| Parameter                        |                                                       |                  |                                                      |                      |                  |                  |                  |                  | Limit of Quantitation                         |                                               | Industrial Land Use |
| Benzene                          | <0.02                                                 | <0.02            | <0.002 <sup>4</sup>                                  | <0.05 <sup>5</sup>   | <0.02            | NA               | NA               | NA               | <0.02                                         | 0.02                                          | 39 <sup>6</sup>     |
| Toluene                          | <0.02                                                 | <0.02            | <0.002 <sup>4</sup>                                  | <0.01 <sup>5</sup>   | <0.02            | NA               | NA               | NA               | <0.02                                         | 0.02                                          | 14 <sup>6</sup>     |
| Ethylbenzene                     | <0.02                                                 | <0.02            | <0.002 <sup>4</sup>                                  | <0.01 <sup>5</sup>   | <0.02            | NA               | NA               | NA               | <0.02                                         | 0.02                                          | 20                  |
| Xylene(s)                        | <0.04                                                 | <0.04            | 0.007 <sup>4</sup>                                   | <0.2 <sup>5</sup>    | <0.04            | NA               | NA               | NA               | <0.04                                         | 0.04                                          | 20                  |
| TVH <sup>2</sup>                 | <10                                                   | <10              | <10                                                  | 77                   | <10              | NA               | NA               | NA               | <10                                           | 10                                            | 800 <sup>7</sup>    |
| TEH <sup>3</sup>                 | <10                                                   | 1,210            | 17,400                                               | 35,900               | <10              | 2,110            | 10,300           | 287              | <10                                           | 10                                            | 2,000 <sup>7</sup>  |
| Mineral Oil & Grease             | NA                                                    | 820              | NA                                                   | NA                   | NA               | NA               | NA               | NA               | NA                                            | 100                                           | 5,000 <sup>7</sup>  |
| PCBs                             | NA                                                    | NA               | NA                                                   | 3.73                 | NA               | NA               | NA               | NA               | NA                                            | 0.05                                          | 33                  |

Results expressed in milligrams per dry kilogram (mg/kg)

TVH - total volatile hydrocarbons

PCBs - polychlorinated biphenyls

NA - not analysed

TEH - total extractable hydrocarbons

TR - trace level less than detection limit

<sup>1</sup> - Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment (CCME), 1999

<sup>2</sup> - C<sub>5</sub> to C<sub>10</sub>

<sup>3</sup> - C<sub>11</sub> to C<sub>32</sub>

<sup>4</sup> - limit of quantitation lower due to BTEX components analysed as part of volatile organic compound analyses

<sup>5</sup> - limit of quantitation raised due to sample dilution

<sup>6</sup> - Provisional Soil Quality Guideline for Environmental Health (SQGE), CCME, 1999

<sup>7</sup> - A Guideline for the Environmental Investigation and Remediation of Petroleum Storage Sites in Manitoba, Manitoba Environment, July 1993

**BOLD** - value exceeds referenced guideline/criterion

MORROW ENVIRONMENTAL CONSULTANTS INC.

**TABLE 3: Summary of Analytical Results for Hydrocarbons in Soil - Drilling Investigation**

| Area of Concern:               | Component Shop<br>(Drawing W8140B-010) |                      |                      |                      | Wheel Shop<br>(Drawing W8140B-010) |                      |                      |                      | Diesel Heavy<br>Repair Shop<br>(Drawing<br>W8140B-<br>004) | Environmental<br>Quality<br>Guideline <sup>1</sup> |                        |
|--------------------------------|----------------------------------------|----------------------|----------------------|----------------------|------------------------------------|----------------------|----------------------|----------------------|------------------------------------------------------------|----------------------------------------------------|------------------------|
| Borehole No.:                  | 98-35                                  | 98-35                | 99-61                | 99-63                | 98-33                              | 98-33                | 99-56                | 99-59                | 98-14                                                      |                                                    |                        |
| Sample No.:                    | BH98-35-2-<br>981117                   | BH98-35-4-<br>981117 | BH99-61-3-<br>990720 | BH99-63-2-<br>990721 | BH98-33-3-<br>981117               | BH98-33-5-<br>981117 | BH99-56-4-<br>990716 | BH99-59-4-<br>990720 | BH98-14-1-<br>981112                                       |                                                    |                        |
| Depth (m):                     | 2.6                                    | 3.8                  | 2.1                  | 2.1                  | 2.4                                | 3.8                  | 1.8                  | 2.4                  | 0.6                                                        |                                                    |                        |
| Concentration<br>(ppm):        | 350                                    | 240                  | 10                   | 23                   | 125                                | 325                  | 44                   | 310                  | 175                                                        |                                                    |                        |
| Visual Soil<br>Classification: | sand fill                              | clay                 | silt                 | clay                 | silt                               | clay                 | silt                 | silt                 | gravel fill                                                |                                                    |                        |
| Parameter                      |                                        |                      |                      |                      |                                    |                      |                      |                      |                                                            | Limit of<br>Quantitation                           | Industrial<br>Land Use |
| Benzene                        | <0.002 <sup>4</sup>                    | <0.2 <sup>5</sup>    | <0.05 <sup>5</sup>   | <0.002 <sup>4</sup>  | <0.05 <sup>5</sup>                 | <13 <sup>5</sup>     | <0.002 <sup>4</sup>  | <0.05 <sup>5</sup>   | 0.05                                                       | 0.02                                               | 39 <sup>6</sup>        |
| Toluene                        | <0.002 <sup>4</sup>                    | <0.4 <sup>5</sup>    | <0.1 <sup>5</sup>    | <0.002 <sup>4</sup>  | <0.01 <sup>5</sup>                 | <25 <sup>5</sup>     | <0.002 <sup>4</sup>  | <0.1 <sup>5</sup>    | 0.05                                                       | 0.02                                               | 14 <sup>6</sup>        |
| Ethylbenzene                   | <0.002 <sup>4</sup>                    | <0.4 <sup>5</sup>    | <0.1 <sup>5</sup>    | <0.002 <sup>4</sup>  | <0.01 <sup>5</sup>                 | <25 <sup>5</sup>     | <0.002 <sup>4</sup>  | <0.1 <sup>5</sup>    | 0.78                                                       | 0.02                                               | 20                     |
| Xylene(s)                      | <0.004 <sup>4</sup>                    | <0.8 <sup>5</sup>    | <0.2 <sup>5</sup>    | <0.004 <sup>4</sup>  | <0.2 <sup>5</sup>                  | <50 <sup>5</sup>     | <0.004 <sup>4</sup>  | <0.2 <sup>5</sup>    | 4.39                                                       | 0.04                                               | 20                     |
| TVH <sup>2</sup>               | NA                                     | NA                   | NA                   | NA                   | NA                                 | NA                   | NA                   | NA                   | 216                                                        | 10                                                 | 800 <sup>7</sup>       |
| TEH <sup>3</sup>               | TR                                     | TR                   | NA                   | NA                   | 365                                | <10                  | NA                   | NA                   | 31,000                                                     | 10                                                 | 2,000 <sup>7</sup>     |
| Mineral Oil & Grease           | NA                                     | NA                   | NA                   | NA                   | NA                                 | NA                   | NA                   | NA                   | NA                                                         | 100                                                | 5,000 <sup>7</sup>     |
| PCBs                           | NA                                     | NA                   | NA                   | NA                   | NA                                 | NA                   | NA                   | NA                   | NA                                                         | 0.05                                               | 33                     |

Results expressed in milligrams per dry kilogram (mg/kg)

TVH - total volatile hydrocarbons      PCBs - polychlorinated biphenyls      NA - not analysed

TEH - total extractable hydrocarbons      TR - trace level less than detection limit

<sup>1</sup> - *Canadian Environmental Quality Guidelines*, Canadian Council of Ministers of the Environment (CCME), 1999<sup>2</sup> - C<sub>5</sub> to C<sub>10</sub><sup>3</sup> - C<sub>11</sub> to C<sub>32</sub><sup>4</sup> - limit of quantitation lower due to BTEX components analysed as part of volatile organic compound analyses<sup>5</sup> - limit of quantitation raised due to sample dilution<sup>6</sup> - Provisional Soil Quality Guideline for Environmental Health (SQGE), CCME, 1999<sup>7</sup> - *A Guideline for the Environmental Investigation and Remediation of Petroleum Storage Sites in Manitoba*, Manitoba Environment, July 1993**BOLD** - value exceeds referenced guideline/criterion

MORROW ENVIRONMENTAL CONSULTANTS INC.

**TABLE 4: Summary of Analytical Results for PAHs in Soil - Drilling Investigation**

| Area of Concern:                 | Former Locomotive Fuelling Facility (Drawing W8140B-003) | Above Ground Diesel Fuel Storage Tank Area (Drawing W8140B-005) |                    | Former Tank Car Cleaning Area (Drawing W8140B-007) | Former Leaking Tank Car Area (Drawing W8140B-008) | Environmental Quality Guidelines <sup>1</sup> |                     |
|----------------------------------|----------------------------------------------------------|-----------------------------------------------------------------|--------------------|----------------------------------------------------|---------------------------------------------------|-----------------------------------------------|---------------------|
| Borehole No.:                    | 98-1                                                     | 98-19                                                           | 99-48              | 98-24                                              | 98-25                                             |                                               |                     |
| Sample No.:                      | BH98-1-3-981109                                          | BH98-19-12-981112                                               | BH99-48-1-990714   | BH98-24-3-981113                                   | BH98-25-2-981113                                  |                                               |                     |
| Depth (m):                       | 2.3                                                      | 1.1                                                             | 0.6                | 2.3                                                | 1.4                                               |                                               |                     |
| Soil Vapour Concentration (ppm): | 1,210                                                    | 230                                                             | 76                 | 75                                                 | 110                                               |                                               |                     |
| Visual Soil Classification:      | silt                                                     | sand fill                                                       | sand fill          | silt                                               | clay fill                                         |                                               |                     |
| Parameter                        |                                                          |                                                                 |                    |                                                    |                                                   | Limit of Quantitation                         | Industrial Land Use |
| Acenaphthene                     | 2.45                                                     | 352                                                             | <0.20 <sup>2</sup> | <0.05                                              | <0.5 <sup>2</sup>                                 | 0.05                                          | NG                  |
| Acenaphthylene                   | <0.05                                                    | 39                                                              | <0.20 <sup>2</sup> | <0.05                                              | <0.5 <sup>2</sup>                                 | 0.05                                          | NG                  |
| Anthracene                       | <0.05                                                    | 685                                                             | 0.37               | 0.07                                               | <0.5 <sup>2</sup>                                 | 0.05                                          | NG                  |
| Benzo(a)anthracene               | 0.06                                                     | 664                                                             | 1.60               | <0.25 <sup>2</sup>                                 | <2.5 <sup>2</sup>                                 | 0.05                                          | 10                  |
| Benzo(a)pyrene                   | <0.05                                                    | 595                                                             | 1.34               | <0.25 <sup>2</sup>                                 | <2.5 <sup>2</sup>                                 | 0.05                                          | 1.4 <sup>3</sup>    |
| Benzo(b)fluoranthene             | 0.05                                                     | 490                                                             | 1.60               | <0.25 <sup>2</sup>                                 | <2.5 <sup>2</sup>                                 | 0.05                                          | 10                  |
| Benzo(k)fluoranthene             | <0.05                                                    | 448                                                             | 1.23               | <0.25 <sup>2</sup>                                 | <2.5 <sup>2</sup>                                 | 0.05                                          | 10                  |
| Benzo(g,h,i)perylene             | <0.05                                                    | 289                                                             | 1.12               | <0.25 <sup>2</sup>                                 | <2.5 <sup>2</sup>                                 | 0.05                                          | NG                  |
| Chrysene                         | 0.09                                                     | 590                                                             | 1.51               | <0.25 <sup>2</sup>                                 | <2.5 <sup>2</sup>                                 | 0.05                                          | NG                  |
| Dibenzo(a,h)anthracene           | <0.05                                                    | 75                                                              | 0.30               | <0.25 <sup>2</sup>                                 | <2.5 <sup>2</sup>                                 | 0.05                                          | 10                  |
| Fluoranthene                     | 0.30                                                     | 1,830                                                           | 2.65               | 0.15                                               | 0.9                                               | 0.05                                          | NG                  |
| Fluorene                         | 4.48                                                     | 415                                                             | <0.20 <sup>2</sup> | 0.06                                               | 0.5                                               | 0.05                                          | NG                  |
| Indeno(1,2,3-cd)pyrene           | <0.05                                                    | 362                                                             | 1.20               | <0.25 <sup>2</sup>                                 | <2.5 <sup>2</sup>                                 | 0.05                                          | 10                  |
| Naphthalene                      | 12.7                                                     | 606                                                             | 0.31               | <0.05                                              | <0.5 <sup>2</sup>                                 | 0.05                                          | 22                  |
| 1-Methylnaphthalene              | 26.2                                                     | 97                                                              | 0.25               | <0.05                                              | 1.3                                               | 0.05                                          | NG                  |
| 2-Methylnaphthalene              | 41.2                                                     | 177                                                             | 0.41               | <0.05                                              | 1.1                                               | 0.05                                          | NG                  |
| Phenanthrene                     | 8.28                                                     | 1,970                                                           | 1.72               | 0.28                                               | 2.0                                               | 0.05                                          | 50                  |
| Pyrene                           | 0.42                                                     | 1,510                                                           | 2.16               | 0.11                                               | 0.9                                               | 0.05                                          | 100                 |

Results expressed in milligrams per dry kilogram (mg/kg)

NG - no guideline

<sup>1</sup> - Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment (CCME), 1999<sup>2</sup> - limit of quantitation raised due to sample dilution<sup>3</sup> - Provisional Soil Quality Guideline for Environmental Health (SQGE), CCME, 1999.**BOLD** - value exceeds referenced guideline

**TABLE 5: Summary of Analytical Results for VOCs in Soil - Drilling Investigation**

| Area of Concern:                    | Former Leaking Tank<br>Car Area<br>(Drawing W8140B-008) |                         | Component Shop<br>(Drawing W8140B-010) |                      |                      | Environmental<br>Quality<br>Guidelines <sup>1</sup> |                        |
|-------------------------------------|---------------------------------------------------------|-------------------------|----------------------------------------|----------------------|----------------------|-----------------------------------------------------|------------------------|
| Borehole No.:                       | 98-25                                                   | 98-26                   | 98-35                                  | 98-35                | 99-61                |                                                     |                        |
| Sample No.:                         | BH98-25-2-<br>981113                                    | BH98-26-1-<br>981113    | BH98-35-2-<br>981117                   | BH98-35-4-<br>981117 | BH99-61-3-<br>990720 |                                                     |                        |
| Depth (m):                          | 1.4                                                     | 0.5                     | 2.6                                    | 3.8                  | 2.1                  |                                                     |                        |
| Soil Vapour<br>Concentration (ppm): | 110                                                     | 170                     | 350                                    | 240                  | 10                   |                                                     |                        |
| Visual Soil<br>Classification       | clay fill                                               | sand and<br>gravel fill | sand fill                              | clay                 | silt                 |                                                     |                        |
| Parameter                           |                                                         |                         |                                        |                      |                      | Limit of<br>Quantitation                            | Industrial<br>Land Use |
| Acetone                             | 0.212                                                   | <10 <sup>2</sup>        | <40 <sup>2</sup>                       | <40 <sup>2</sup>     | <10.0 <sup>2</sup>   | 0.050                                               | NG                     |
| Carbon Tetrachloride                | <0.002                                                  | <0.1 <sup>2</sup>       | <0.002                                 | <0.4 <sup>2</sup>    | <0.1 <sup>2</sup>    | 0.002                                               | 50                     |
| Chloroethane                        | <0.005                                                  | <1.0 <sup>2</sup>       | <0.005                                 | <4 <sup>2</sup>      | <1.0 <sup>2</sup>    | 0.005                                               | NG                     |
| Chloroform                          | <0.002                                                  | <0.1 <sup>2</sup>       | <0.002                                 | <0.4 <sup>2</sup>    | <0.1 <sup>2</sup>    | 0.002                                               | 50                     |
| Chloromethane                       | <0.005                                                  | <1.0 <sup>2</sup>       | <0.005                                 | <4 <sup>2</sup>      | <1.0 <sup>2</sup>    | 0.005                                               | NG                     |
| 1,1-Dichloroethane                  | <0.002                                                  | <0.1 <sup>2</sup>       | 0.006                                  | 1.1                  | <0.1 <sup>2</sup>    | 0.002                                               | 50                     |
| 1,2-Dichloroethane                  | <0.002                                                  | <0.1 <sup>2</sup>       | <0.002                                 | <0.4 <sup>2</sup>    | <0.1 <sup>2</sup>    | 0.002                                               | 50                     |
| 1,1-Dichloroethene                  | <0.002                                                  | <0.1 <sup>2</sup>       | 0.042                                  | 3.2                  | <0.1 <sup>2</sup>    | 0.002                                               | 50                     |
| cis-1,2-Dichloroethene              | <0.002                                                  | <0.1 <sup>2</sup>       | 0.065                                  | 2.8                  | <0.1 <sup>2</sup>    | 0.002                                               | 50                     |
| trans-1,2-Dichloroethene            | <0.002                                                  | <0.1 <sup>2</sup>       | <0.4 <sup>2</sup>                      | <0.4 <sup>2</sup>    | <0.1 <sup>2</sup>    | 0.002                                               | 50                     |
| Dichloromethane                     | <0.010                                                  | <0.5 <sup>2</sup>       | <0.010                                 | <2 <sup>2</sup>      | <0.5 <sup>2</sup>    | 0.010                                               | 50                     |
| Styrene                             | <0.002                                                  | <0.1 <sup>2</sup>       | <0.002                                 | <0.4 <sup>2</sup>    | <0.1 <sup>2</sup>    | 0.002                                               | 50                     |
| 1,1,1,2-Tetrachloroethane           | <0.002                                                  | <0.1 <sup>2</sup>       | <0.002                                 | <0.4 <sup>2</sup>    | <0.1 <sup>2</sup>    | 0.002                                               | NG                     |
| 1,1,2,2-Tetrachloroethane           | <0.002                                                  | <0.1 <sup>2</sup>       | <0.002                                 | <0.4 <sup>2</sup>    | <0.1 <sup>2</sup>    | 0.002                                               | 50                     |
| Tetrachloroethene                   | <0.002                                                  | <0.1 <sup>2</sup>       | 0.2                                    | <b>3.4</b>           | 0.3                  | 0.002                                               | 0.6                    |
| Trichloroethene                     | <0.002                                                  | <0.1 <sup>2</sup>       | 0.4                                    | <b>51.1</b>          | 0.4                  | 0.002                                               | 31                     |
| 1,1,1-Trichloroethane               | <0.002                                                  | <0.1 <sup>2</sup>       | 0.026                                  | 1.2                  | <0.1 <sup>2</sup>    | 0.002                                               | 50                     |
| 1,1,2-Trichloroethane               | <0.002                                                  | <0.1 <sup>2</sup>       | <0.002                                 | <0.4 <sup>2</sup>    | <0.1 <sup>2</sup>    | 0.002                                               | 50                     |
| Vinyl Chloride                      | <0.003                                                  | <0.5 <sup>2</sup>       | <0.003                                 | <2 <sup>2</sup>      | <0.5 <sup>2</sup>    | 0.003                                               | NG                     |

Results expressed in milligrams per dry kilogram (mg/kg)

NG - no guideline

<sup>1</sup> - Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment (CCME), 1999<sup>2</sup> - limit of quantitation raised due to sample dilution**BOLD** - value exceeds referenced guideline

**TABLE 5: Summary of Analytical Results for VOCs in Soil - Drilling Investigation**

| Area of Concern:                    | Component Shop<br>(Drawing W8140B-010) | Wheel Shop<br>(Drawing W8140B-010) |                    |                  |                    | Environmental<br>Quality<br>Guidelines <sup>1</sup> |                        |
|-------------------------------------|----------------------------------------|------------------------------------|--------------------|------------------|--------------------|-----------------------------------------------------|------------------------|
| Borehole No.:                       | 99-63                                  | 98-33                              | 98-33              | 99-56            | 99-59              |                                                     |                        |
| Sample No.:                         | BH99-63-2-990721                       | BH98-33-3-981117                   | BH98-33-5-981117   | BH99-56-4-990716 | BH99-59-4-990720   |                                                     |                        |
| Depth (m):                          | 2.1                                    | 2.4                                | 3.8                | 1.8              | 2.4                |                                                     |                        |
| Soil Vapour<br>Concentration (ppm): | 23                                     | 125                                | 325                | 44               | 310                |                                                     |                        |
| Visual Soil<br>Classification       | clay                                   | silt                               | clay               | silt             | silt               |                                                     |                        |
| Parameter                           |                                        |                                    |                    |                  |                    | Limit of<br>Quantitation                            | Industrial<br>Land Use |
| Acetone                             | <0.050                                 | <10 <sup>2</sup>                   | <2500 <sup>2</sup> | <0.050           | <10.0 <sup>2</sup> | 0.050                                               | NG                     |
| Carbon Tetrachloride                | <0.002                                 | <0.1 <sup>2</sup>                  | <25 <sup>2</sup>   | <0.002           | <0.1 <sup>2</sup>  | 0.002                                               | 50                     |
| Chloroethane                        | 0.044                                  | <1.0 <sup>2</sup>                  | <250 <sup>2</sup>  | <0.005           | <1.0 <sup>2</sup>  | 0.005                                               | NG                     |
| Chloroform                          | <0.002                                 | <0.1 <sup>2</sup>                  | <25 <sup>2</sup>   | <0.002           | <0.1 <sup>2</sup>  | 0.002                                               | 50                     |
| Chloromethane                       | <0.005                                 | <1.0 <sup>2</sup>                  | <250 <sup>2</sup>  | <0.005           | <1.0 <sup>2</sup>  | 0.005                                               | NG                     |
| 1,1-Dichloroethane                  | 0.4                                    | <0.1 <sup>2</sup>                  | <25 <sup>2</sup>   | <0.002           | <0.1 <sup>2</sup>  | 0.002                                               | 50                     |
| 1,2-Dichloroethane                  | 0.007                                  | <0.1 <sup>2</sup>                  | <25 <sup>2</sup>   | <0.002           | <0.1 <sup>2</sup>  | 0.002                                               | 50                     |
| 1,1-Dichloroethene                  | 0.2                                    | <0.1 <sup>2</sup>                  | <25 <sup>2</sup>   | <0.002           | <0.1 <sup>2</sup>  | 0.002                                               | 50                     |
| cis-1,2-Dichloroethene              | 0.085                                  | 1.3                                | <25 <sup>2</sup>   | <0.002           | 2.4                | 0.002                                               | 50                     |
| trans-1,2-Dichloroethene            | 0.002                                  | <0.1 <sup>2</sup>                  | <25 <sup>2</sup>   | <0.002           | <0.1 <sup>2</sup>  | 0.002                                               | 50                     |
| Dichloromethane                     | <0.010                                 | <0.5 <sup>2</sup>                  | <125 <sup>2</sup>  | <0.010           | <0.5 <sup>2</sup>  | 0.010                                               | 50                     |
| Styrene                             | <0.002                                 | <0.1 <sup>2</sup>                  | <25 <sup>2</sup>   | <0.002           | <0.1 <sup>2</sup>  | 0.002                                               | 50                     |
| 1,1,1,2-Tetrachloroethane           | <0.002                                 | <0.1 <sup>2</sup>                  | <25 <sup>2</sup>   | <0.002           | <0.1 <sup>2</sup>  | 0.002                                               | NG                     |
| 1,1,2,2-Tetrachloroethane           | <0.002                                 | <0.1 <sup>2</sup>                  | <25 <sup>2</sup>   | <0.002           | <0.1 <sup>2</sup>  | 0.002                                               | 50                     |
| Tetrachloroethene                   | 0.014                                  | <b>6.2</b>                         | <b>1,240</b>       | 0.046            | <0.1 <sup>2</sup>  | 0.002                                               | 0.6                    |
| Trichloroethene                     | 0.062                                  | 0.3                                | <25 <sup>2</sup>   | <0.002           | 0.1                | 0.002                                               | 31                     |
| 1,1,1-Trichloroethane               | 0.4                                    | <0.1 <sup>2</sup>                  | <25 <sup>2</sup>   | <0.002           | <0.1 <sup>2</sup>  | 0.002                                               | 50                     |
| 1,1,2-Trichloroethane               | <0.002                                 | <0.1 <sup>2</sup>                  | <25 <sup>2</sup>   | <0.002           | <0.1 <sup>2</sup>  | 0.002                                               | 50                     |
| Vinyl Chloride                      | 0.036                                  | <0.5 <sup>2</sup>                  | <125 <sup>2</sup>  | <0.003           | 0.3                | 0.003                                               | NG                     |

Results expressed in milligrams per dry kilogram (mg/kg)

NG - no guideline

<sup>1</sup> - Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment (CCME), 1999<sup>2</sup> - limit of quantitation raised due to sample dilution**BOLD** - value exceeds referenced guideline

**TABLE 6: Summary of Analytical Results for Phenols in Soil - Drilling Investigation**

| Area of Concern:                                         | Former Tank Car<br>Cleaning Area<br>(Drawing W8140B-<br>007) | Former Leaking<br>Tank Car Area<br>(Drawing<br>W8140B-008) | Environmental Quality<br>Guidelines <sup>1</sup> |                        |
|----------------------------------------------------------|--------------------------------------------------------------|------------------------------------------------------------|--------------------------------------------------|------------------------|
| Borehole No.:                                            | 98-22                                                        | 98-26                                                      |                                                  |                        |
| Sample No.:                                              | BH98-22-1-<br>981113                                         | BH98-26-1-<br>981113                                       |                                                  |                        |
| Depth (m):                                               | 0.6                                                          | 0.5                                                        |                                                  |                        |
| Soil Vapour<br>Concentration (ppm):                      | 275                                                          | 170                                                        |                                                  |                        |
| Visual Soil<br>Classification:                           | clay and<br>silt fill                                        | sand and<br>gravel fill                                    |                                                  |                        |
| Parameter                                                |                                                              |                                                            | Limit of Quantitation                            | Industrial<br>Land Use |
| Phenol                                                   | <0.1                                                         | <1.3                                                       | 0.1                                              | 128 <sup>3</sup>       |
| 2-Chlorophenol                                           | <0.1                                                         | <1.3                                                       | 0.1                                              | 5                      |
| o-Cresol                                                 | <0.1                                                         | <1.3                                                       | 0.1                                              | 10                     |
| m-Cresol & p-Cresol                                      | 0.1                                                          | <1.3                                                       | 0.1                                              | 10                     |
| 2-Nitrophenol                                            | <0.1                                                         | <1.3                                                       | 0.1                                              | 10                     |
| 2,4-Dimethylphenol                                       | <0.1                                                         | <1.3                                                       | 0.1                                              | 10                     |
| 2,4-Dichlorophenol                                       | <0.1                                                         | <1.3                                                       | 0.1                                              | 5                      |
| 4-Chloro-3-Methylphenol                                  | <0.1                                                         | <1.3                                                       | 0.1                                              | NG                     |
| 2,4,6-Trichlorophenol                                    | <0.1                                                         | <1.3                                                       | 0.1                                              | 5                      |
| 2,4,5-Trichlorophenol                                    | <0.1                                                         | <1.3                                                       | 0.1                                              | 5                      |
| 2,4-Dinitrophenol                                        | <0.2                                                         | <2.5 <sup>2</sup>                                          | 0.2                                              | 10                     |
| 4-Nitrophenol                                            | <0.5                                                         | <6.3 <sup>2</sup>                                          | 0.5                                              | 10                     |
| 2,3,5,6-Tetrachlorophenol                                | <0.1                                                         | <1.3 <sup>2</sup>                                          | 0.1                                              | 5                      |
| 2,3,4,5-Tetrachlorophenol &<br>2,3,4,6-Tetrachlorophenol | <0.1                                                         | <1.3 <sup>2</sup>                                          | 0.1                                              | 5                      |
| 2-Methyl-4,6-Dinitrophenol                               | <0.5                                                         | <6.3 <sup>2</sup>                                          | 0.5                                              | 10                     |
| Pentachlorophenol                                        | <0.2                                                         | <2.5 <sup>2</sup>                                          | 0.2                                              | 28 <sup>3</sup>        |

Results expressed in milligrams per dry kilogram (mg/kg)

NG - no guideline

<sup>1</sup> - *Canadian Environmental Quality Guidelines*, Canadian Council of Ministers of the Environment (CCME), 1999

<sup>2</sup> - limit of quantitation raised due to sample dilution

<sup>3</sup> - *Provisional Soil Quality Guidelines for Environmental Health (SQGE)*, CCME, 1999

**TABLE 7: Summary of Analytical Results for Metals in Soil - Drilling Investigation**

| Area of Concern:               | Former Leaking<br>Tank Car Area<br>(Drawing W8140B-008)               |                      |                         |                      |                      |                      | Environmental<br>Quality<br>Guidelines <sup>1</sup> |                        |
|--------------------------------|-----------------------------------------------------------------------|----------------------|-------------------------|----------------------|----------------------|----------------------|-----------------------------------------------------|------------------------|
|                                | Former<br>Tank Car<br>Cleaning<br>Area<br>(Drawing<br>W8140B-<br>007) |                      |                         |                      |                      |                      |                                                     |                        |
| Borehole No.:                  | 98-24                                                                 | 98-25                | 98-26                   | 99-50                | 99-51                | 99-53                |                                                     |                        |
| Sample No.:                    | BH98-24-3-<br>981113                                                  | BH98-25-2-<br>981113 | BH98-26-1-<br>981113    | BH99-50-2-<br>990716 | BH99-51-1-<br>990716 | BH99-53-4-<br>990716 |                                                     |                        |
| Depth (m):                     | 2.3                                                                   | 1.4                  | 0.5                     | 1.4                  | 0.6                  | 2.7                  |                                                     |                        |
| Soil Vapour<br>Concentration   | 75                                                                    | 110                  | 170                     | 92                   | 48                   | 79                   |                                                     |                        |
| Visual Soil<br>Classification: | silt                                                                  | clay fill            | sand and<br>gravel fill | sand fill            | clay fill            | sand fill            |                                                     |                        |
| Parameter                      |                                                                       |                      |                         |                      |                      |                      | Limit of<br>Quantitation                            | Industrial<br>Land Use |
| Antimony                       | <0.5                                                                  | 26.9                 | 20.0                    | NA                   | NA                   | NA                   | 0.5                                                 | 40                     |
| Arsenic                        | <0.5                                                                  | 10.0                 | 5.6                     | NA                   | NA                   | NA                   | 0.5                                                 | 12                     |
| Barium                         | 24.7                                                                  | 236                  | 700                     | 151                  | 113                  | 40.5                 | 5.0                                                 | 2,000                  |
| Beryllium                      | <0.2                                                                  | 0.7                  | 0.3                     | 0.8                  | 0.6                  | <0.2                 | 0.2                                                 | 8                      |
| Cadmium                        | <0.3                                                                  | 1.4                  | 0.8                     | 2.5                  | 0.4                  | <0.3                 | 0.3                                                 | 22                     |
| Chromium                       | 9.7                                                                   | 36.7                 | 24.6                    | 38.3                 | 25.6                 | 9.7                  | 1.0                                                 | 87                     |
| Cobalt                         | <2.0                                                                  | 8.4                  | 4.8                     | 10.5                 | 5.8                  | 3.1                  | 2.0                                                 | 300                    |
| Copper                         | 7.8                                                                   | <b>296</b>           | <b>170</b>              | <b>357</b>           | 73.6                 | 16.2                 | 1.0                                                 | 91                     |
| Lead                           | <5.0                                                                  | <b>635</b>           | 402                     | <b>1,190</b>         | 258                  | <5.0                 | 5.0                                                 | 600                    |
| Molybdenum                     | <3.0                                                                  | <3.0                 | 13.2                    | <3.0                 | <3.0                 | <3.0                 | 3.0                                                 | 40                     |
| Nickel                         | 9.1                                                                   | 38.0                 | 40.3                    | <b>81.7</b>          | 19.6                 | 7.9                  | 2.0                                                 | 50                     |
| Selenium                       | <0.2                                                                  | 0.7                  | 0.4                     | NA                   | NA                   | NA                   | 0.2                                                 | 10                     |
| Silver                         | <0.3                                                                  | <0.3                 | <0.3                    | <0.6                 | <0.6                 | <0.6                 | 0.3/0.6                                             | 40                     |
| Vanadium                       | 11.4                                                                  | 41.0                 | 18.5                    | 43.1                 | 33.4                 | 14.1                 | 1.0                                                 | 130                    |
| Zinc                           | 12.6                                                                  | 267                  | 232                     | <b>933</b>           | 67.5                 | 23.0                 | 5.0                                                 | 360                    |

Results expressed in milligrams per dry kilogram (mg/kg)

<sup>1</sup> - Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment (CCME), 1999

**BOLD** - value exceeds referenced guideline

**TABLE 8: Summary of Analytical Results for Hydrocarbons in Soil - Test Pitting Investigation**

| Area of Concern:                    | Above Ground Diesel Fuel Storage Tank Area<br>(Drawing W8140B-006) |                         |                         |                      | Former Leaking Tank Car Area<br>(Drawing W8140B-008) |                      | Environmental<br>Quality<br>Guidelines <sup>1</sup> |                        |
|-------------------------------------|--------------------------------------------------------------------|-------------------------|-------------------------|----------------------|------------------------------------------------------|----------------------|-----------------------------------------------------|------------------------|
| Test Pit No.:                       | 98-1                                                               | 98-1                    | 99-12                   | 99-14                | 99-28                                                | 99-29                |                                                     |                        |
| Sample No.:                         | TP98-1-2-<br>981118                                                | TP98-1-5-<br>981118     | TP99-12-3-<br>991007    | TP99-14-4-<br>991007 | TP99-28-4-<br>991028                                 | TP99-29-1-<br>991028 |                                                     |                        |
| Depth (m):                          | 0.7                                                                | 0.7                     | 0.9                     | 1.5                  | 1.3                                                  | 0.4                  |                                                     |                        |
| Soil Vapour<br>Concentration (ppm): | 125                                                                | duplicate<br>of 98-1-2  | 860                     | 1,760                | 350                                                  | 140                  |                                                     |                        |
| Visual Soil<br>Classification:      | sand and<br>gravel fill                                            | sand and<br>gravel fill | sand and<br>gravel fill | clay                 | waste paint                                          | sand fill            |                                                     |                        |
| Parameter                           |                                                                    |                         |                         |                      |                                                      |                      | Limit of<br>Quantitation                            | Industrial<br>Land Use |
| Benzene                             | <0.02                                                              | <0.02                   | 0.36                    | 0.04                 | <1.3 <sup>4</sup>                                    | NA                   | 0.02                                                | 39 <sup>5</sup>        |
| Toluene                             | 0.07                                                               | 0.06                    | <0.02                   | 0.29                 | <2.5 <sup>4</sup>                                    | NA                   | 0.02                                                | 14 <sup>5</sup>        |
| Ethylbenzene                        | 0.26                                                               | 0.24                    | 1.59                    | 8.74                 | 2.5                                                  | NA                   | 0.02                                                | 20                     |
| Xylene(s)                           | 1.06                                                               | 0.61                    | 2.66                    | <b>26.4</b>          | <b>26.4</b>                                          | NA                   | 0.04                                                | 20                     |
| TVH <sup>2</sup>                    | 82                                                                 | 61                      | 246                     | 730                  | <b>2,000</b>                                         | NA                   | 10                                                  | 800 <sup>6</sup>       |
| TEH <sup>3</sup>                    | <b>3,550</b>                                                       | <b>3,020</b>            | <b>3,880</b>            | <b>4,580</b>         | <b>16,500</b>                                        | <b>3,430</b>         | 10                                                  | 2,000 <sup>6</sup>     |

Results expressed in milligrams per dry kilogram (mg/kg)

TVH - total volatile hydrocarbons

TEH - total extractable hydrocarbons

<sup>1</sup> - Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment (CCME), 1999<sup>2</sup> - C<sub>5</sub> to C<sub>10</sub><sup>3</sup> - C<sub>11</sub> to C<sub>32</sub><sup>4</sup> - limit of quantitation raised due to sample dilution<sup>5</sup> - Provisional Soil Quality Guidelines for Environmental Health (SQGE), CCME, 1999<sup>6</sup> - A Guideline for the Environmental Investigation and Remediation of Petroleum Storage Sites in Manitoba, Manitoba Environment, July 1993**BOLD** - value exceeds referenced guideline/criterion

**TABLE 8: Summary of Analytical Results for Hydrocarbons in Soil - Test Pitting Investigation**

| Area of Concern:                    | Soil Stockpiling Area<br>(Drawing W8140B-009) |                       |                     |                     |                             |                         |                     |                     | Environmental<br>Quality<br>Guidelines <sup>1</sup> |                        |
|-------------------------------------|-----------------------------------------------|-----------------------|---------------------|---------------------|-----------------------------|-------------------------|---------------------|---------------------|-----------------------------------------------------|------------------------|
| Test Pit No.:                       | 98-2                                          | 98-4                  | 98-4                | 98-5                | 98-6                        | 98-7                    | 98-8                | 98-11               |                                                     |                        |
| Sample No.:                         | TP98-2-1-<br>981118                           | TP98-4-2-<br>981118   | TP98-4-3-<br>981118 | TP98-5-1-<br>981118 | TP98-6-3-<br>981118         | TP98-7-1-<br>981118     | TP98-8-4-<br>981118 | TP98-8-3-<br>981118 |                                                     |                        |
| Depth (m):                          | 0.8                                           | 1.4                   | 1.8                 | 0.4                 | 2.2                         | 0.4                     | 2.8                 | 1.7                 |                                                     |                        |
| Soil Vapour<br>Concentration (ppm): | 125                                           | 150                   | 180                 | 175                 | 175                         | 40                      | 175                 | 240                 |                                                     |                        |
| Visual Soil<br>Classification:      | sand fill                                     | silt and<br>clay fill | organic<br>clay     | sand fill           | silt, clay and<br>sand fill | sand and<br>gravel fill | crushed<br>glass    | organic<br>silt     |                                                     |                        |
| Parameter                           |                                               |                       |                     |                     |                             |                         |                     |                     | Limit of<br>Quantitation                            | Industrial Land<br>Use |
| Benzene                             | <0.02                                         | <0.02                 | <0.02               | <0.02               | <0.02                       | <0.02                   | <0.02               | <0.02               | 0.02                                                | 39 <sup>5</sup>        |
| Toluene                             | <0.02                                         | <0.02                 | <0.02               | <0.02               | <0.02                       | <0.02                   | <0.02               | <0.02               | 0.02                                                | 14 <sup>5</sup>        |
| Ethylbenzene                        | <0.02                                         | <0.02                 | <0.02               | <0.02               | <0.02                       | 0.13                    | <0.02               | <0.02               | 0.02                                                | 20                     |
| Xylene(s)                           | <0.04                                         | <0.04                 | <0.04               | <0.04               | <0.04                       | 0.57                    | <0.04               | <0.04               | 0.04                                                | 20                     |
| TVH <sup>2</sup>                    | <10                                           | <10                   | <10                 | <10                 | <10                         | 41                      | <10                 | <10                 | 10                                                  | 800 <sup>6</sup>       |
| TEH <sup>3</sup>                    | <b>14,900</b>                                 | 117                   | <10                 | 650                 | <10                         | <b>4,920</b>            | 213                 | <10                 | 10                                                  | 2,000 <sup>6</sup>     |

Results expressed in milligrams per dry kilogram (mg/kg)

TVH - total volatile hydrocarbons

TEH - total extractable hydrocarbons

<sup>1</sup> - *Canadian Environmental Quality Guidelines*, Canadian Council of Ministers of the Environment (CCME), 1999

<sup>2</sup> - C<sub>5</sub> to C<sub>10</sub>

<sup>3</sup> - C<sub>11</sub> to C<sub>32</sub>

<sup>4</sup> - limit of quantitation raised due to sample dilution

<sup>5</sup> - *Provisional Soil Quality Guidelines for Environmental Health (SQGE)*, CCME, 1999

<sup>6</sup> - *A Guideline for the Environmental Investigation and Remediation of Petroleum Storage Sites in Manitoba*, Manitoba Environment, July 1993

**BOLD** - value exceeds referenced guideline/criterion

**TABLE 8: Summary of Analytical Results for Hydrocarbons in Soil - Test Pitting Investigation**

| Area of Concern:               | Soil Stockpiling Area<br>(Drawing W8140B-009) |                         |                      |                      | Diesel Heavy Repair Shop<br>(Drawing W8140B-004) |                      |                         |                      | Environmental Quality<br>Guidelines <sup>1</sup> |                     |
|--------------------------------|-----------------------------------------------|-------------------------|----------------------|----------------------|--------------------------------------------------|----------------------|-------------------------|----------------------|--------------------------------------------------|---------------------|
| Test Pit No.:                  | 99-16                                         | 99-19                   | 99-20                | 99-21                | 99-24                                            | 99-25                | 99-26                   | 99-27                |                                                  |                     |
| Sample No.:                    | TP99-16-1-<br>991007                          | TP99-19-2-<br>991007    | TP99-20-3-<br>991007 | TP99-21-2-<br>991007 | TP99-24-1-<br>991028                             | TP99-25-1-<br>991028 | TP99-26-2-<br>991028    | TP99-27-3-<br>991028 |                                                  |                     |
| Depth (m):                     | 1.0                                           | 1.0                     | 1.2                  | 1.0                  | 0.5                                              | 0.6                  | 0.8                     | 0.8                  |                                                  |                     |
| Concentration<br>(ppm):        | 45                                            | 50                      | 400                  | 270                  | 175                                              | 390                  | 210                     | 325                  |                                                  |                     |
| Visual Soil<br>Classification: | sand and<br>gravel fill                       | sand and<br>gravel fill | sand fill            | sand fill            | sand fill                                        | sand fill            | sand and<br>gravel fill | clay fill            |                                                  |                     |
| Parameter                      |                                               |                         |                      |                      |                                                  |                      |                         |                      | Limit of<br>Quantitation                         | Industrial Land Use |
| Benzene                        | NA                                            | NA                      | <0.02                | <0.02                | <0.02                                            | 0.06                 | <0.02                   | <0.02                | 0.02                                             | 39 <sup>5</sup>     |
| Toluene                        | NA                                            | NA                      | 0.02                 | 0.03                 | 0.13                                             | 0.16                 | 0.09                    | 0.05                 | 0.02                                             | 14 <sup>5</sup>     |
| Ethylbenzene                   | NA                                            | NA                      | 3.42                 | 1.55                 | 0.56                                             | 0.92                 | 2.17                    | 2.17                 | 0.02                                             | 20                  |
| Xylene(s)                      | NA                                            | NA                      | 4.70                 | 1.58                 | 1.02                                             | 3.32                 | 1.67                    | 3.16                 | 0.04                                             | 20                  |
| TVH <sup>2</sup>               | NA                                            | NA                      | 429                  | 149                  | 68                                               | 305                  | 170                     | 334                  | 10                                               | 800 <sup>6</sup>    |
| TEH <sup>3</sup>               | 238                                           | 542                     | <b>8,540</b>         | <b>10,500</b>        | <b>17,300</b>                                    | <b>22,400</b>        | <b>7,540</b>            | <b>10,600</b>        | 10                                               | 2,000 <sup>6</sup>  |

Results expressed in milligrams per dry kilogram (mg/kg)

TVH - total volatile hydrocarbons

TEH - total extractable hydrocarbons

<sup>1</sup> - Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment (CCME), 1999

<sup>2</sup> - C<sub>5</sub> to C<sub>10</sub>

<sup>3</sup> - C<sub>11</sub> to C<sub>32</sub>

<sup>4</sup> - limit of quantitation raised due to sample dilution

<sup>5</sup> - Provisional Soil Quality Guidelines for Environmental Health (SQGE), CCME, 1999

<sup>6</sup> - A Guideline for the Environmental Investigation and Remediation of Petroleum Storage Sites in Manitoba, Manitoba Environment, July 1993

**BOLD** - value exceeds referenced guideline/criterion

**TABLE 9: Summary of Analytical Results for VOCs in Soil - Test Pitting Investigation**

| Area of Concern:                    | Former Leaking Tank<br>Car Area<br>(Drawing W8140B-008) | Environmental<br>Quality<br>Guidelines <sup>1</sup> |                        |
|-------------------------------------|---------------------------------------------------------|-----------------------------------------------------|------------------------|
| Test Pit No.:                       | 99-28                                                   |                                                     |                        |
| Sample No.:                         | TP99-28-4-991028                                        |                                                     |                        |
| Depth (m):                          | 1.3                                                     |                                                     |                        |
| Soil Vapour<br>Concentration (ppm): | 350                                                     |                                                     |                        |
| Visual Soil<br>Classification:      | waste paint                                             |                                                     |                        |
| Parameter                           |                                                         | Limit of Quantitation                               | Industrial<br>Land Use |
| Acetone                             | <250 <sup>2</sup>                                       | 0.050                                               | NG                     |
| Carbon Tetrachloride                | <2.5 <sup>2</sup>                                       | 0.002                                               | 50                     |
| Chloroethane                        | <25.0 <sup>2</sup>                                      | 0.005                                               | NG                     |
| Chloroform                          | <2.5 <sup>2</sup>                                       | 0.002                                               | 50                     |
| Chloromethane                       | <25.0 <sup>2</sup>                                      | 0.005                                               | NG                     |
| 1,1-Dichloroethane                  | <2.5 <sup>2</sup>                                       | 0.002                                               | 50                     |
| 1,2-Dichloroethane                  | <2.5 <sup>2</sup>                                       | 0.002                                               | 50                     |
| 1,1-Dichloroethene                  | <2.5 <sup>2</sup>                                       | 0.002                                               | 50                     |
| cis-1,2-Dichloroethene              | <2.5 <sup>2</sup>                                       | 0.002                                               | 50                     |
| trans-1,2-Dichloroethene            | <2.5 <sup>2</sup>                                       | 0.002                                               | 50                     |
| Dichloromethane                     | <12.5 <sup>2</sup>                                      | 0.010                                               | 50                     |
| Styrene                             | <2.5 <sup>2</sup>                                       | 0.002                                               | 50                     |
| 1,1,1,2-Tetrachloroethane           | <2.5 <sup>2</sup>                                       | 0.002                                               | NG                     |
| 1,1,2,2-Tetrachloroethane           | <2.5 <sup>2</sup>                                       | 0.002                                               | 50                     |
| Tetrachloroethene                   | <2.5 <sup>2</sup>                                       | 0.002                                               | 34 <sup>3</sup>        |
| Trichloroethene                     | <2.5 <sup>2</sup>                                       | 0.002                                               | 31                     |
| 1,1,1-Trichloroethane               | <2.5 <sup>2</sup>                                       | 0.002                                               | 50                     |
| 1,1,2-Trichloroethane               | <2.5 <sup>2</sup>                                       | 0.002                                               | 50                     |
| Vinyl Chloride                      | <12.5 <sup>2</sup>                                      | 0.003                                               | NG                     |

Results expressed in milligrams per dry kilogram (mg/kg)

NG - no guideline

<sup>1</sup> - *Canadian Environmental Quality Guidelines*, Canadian Council of Ministers of the Environment (CCME), 1999

<sup>2</sup> - limit of quantitation raised due to sample dilution

<sup>3</sup> - Provisional Soil Quality Guideline for Environmental Health (SQGE), CCME, 1999

**TABLE 10: Summary of Analytical Results for Metals in Soil - Test Pitting Investigation**

| Area of Concern:                    | Former Leaking Tank Car Area<br>(Drawing W8140B-008) |                      | Environmental Quality<br>Guidelines <sup>1</sup> |                        |
|-------------------------------------|------------------------------------------------------|----------------------|--------------------------------------------------|------------------------|
| Test Pit No.:                       | 99-28                                                | 99-29                |                                                  |                        |
| Sample No.:                         | TP99-28-4-<br>991028                                 | TP99-29-1-<br>991028 |                                                  |                        |
| Depth (m):                          | 1.3                                                  | 0.4                  |                                                  |                        |
| Soil Vapour<br>Concentration (ppm): | 350                                                  | 140                  |                                                  |                        |
| Visual Soil<br>Classification:      | waste paint                                          | sand fill            |                                                  |                        |
| Parameter                           |                                                      |                      | Limit of<br>Quantitation                         | Industrial<br>Land Use |
| Antimony                            | 3.9                                                  | 29.4                 | 0.5                                              | 40                     |
| Arsenic                             | 9.0                                                  | <b>25.7</b>          | 0.5                                              | 12                     |
| Barium                              | 294                                                  | 403                  | 5.0                                              | 2,000                  |
| Beryllium                           | <0.2                                                 | 0.6                  | 0.2                                              | 8                      |
| Cadmium                             | 1.0                                                  | 7.0                  | 0.3                                              | 22                     |
| Chromium                            | 11.3                                                 | 44.8                 | 1.0                                              | 87                     |
| Cobalt                              | 3.1                                                  | 13.7                 | 2.0                                              | 300                    |
| Copper                              | 42.1                                                 | <b>633</b>           | 1.0                                              | 91                     |
| Lead                                | <b>4,100</b>                                         | <b>1,830</b>         | 5.0                                              | 600                    |
| Molybdenum                          | 3.2                                                  | 4.0                  | 3.0                                              | 40                     |
| Nickel                              | 12.5                                                 | <b>115</b>           | 2.0                                              | 50                     |
| Selenium                            | 0.6                                                  | 2.0                  | 0.2                                              | 10                     |
| Silver                              | <0.6                                                 | 4.5                  | 0.6                                              | 40                     |
| Vanadium                            | 17.1                                                 | 33.0                 | 1.0                                              | 130                    |
| Zinc                                | 239                                                  | <b>2,040</b>         | 5.0                                              | 360                    |

Results expressed in milligrams per dry kilogram (mg/kg)

<sup>1</sup> - Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment (CCME), 1999

**BOLD** - value exceeds referenced guideline

**TABLE 11: Summary of Analytical Results for Hydrocarbons in Groundwater**

| Area of Concern:     | Former Locomotive Fuelling Facility<br>(Drawing W8140B-003) |                        |                   |                   | Active<br>Locomotive<br>Fuelling Facility<br>(Drawing<br>W8140B-004) | Environmental Quality<br>Guidelines <sup>1,2</sup> |                    |                            |
|----------------------|-------------------------------------------------------------|------------------------|-------------------|-------------------|----------------------------------------------------------------------|----------------------------------------------------|--------------------|----------------------------|
| Monitoring Well No.: | 98-2                                                        | 98-44                  | 98-4              | 98-8              | 98-11                                                                |                                                    |                    |                            |
| Sample No.:          | MW98-2-<br>981215                                           | MW98-44-<br>981215     | MW98-4-<br>981215 | MW98-8-<br>981215 | MW98-11-<br>981215                                                   |                                                    |                    |                            |
| Parameter            |                                                             | Duplicate<br>of MW98-2 |                   |                   |                                                                      | Limit of<br>Quantitation                           | Community<br>Water | Freshwater<br>Aquatic Life |
| Benzene              | 0.0435                                                      | 0.0398                 | 0.0180            | <0.0002           | <0.0002                                                              | 0.0002                                             | 0.0050             | 0.370                      |
| Toluene              | 0.0817                                                      | 0.0663                 | 0.0004            | <0.0002           | <0.0002                                                              | 0.0002                                             | ≤0.0024            | 0.002                      |
| Ethylbenzene         | 0.0766                                                      | 0.0629                 | 0.0090            | 0.0005            | <0.0002                                                              | 0.0002                                             | ≤0.0024            | 0.09                       |
| Xylene(s)            | 0.4690                                                      | 0.4290                 | 0.1550            | 0.0005            | <0.0004                                                              | 0.0004                                             | ≤0.03              | NG                         |
| TVH <sup>3</sup>     | 3.25                                                        | 2.59                   | 1.27              | 0.152             | <0.100                                                               | 0.100                                              | NG                 | NG                         |
| TEH <sup>4</sup>     | 2.05                                                        | 1.53                   | 1.72              | 0.270             | <0.100                                                               | 0.100                                              | NG                 | NG                         |

Results expressed in milligrams per litre (mg/L)

TVH - total volatile hydrocarbons

TEH - total extractable hydrocarbons

NA - not analyzed

NG - no guideline

<sup>1</sup> - Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment (CCME), 1999

<sup>2</sup> - There are no applicable guidelines/criteria for the parameters listed. However, the CCME (1999) Community Water and Freshwater Aquatic Life guidelines are shown for informational purposes only.

<sup>3</sup> - C<sub>5</sub> to C<sub>10</sub>

<sup>4</sup> - C<sub>11</sub> to C<sub>32</sub>

<sup>5</sup> - limit of quantitation lowered due to BTEX components analyzed as part of the volatile organic compounds analyses

<sup>6</sup> - limit of quantitation raised due to sample dilution

**TABLE 11: Summary of Analytical Results for Hydrocarbons in Groundwater**

| Area of Concern:     | Above Ground Diesel Fuel Storage Tanks (Drawing W8140B-005) |                | Frog Shop (Drawing W8140B-006) |                      | Former Tank Car Cleaning Area (Drawing W8140B-007) |                | Environmental Quality Guidelines <sup>1,2</sup> |                 |                         |
|----------------------|-------------------------------------------------------------|----------------|--------------------------------|----------------------|----------------------------------------------------|----------------|-------------------------------------------------|-----------------|-------------------------|
| Monitoring Well No.: | 98-17                                                       | 98-19          | 98-34                          | 98-34                | 98-22                                              | 98-24          |                                                 |                 |                         |
| Sample No.:          | MW98-17-981215                                              | MW98-19-981215 | MW98-34-981215                 | MW98-37-981215       | MW98-22-981215                                     | MW98-24-981215 |                                                 |                 |                         |
| Parameter            |                                                             |                |                                | Duplicate of MW98-34 |                                                    |                | Limit of Quantitation                           | Community Water | Freshwater Aquatic Life |
| Benzene              | <0.0002                                                     | <0.0002        | <0.0002                        | <0.0002              | <0.0002                                            | <0.0002        | 0.0002                                          | 0.0050          | 0.370                   |
| Toluene              | <0.0002                                                     | <0.0002        | 0.0009                         | 0.0011               | <0.0002                                            | <0.0002        | 0.0002                                          | ≤0.0024         | 0.002                   |
| Ethylbenzene         | <0.0002                                                     | <0.0002        | 0.0007                         | 0.0011               | <0.0002                                            | <0.0002        | 0.0002                                          | ≤0.0024         | 0.09                    |
| Xylene(s)            | <0.0004                                                     | <0.0004        | 0.0030                         | 0.0041               | <0.0004                                            | <0.0004        | 0.0004                                          | ≤0.03           | NG                      |
| TVH <sup>3</sup>     | <0.100                                                      | <0.100         | 0.157                          | 0.154                | <0.100                                             | <0.100         | 0.100                                           | NG              | NG                      |
| TEH <sup>4</sup>     | <0.100                                                      | <0.100         | 1.69                           | 2.77                 | <0.100                                             | 2.37           | 0.100                                           | NG              | NG                      |

Results expressed in milligrams per litre (mg/L)

TVH - total volatile hydrocarbons

TEH - total extractable hydrocarbons

NA - not analyzed

NG - no guideline

<sup>1</sup> - *Canadian Environmental Quality Guidelines*, Canadian Council of Ministers of the Environment (CCME), 1999

<sup>2</sup> - There are no applicable guidelines/criteria for the parameters listed. However, the CCME (1999) Community Water and Freshwater Aquatic Life guidelines are shown for informational purposes only.

<sup>3</sup> - C<sub>5</sub> to C<sub>10</sub>

<sup>4</sup> - C<sub>11</sub> to C<sub>32</sub>

<sup>5</sup> - limit of quantitation lowered due to BTEX components analyzed as part of the volatile organic compounds analyses

<sup>6</sup> - limit of quantitation raised due to sample dilution

**TABLE 11: Summary of Analytical Results for Hydrocarbons in Groundwater**

| Area of Concern:     | Former Leaking Tank Car Area<br>(Drawing W8140B-008) |                      |                    | Component Shop<br>(Drawing W8140B-010) |                    |                      | Environmental Quality<br>Guidelines <sup>1,2</sup> |                    |                            |
|----------------------|------------------------------------------------------|----------------------|--------------------|----------------------------------------|--------------------|----------------------|----------------------------------------------------|--------------------|----------------------------|
| Monitoring Well No.: | 98-25                                                | 98-26                | 98-35              | 98-35                                  | 99-60              | 99-61                |                                                    |                    |                            |
| Sample No.:          | MW98-25-<br>981215                                   | MW98-26-<br>981215   | MW98-35-<br>981215 | MW98-38-<br>981215                     | MW99-60-<br>990914 | MW99-61-<br>990914   |                                                    |                    |                            |
| Parameter            |                                                      |                      |                    | Duplicate of<br>MW98-35                |                    |                      | Limit of<br>Quantitation                           | Community<br>Water | Freshwater<br>Aquatic Life |
| Benzene              | <0.0001 <sup>5</sup>                                 | <0.0001 <sup>5</sup> | <0.1 <sup>6</sup>  | <0.1 <sup>6</sup>                      | <0.0002            | <0.0025 <sup>6</sup> | 0.0002                                             | 0.0050             | 0.370                      |
| Toluene              | <0.0002                                              | <0.0002              | <0.2 <sup>6</sup>  | <0.2 <sup>6</sup>                      | 0.0002             | <0.005 <sup>6</sup>  | 0.0002                                             | ≤0.0024            | 0.002                      |
| Ethylbenzene         | <0.0002                                              | <0.0002              | <0.2 <sup>6</sup>  | <0.2 <sup>6</sup>                      | <0.0002            | <0.005 <sup>6</sup>  | 0.0002                                             | ≤0.0024            | 0.09                       |
| Xylene(s)            | <0.0004                                              | <0.0004              | <0.4 <sup>6</sup>  | <0.4 <sup>6</sup>                      | <0.0004            | <0.010 <sup>6</sup>  | 0.0004                                             | ≤0.03              | NG                         |
| TVH <sup>3</sup>     | <0.100                                               | <0.100               | 16.1               | NA                                     | NA                 | NA                   | 0.100                                              | NG                 | NG                         |
| TEH <sup>4</sup>     | <0.100                                               | <0.100               | <0.100             | NA                                     | NA                 | NA                   | 0.100                                              | NG                 | NG                         |

Results expressed in milligrams per litre (mg/L)

TVH - total volatile hydrocarbons

TEH - total extractable hydrocarbons

NA - not analyzed

NG - no guideline

<sup>1</sup> - *Canadian Environmental Quality Guidelines*, Canadian Council of Ministers of the Environment (CCME), 1999

<sup>2</sup> - There are no applicable guidelines/criteria for the parameters listed. However, the CCME (1999) Community Water and Freshwater Aquatic Life guidelines are shown for informational purposes only.

<sup>3</sup> - C<sub>5</sub> to C<sub>10</sub>

<sup>4</sup> - C<sub>11</sub> to C<sub>32</sub>

<sup>5</sup> - limit of quantitation lowered due to BTEX components analyzed as part of the volatile organic compounds analyses

<sup>6</sup> - limit of quantitation raised due to sample dilution

**TABLE 11: Summary of Analytical Results for Hydrocarbons in Groundwater**

| Area of Concern:     | Component Shop<br>(Drawing W8140B-010) |                         |                                 | Wheel Shop<br>(Drawing W8140B-010) |                         |                      | Environmental Quality<br>Guidelines <sup>1,2</sup> |                    |                            |
|----------------------|----------------------------------------|-------------------------|---------------------------------|------------------------------------|-------------------------|----------------------|----------------------------------------------------|--------------------|----------------------------|
| Monitoring Well No.: | 99-63                                  | 99-63                   |                                 | 98-33                              | 98-33                   | 99-55                |                                                    |                    |                            |
| Sample No.:          | MW99-63-<br>990914                     | MW99-83-<br>990914      |                                 | MW98-33-<br>981215                 | MW98-43-<br>981215      | MW99-55-<br>990914   |                                                    |                    |                            |
| Parameter            |                                        | Duplicate<br>of MW99-63 | RPD <sub>DUP</sub> <sup>7</sup> |                                    | Duplicate<br>of MW98-33 |                      | Limit of<br>Quantitation                           | Community<br>Water | Freshwater<br>Aquatic Life |
| Benzene              | <0.01 <sup>6</sup>                     | <0.01 <sup>6</sup>      | -                               | <2.5 <sup>6</sup>                  | <1 <sup>6</sup>         | <0.0001 <sup>5</sup> | 0.0002                                             | 0.0050             | 0.370                      |
| Toluene              | <0.02 <sup>6</sup>                     | <0.02 <sup>6</sup>      | -                               | <5 <sup>6</sup>                    | <2 <sup>6</sup>         | <0.0002              | 0.0002                                             | ≤0.0024            | 0.002                      |
| Ethylbenzene         | <0.02 <sup>6</sup>                     | <0.02 <sup>6</sup>      | -                               | <5 <sup>6</sup>                    | <2 <sup>6</sup>         | <0.0002              | 0.0002                                             | ≤0.0024            | 0.09                       |
| Xylene(s)            | <0.04 <sup>6</sup>                     | <0.04 <sup>6</sup>      | -                               | <10 <sup>6</sup>                   | <4 <sup>6</sup>         | <0.0004              | 0.0004                                             | ≤0.03              | NG                         |
| TVH <sup>3</sup>     | NA                                     | NA                      | -                               | 132                                | NA                      | NA                   | 0.100                                              | NG                 | NG                         |
| TEH <sup>4</sup>     | NA                                     | NA                      | -                               | <0.100                             | NA                      | NA                   | 0.100                                              | NG                 | NG                         |

Results expressed in milligrams per litre (mg/L)

TVH - total volatile hydrocarbons

TEH - total extractable hydrocarbons

NA - not analyzed

NG - no guideline

<sup>1</sup> - *Canadian Environmental Quality Guidelines*, Canadian Council of Ministers of the Environment (CCME), 1999

<sup>2</sup> - There are no applicable guidelines/criteria for the parameters listed. However, the CCME (1999) Community Water and Freshwater Aquatic Life guidelines are shown for informational purposes only.

<sup>3</sup> - C<sub>5</sub> to C<sub>10</sub>

<sup>4</sup> - C<sub>11</sub> to C<sub>32</sub>

<sup>5</sup> - limit of quantitation lowered due to BTEX components analyzed as part of the volatile organic compounds analyses

<sup>6</sup> - limit of quantitation raised due to sample dilution

**TABLE 11: Summary of Analytical Results for Hydrocarbons in Groundwater**

| Area of Concern:     | Wheel Shop<br>(Drawing W8140B-010) |                     | Diesel Heavy<br>Repair Shop<br>(Drawing W8140B-004) | Environmental Quality<br>Guidelines <sup>1,2</sup> |                 |                            |
|----------------------|------------------------------------|---------------------|-----------------------------------------------------|----------------------------------------------------|-----------------|----------------------------|
| Monitoring Well No.: | 99-56                              | 99-59               | 98-14                                               |                                                    |                 |                            |
| Sample No.:          | MW99-56-<br>990914                 | MW99-59-<br>990914  | MW98-14-<br>981215                                  |                                                    |                 |                            |
| Parameter            |                                    |                     |                                                     | Limit of<br>Quantitation                           | Community Water | Freshwater<br>Aquatic Life |
| Benzene              | <0.001 <sup>6</sup>                | <0.025 <sup>6</sup> | 0.0003                                              | 0.0002                                             | 0.0050          | 0.370                      |
| Toluene              | <0.002 <sup>6</sup>                | <0.05 <sup>6</sup>  | <0.0002                                             | 0.0002                                             | ≤0.0024         | 0.002                      |
| Ethylbenzene         | <0.002 <sup>6</sup>                | <0.05 <sup>6</sup>  | 0.0003                                              | 0.0002                                             | ≤0.0024         | 0.09                       |
| Xylene(s)            | <0.004 <sup>6</sup>                | <0.1 <sup>6</sup>   | 0.0013                                              | 0.0004                                             | ≤0.03           | NG                         |
| TVH <sup>3</sup>     | NA                                 | NA                  | <0.100                                              | 0.100                                              | NG              | NG                         |
| TEH <sup>4</sup>     | NA                                 | NA                  | <0.100                                              | 0.100                                              | NG              | NG                         |

Results expressed in milligrams per litre (mg/L)

TVH - total volatile hydrocarbons

TEH - total extractable hydrocarbons

NA - not analyzed

NG - no guideline

<sup>1</sup> - *Canadian Environmental Quality Guidelines*, Canadian Council of Ministers of the Environment (CCME), 1999

<sup>2</sup> - There are no applicable guidelines/criteria for the parameters listed. However, the CCME (1999) Community Water and Freshwater Aquatic Life guidelines are shown for informational purposes only.

<sup>3</sup> - C<sub>5</sub> to C<sub>10</sub>

<sup>4</sup> - C<sub>11</sub> to C<sub>32</sub>

<sup>5</sup> - limit of quantitation lowered due to BTEX components analyzed as part of the volatile organic compounds analyses

<sup>6</sup> - limit of quantitation raised due to sample dilution

**TABLE 12: Summary of Analytical Results for PAHs in Groundwater**

| Area of Concern:       | Former Locomotive Fuelling Facility (Drawing W8140B-003) | Above Ground Diesel Fuel Storage Tanks (Drawing W8140B-005) | Former Tank Car Cleaning Area (Drawing W8140B-007) | Former Leaking Tank Car Area (Drawing W8140B-008) | Environmental Quality Guidelines <sup>1,2</sup> |                 |                         |
|------------------------|----------------------------------------------------------|-------------------------------------------------------------|----------------------------------------------------|---------------------------------------------------|-------------------------------------------------|-----------------|-------------------------|
| Monitoring Well No.:   | 98-2                                                     | 98-19                                                       | 98-24                                              | 98-25                                             |                                                 |                 |                         |
| Sample No.:            | MW98-2-981215                                            | MW98-19-981215                                              | MW98-24-981215                                     | MW98-25-981215                                    |                                                 |                 |                         |
| Parameter              |                                                          |                                                             |                                                    |                                                   | Limit of Quantitation                           | Community Water | Freshwater Aquatic Life |
| Acenaphthene           | <0.001 <sup>3</sup>                                      | <0.000050                                                   | 0.000781                                           | <0.000050                                         | 0.000050                                        | NG              | 0.0058                  |
| Acenaphthylene         | <0.001 <sup>3</sup>                                      | <0.000050                                                   | <0.000050                                          | <0.000050                                         | 0.000050                                        | NG              | NG                      |
| Anthracene             | <0.001 <sup>3</sup>                                      | <0.000050                                                   | 0.000666                                           | <0.000050                                         | 0.000050                                        | NG              | 0.000012                |
| Benzo(a)anthracene     | <0.001 <sup>3</sup>                                      | <0.000050                                                   | 0.00122                                            | <0.000050                                         | 0.000050                                        | NG              | 0.000018                |
| Benzo(a)pyrene         | <0.002 <sup>3</sup>                                      | 0.000023                                                    | 0.000235                                           | <0.000010                                         | 0.000010                                        | 0.00001         | 0.000015                |
| Benzo(b)fluoranthene   | <0.001 <sup>3</sup>                                      | <0.000050                                                   | 0.000264                                           | <0.000050                                         | 0.000050                                        | NG              | NG                      |
| Benzo(k)fluoranthene   | <0.001 <sup>3</sup>                                      | <0.000050                                                   | 0.000273                                           | <0.000050                                         | 0.000050                                        | NG              | NG                      |
| Benzo(g,h,i)perylene   | <0.001 <sup>3</sup>                                      | <0.000050                                                   | 0.000089                                           | <0.000050                                         | 0.000050                                        | NG              | NG                      |
| Chrysene               | <0.001 <sup>3</sup>                                      | <0.000050                                                   | 0.000652                                           | <0.000050                                         | 0.000050                                        | NG              | NG                      |
| Dibenzo(a,h)anthracene | <0.001 <sup>3</sup>                                      | <0.000050                                                   | <0.000050                                          | <0.000050                                         | 0.000050                                        | NG              | NG                      |
| Fluoranthene           | <0.001 <sup>3</sup>                                      | 0.000060                                                    | 0.0125                                             | <0.000050                                         | 0.000050                                        | NG              | 0.00004                 |
| Fluorene               | 0.00490                                                  | <0.000050                                                   | 0.00128                                            | <0.000050                                         | 0.000050                                        | NG              | 0.003                   |
| Indeno(1,2,3-cd)pyrene | <0.001 <sup>3</sup>                                      | <0.000050                                                   | 0.000133                                           | <0.000050                                         | 0.000050                                        | NG              | NG                      |
| Naphthalene            | 0.0328                                                   | <0.000050                                                   | 0.000708                                           | <0.000050                                         | 0.000050                                        | NG              | 0.0011                  |
| 1-Methylnaphthalene    | 0.0601                                                   | <0.000050                                                   | 0.00133                                            | <0.000050                                         | 0.000050                                        | NG              | NG                      |
| 2-Methylnaphthalene    | 0.0713                                                   | <0.000050                                                   | 0.00144                                            | <0.000050                                         | 0.000050                                        | NG              | NG                      |
| Phenanthrene           | 0.00278                                                  | <0.000050                                                   | 0.00118                                            | <0.000050                                         | 0.000050                                        | NG              | 0.0004                  |
| Pyrene                 | <0.001 <sup>3</sup>                                      | 0.000061                                                    | 0.00736                                            | <0.000050                                         | 0.000050                                        | NG              | 0.000025                |

Results expressed in milligrams per litre (mg/L)

NG - no guideline

<sup>1</sup> - Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment (CCME), 1999<sup>2</sup> - There are no applicable guidelines/criteria for the parameters listed. However, the CCME (1999) Community Water and Freshwater Aquatic Life guidelines are shown for informational purposes only.<sup>3</sup> - limit of quantitation raised due to sample dilution

**TABLE 13: Summary of Analytical Results for VOCs in Groundwater**

| Area of Concern:          | Former Leaking Tank<br>Car Area<br>(Drawing W8140B-008) |                    | Component Shop<br>(Drawing W8140B-010) |                                                   | Environmental<br>Quality<br>Guidelines <sup>1,2</sup> |                    |                            |
|---------------------------|---------------------------------------------------------|--------------------|----------------------------------------|---------------------------------------------------|-------------------------------------------------------|--------------------|----------------------------|
| Monitoring Well No.:      | 98-25                                                   | 98-26              | 98-35                                  | 98-35                                             |                                                       |                    |                            |
| Sample No.:               | MW98-25-<br>981215                                      | MW98-26-<br>981215 | MW98-35-<br>981215                     | MW98-38-<br>981215<br>Duplicate<br>of MW98-<br>35 | Limit of<br>Quantitation                              | Community<br>Water | Freshwater<br>Aquatic Life |
| Parameter                 |                                                         |                    |                                        |                                                   |                                                       |                    |                            |
| Acetone                   | <0.01                                                   | <0.01              | <10 <sup>3</sup>                       | <10 <sup>3</sup>                                  | 0.010                                                 | NG                 | NG                         |
| Carbon Tetrachloride      | <0.0002                                                 | <0.0002            | <0.2 <sup>3</sup>                      | <0.2 <sup>3</sup>                                 | 0.0002                                                | 0.005              | 0.0133                     |
| Chloroethane              | <0.0005                                                 | <0.0005            | <0.5 <sup>3</sup>                      | <0.5 <sup>3</sup>                                 | 0.0005                                                | NG                 | NG                         |
| Chloroform                | <0.0002                                                 | <0.0002            | <0.2 <sup>3</sup>                      | <0.2 <sup>3</sup>                                 | 0.0002                                                | NG                 | 0.0018                     |
| Chloromethane             | <0.001                                                  | <0.001             | <1 <sup>3</sup>                        | <1 <sup>3</sup>                                   | 0.001                                                 | NG                 | NG                         |
| 1,1-Dichloroethane        | <0.0002                                                 | <0.0002            | 0.910                                  | 0.985                                             | 0.0002                                                | NG                 | NG                         |
| 1,2-Dichloroethane        | 0.0004                                                  | <0.002             | <0.2 <sup>3</sup>                      | <0.2 <sup>3</sup>                                 | 0.0002                                                | 0.005              | 0.1                        |
| 1,1-Dichloroethene        | <0.0002                                                 | <0.0002            | 3.040                                  | 3.390                                             | 0.0002                                                | 0.014              | NG                         |
| cis-1,2-Dichloroethene    | <0.0002                                                 | <0.0002            | 3.640                                  | 4.490                                             | 0.0002                                                | NG                 | NG                         |
| trans-1,2-Dichloroethene  | <0.0002                                                 | <0.0002            | <0.2 <sup>3</sup>                      | <0.2 <sup>3</sup>                                 | 0.0002                                                | NG                 | NG                         |
| Dichloromethane           | <0.001                                                  | <0.0002            | <1 <sup>3</sup>                        | <1 <sup>3</sup>                                   | 0.001                                                 | 0.05               | 0.0981                     |
| Styrene                   | <0.0002                                                 | <0.0002            | <0.2 <sup>3</sup>                      | <0.2 <sup>3</sup>                                 | 0.0002                                                | NG                 | 0.072                      |
| 1,1,1,2-Tetrachloroethane | <0.0002                                                 | <0.0002            | <0.2 <sup>3</sup>                      | <0.2 <sup>3</sup>                                 | 0.0002                                                | NG                 | NG                         |
| 1,1,2,2-Tetrachloroethane | <0.0002                                                 | <0.0002            | <0.2 <sup>3</sup>                      | <0.2 <sup>3</sup>                                 | 0.0002                                                | NG                 | NG                         |
| Tetrachloroethene         | <0.0002                                                 | <0.0002            | 0.570                                  | 0.788                                             | 0.0002                                                | 0.03               | 0.111                      |
| Trichloroethene           | <0.0002                                                 | <0.0002            | 11.8                                   | 11.6                                              | 0.0002                                                | 0.05               | 0.021                      |
| 1,1,1-Trichloroethane     | <0.0002                                                 | <0.0002            | 1.45                                   | 1.71                                              | 0.0002                                                | NG                 | NG                         |
| 1,1,2-Trichloroethane     | <0.0002                                                 | <0.0002            | <0.2 <sup>3</sup>                      | <0.2 <sup>3</sup>                                 | 0.0002                                                | NG                 | NG                         |
| Vinyl Chloride            | <0.0005                                                 | <0.0002            | 0.560                                  | 0.612                                             | 0.0005                                                | 0.002              | NG                         |

Results expressed in milligrams per litre (mg/L)

NG - no guideline

<sup>1</sup> - *Canadian Environmental Quality Guidelines*, Canadian Council of Ministers of the Environment (CCME), 1999<sup>2</sup> - There are no applicable guidelines/criteria for the parameters listed. However, the CCME (1999) Community Water and Freshwater Aquatic Life guidelines are shown for informational purposes only.<sup>3</sup> - limit of quantitation raised due to sample dilution<sup>4</sup> - detected below limit of quantitation but passed compound identification criteria

**TABLE 13: Summary of Analytical Results for VOCs in Groundwater**

| Area of Concern:          |                     | Component Shop<br>(Drawing W8140B-010) |                     |                             |                          | Environmental<br>Quality<br>Guidelines <sup>1,2</sup> |                            |
|---------------------------|---------------------|----------------------------------------|---------------------|-----------------------------|--------------------------|-------------------------------------------------------|----------------------------|
| Monitoring Well No.:      | 99-60               | 99-61                                  | 99-63               | 99-63                       |                          |                                                       |                            |
| Sample No.:               | MW99-60-<br>990914  | MW99-61-<br>990914                     | MW99-63-<br>990914  | MW99-83-<br>990914          |                          |                                                       |                            |
| Parameter                 |                     |                                        |                     | Duplicate<br>of MW99-<br>63 | Limit of<br>Quantitation | Community<br>Water                                    | Freshwater<br>Aquatic Life |
| Acetone                   | <0.010              | <0.25                                  | <0.05 <sup>3</sup>  | <0.05 <sup>3</sup>          | 0.010                    | NG                                                    | NG                         |
| Carbon Tetrachloride      | <0.0002             | <0.005                                 | <0.020 <sup>3</sup> | <0.020 <sup>3</sup>         | 0.0002                   | 0.005                                                 | 0.0133                     |
| Chloroethane              | 0.0003 <sup>4</sup> | <0.0125                                | 0.088               | 0.088                       | 0.0005                   | NG                                                    | NG                         |
| Chloroform                | <0.0002             | 0.0088                                 | <0.020 <sup>3</sup> | <0.020 <sup>3</sup>         | 0.0002                   | NG                                                    | 0.0018                     |
| Chloromethane             | <0.001              | <0.025                                 | <0.60 <sup>3</sup>  | <0.100 <sup>2</sup>         | 0.001                    | NG                                                    | NG                         |
| 1,1-Dichloroethane        | 0.0191              | 0.0192                                 | 0.720               | 0.742                       | 0.0002                   | NG                                                    | NG                         |
| 1,2-Dichloroethane        | <0.0002             | <0.005                                 | 0.020               | 0.020                       | 0.0002                   | 0.005                                                 | 0.1                        |
| 1,1-Dichloroethene        | 0.0003              | 0.0886                                 | 0.445               | 0.466                       | 0.0002                   | 0.014                                                 | NG                         |
| cis-1,2-Dichloroethene    | 0.0266              | 0.0074                                 | 0.207               | 0.214                       | 0.0002                   | NG                                                    | NG                         |
| trans-1,2-Dichloroethene  | 0.0022              | <0.005                                 | <0.020 <sup>3</sup> | <0.020 <sup>3</sup>         | 0.0002                   | NG                                                    | NG                         |
| Dichloromethane           | <0.001              | <0.025                                 | <0.100 <sup>3</sup> | <0.100 <sup>3</sup>         | 0.001                    | 0.05                                                  | 0.0981                     |
| Styrene                   | <0.0002             | <0.005                                 | <0.020 <sup>3</sup> | <0.020 <sup>3</sup>         | 0.0002                   | NG                                                    | 0.072                      |
| 1,1,1,2-Tetrachloroethane | <0.0002             | <0.005                                 | <0.020 <sup>3</sup> | <0.020 <sup>3</sup>         | 0.0002                   | NG                                                    | NG                         |
| 1,1,2,2-Tetrachloroethane | <0.0002             | <0.005                                 | <0.020 <sup>3</sup> | <0.020 <sup>3</sup>         | 0.0002                   | NG                                                    | NG                         |
| Tetrachloroethene         | 0.0001 <sup>4</sup> | 0.0491                                 | <0.020 <sup>3</sup> | <0.020 <sup>3</sup>         | 0.0002                   | 0.03                                                  | 0.111                      |
| Trichloroethene           | 0.0022              | 0.307                                  | 0.111               | 0.114                       | 0.0002                   | 0.05                                                  | 0.021                      |
| 1,1,1-Trichloroethane     | 0.0001 <sup>4</sup> | 0.0339                                 | 0.905               | 0.957                       | 0.0002                   | NG                                                    | NG                         |
| 1,1,2-Trichloroethane     | <0.0002             | <0.005                                 | <0.020 <sup>3</sup> | <0.020 <sup>3</sup>         | 0.0002                   | NG                                                    | NG                         |
| Vinyl Chloride            | 0.0215              | <0.0125                                | 0.032               | 0.034                       | 0.0005                   | 0.002                                                 | NG                         |

Results expressed in milligrams per litre (mg/L)

NG - no guideline

<sup>1</sup> - *Canadian Environmental Quality Guidelines*, Canadian Council of Ministers of the Environment (CCME), 1999<sup>2</sup> - There are no applicable guidelines/criteria for the parameters listed. However, the CCME (1999) Community Water and Freshwater Aquatic Life guidelines are shown for informational purposes only.<sup>3</sup> - limit of quantitation raised due to sample dilution<sup>4</sup> - detected below limit of quantitation but passed compound identification criteria

**TABLE 13: Summary of Analytical Results for VOCs in Groundwater**

| Area of Concern:          |                             | Wheel Shop<br>(Drawing W8140B-010) |                    |                     |                     | Environmental<br>Quality<br>Guidelines <sup>1,2</sup> |                    |                            |
|---------------------------|-----------------------------|------------------------------------|--------------------|---------------------|---------------------|-------------------------------------------------------|--------------------|----------------------------|
| Monitoring Well No.:      | 98-33                       | 98-33                              | 99-55              | 99-56               | 99-59               |                                                       |                    |                            |
| Sample No.:               | MW98-33-<br>981215          | MW98-43-<br>981215                 | MW99-55-<br>990914 | MW99-56-<br>990914  | MW99-59-<br>990914  |                                                       |                    |                            |
| Parameter                 | Duplicate<br>of MW98-<br>33 |                                    |                    |                     |                     | Limit of<br>Quantitation                              | Community<br>Water | Freshwater<br>Aquatic Life |
| Acetone                   | <250 <sup>3</sup>           | <100 <sup>3</sup>                  | <0.010             | <0.10 <sup>2</sup>  | <2.5 <sup>3</sup>   | 0.010                                                 | NG                 | NG                         |
| Carbon Tetrachloride      | <5 <sup>3</sup>             | <2 <sup>3</sup>                    | <0.0002            | <0.002 <sup>2</sup> | <0.050 <sup>3</sup> | 0.0002                                                | 0.005              | 0.0133                     |
| Chloroethane              | <12.5 <sup>3</sup>          | <5 <sup>3</sup>                    | <0.0005            | <0.005 <sup>3</sup> | <0.125 <sup>3</sup> | 0.0005                                                | NG                 | NG                         |
| Chloroform                | <5 <sup>3</sup>             | <2 <sup>3</sup>                    | <0.0002            | <0.002 <sup>3</sup> | <0.050 <sup>3</sup> | 0.0002                                                | NG                 | 0.0018                     |
| Chloromethane             | <25 <sup>3</sup>            | <10 <sup>3</sup>                   | <0.001             | <0.01 <sup>3</sup>  | <0.250 <sup>3</sup> | 0.001                                                 | NG                 | NG                         |
| 1,1-Dichloroethane        | <5 <sup>3</sup>             | <2 <sup>3</sup>                    | <0.0002            | <0.0026             | <0.050 <sup>3</sup> | 0.0002                                                | NG                 | NG                         |
| 1,2-Dichloroethane        | <5 <sup>3</sup>             | <2 <sup>3</sup>                    | <0.0002            | <0.002 <sup>3</sup> | <0.050 <sup>3</sup> | 0.0002                                                | 0.005              | 0.1                        |
| 1,1-Dichloroethene        | <5 <sup>3</sup>             | <2 <sup>3</sup>                    | <0.0002            | <0.002 <sup>3</sup> | <0.050 <sup>3</sup> | 0.0002                                                | 0.014              | NG                         |
| cis-1,2-Dichloroethene    | <5 <sup>3</sup>             | <2 <sup>3</sup>                    | <0.0002            | 0.0018              | 16.200              | 0.0002                                                | NG                 | NG                         |
| trans-1,2-Dichloroethene  | <5 <sup>3</sup>             | <2 <sup>3</sup>                    | <0.0002            | <0.002 <sup>3</sup> | 0.048               | 0.0002                                                | NG                 | NG                         |
| Dichloromethane           | <25 <sup>3</sup>            | <10 <sup>3</sup>                   | <0.001             | <0.01 <sup>3</sup>  | <0.250 <sup>3</sup> | 0.001                                                 | 0.05               | 0.0981                     |
| Styrene                   | <5 <sup>3</sup>             | <2 <sup>3</sup>                    | <0.0002            | <0.002 <sup>3</sup> | <0.050 <sup>3</sup> | 0.0002                                                | NG                 | 0.072                      |
| 1,1,1,2-Tetrachloroethane | <5 <sup>3</sup>             | <2 <sup>3</sup>                    | <0.0002            | <0.002 <sup>3</sup> | <0.050 <sup>3</sup> | 0.0002                                                | NG                 | NG                         |
| 1,1,2,2-Tetrachloroethane | <5 <sup>3</sup>             | <2 <sup>3</sup>                    | <0.0002            | <0.002 <sup>3</sup> | <0.050 <sup>3</sup> | 0.0002                                                | NG                 | NG                         |
| Tetrachloroethene         | 133                         | 101                                | <0.0002            | 0.101               | <0.050 <sup>3</sup> | 0.0002                                                | 0.03               | 0.111                      |
| Trichloroethene           | <5 <sup>3</sup>             | <2 <sup>3</sup>                    | <0.0002            | <0.002 <sup>3</sup> | 0.046               | 0.0002                                                | 0.05               | 0.021                      |
| 1,1,1-Trichloroethane     | <5 <sup>3</sup>             | <2 <sup>3</sup>                    | <0.0002            | 0.0067              | <0.050 <sup>3</sup> | 0.0002                                                | NG                 | NG                         |
| 1,1,2-Trichloroethane     | <5 <sup>3</sup>             | <2 <sup>3</sup>                    | <0.0002            | <0.002 <sup>3</sup> | <0.050 <sup>3</sup> | 0.0002                                                | NG                 | NG                         |
| Vinyl Chloride            | <12.5 <sup>3</sup>          | <5 <sup>3</sup>                    | <0.0005            | <0.005              | 1.260               | 0.0005                                                | 0.002              | NG                         |

Results expressed in milligrams per litre (mg/L)

NG - no guideline

<sup>1</sup> - Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment (CCME), 1999<sup>2</sup> - There are no applicable guidelines/criteria for the parameters listed. However, the CCME (1999) Community Water and Freshwater Aquatic Life guidelines are shown for informational purposes only.<sup>3</sup> - limit of quantitation raised due to sample dilution<sup>4</sup> - detected below limit of quantitation but passed compound identification criteria

**TABLE 14: Summary of Analytical Results for Metals in Groundwater**

| Area of Concern:      | Former Tank Car Cleaning Area<br>(Drawing W8140B-007) | Former Leaking Tank Car Area<br>(Drawing W8140B-008) |                |                | Component Shop<br>(Drawing W8140B-010) |                       | Environmental Quality Guidelines <sup>1,2</sup> |                              |
|-----------------------|-------------------------------------------------------|------------------------------------------------------|----------------|----------------|----------------------------------------|-----------------------|-------------------------------------------------|------------------------------|
| Monitoring Well No.:  | 98-24                                                 | 98-25                                                | 98-26          | 98-35          | 99-61                                  |                       |                                                 |                              |
| Sample No.:           | BH98-24-981215                                        | BH98-25-981215                                       | BH98-26-981215 | MW98-35-981215 | MW99-61-990914                         |                       |                                                 |                              |
| Parameter             |                                                       |                                                      |                |                |                                        | Limit of Quantitation | Community Water                                 | Freshwater Aquatic Life      |
| Hardness <sup>3</sup> | 599                                                   | 657                                                  | 3,625          | 745            | 2,120                                  | -                     | NG                                              | NG                           |
| Antimony              | <0.002                                                | <0.002                                               | <0.002         | <0.002         | 0.0041                                 | 0.002                 | 0.006                                           | NG                           |
| Arsenic               | 0.007                                                 | <0.002                                               | 0.005          | 0.003          | 0.004                                  | 0.002                 | 0.025                                           | 0.005                        |
| Barium                | 0.247                                                 | 0.051                                                | 0.043          | 0.047          | 0.413                                  | 0.005                 | 1.0                                             | NG                           |
| Beryllium             | <0.005                                                | <0.005                                               | <0.005         | <0.005         | <0.001 <sup>4</sup>                    | 0.005                 | NG                                              | NG                           |
| Cadmium               | <0.0005                                               | <0.0005                                              | <0.0005        | <0.0005        | 0.0002 <sup>4</sup>                    | 0.0005                | 0.005                                           | 0.002 - 0.00038 <sup>6</sup> |
| Chromium              | <0.002                                                | 0.002                                                | <0.002         | <0.002         | <0.050 <sup>5</sup>                    | 0.002                 | 0.05                                            | NG                           |
| Cobalt                | 0.002                                                 | 0.002                                                | 0.009          | 0.003          | 0.0012                                 | 0.001                 | NG                                              | NG                           |
| Copper                | <0.002                                                | <0.002                                               | <0.002         | <0.002         | 0.0062                                 | 0.002                 | ≤1.0                                            | 0.004 (hardness >180 mg/L)   |
| Iron                  | 2.39                                                  | 0.03                                                 | <0.02          | <0.02          | 0.03                                   | 0.02                  | ≤0.3                                            | 0.3                          |
| Lead                  | 0.0002                                                | 0.0005                                               | <0.0001        | <0.0001        | <0.0005 <sup>4</sup>                   | 0.0001                | 0.0100                                          | 0.007 (hardness >180 mg/L)   |
| Manganese             | 0.517                                                 | 0.600                                                | 1.67           | 0.942          | 0.859                                  | 0.002                 | ≤0.05                                           | NG                           |
| Molybdenum            | 0.008                                                 | 0.003                                                | 0.002          | 0.007          | 0.007                                  | 0.002                 | NG                                              | 0.073                        |
| Nickel                | 0.003                                                 | 0.008                                                | 0.022          | 0.015          | 0.016                                  | 0.002                 | NG                                              | 0.150 (hardness >180 mg/L)   |
| Selenium              | <0.002                                                | <0.002                                               | <0.002         | <0.002         | <0.002                                 | 0.002                 | 0.01                                            | 0.001                        |
| Silver                | <0.0005                                               | <0.0005                                              | <0.0005        | <0.0005        | <0.0001 <sup>4</sup>                   | 0.0005                | NG                                              | 0.0001                       |
| Vanadium              | <0.002                                                | <0.002                                               | <0.002         | <0.002         | 0.0047                                 | 0.0020                | NG                                              | NG                           |
| Zinc                  | 0.003                                                 | 0.025                                                | 0.006          | 0.047          | 0.156                                  | 0.002                 | ≤5.0                                            | 0.03                         |

Results expressed in milligrams per litre (mg/L)

NG - no guideline

<sup>1</sup> - Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment (CCME), 1999<sup>2</sup> - There are no applicable guidelines/criteria for the parameters listed. However, the CCME (1999) Community Water and Freshwater Aquatic Life guidelines are shown for informational purposes only.<sup>3</sup> - calculated using: total hardness =  $2.5(\text{Ca}^{2+}) + 4.1(\text{Mg}^{2+})$  as  $\text{CaCO}_3$ <sup>4</sup> - limit of quantitation changed due to laboratory limit of quantitation study<sup>5</sup> - limit of quantitation raised due to sample dilution<sup>6</sup> - guideline changes with hardness

**TABLE 14: Summary of Analytical Results for Metals in Groundwater**

| Area of Concern:      | Component Shop<br>(Drawing W8140B-010) | Wheel Shop<br>(Drawing W8140B-010) |                      |                      |                      | Environmental Quality Guidelines <sup>1, 2</sup> |                 |                              |
|-----------------------|----------------------------------------|------------------------------------|----------------------|----------------------|----------------------|--------------------------------------------------|-----------------|------------------------------|
| Monitoring Well No.:  | 99-63                                  | 98-33                              | 99-56                | 99-59                | 99-59                |                                                  |                 |                              |
| Sample No.:           | MW99-63-990914                         | MW98-33-981215                     | MW99-56-990914       | MW99-59-990914       | MW99-82-990914       |                                                  |                 |                              |
| Parameter             |                                        |                                    |                      |                      | Duplicate of MW99-59 | Limit of Quantitation                            | Community Water | Freshwater Aquatic Life      |
| Hardness <sup>3</sup> | 1,545                                  | 1,161                              | 517                  | 1,366                | 1,313                | -                                                | NG              | NG                           |
| Antimony              | 0.0079                                 | <0.002                             | 0.0091               | 0.0075               | 0.0037               | 0.002                                            | 0.006           | NG                           |
| Arsenic               | 0.003                                  | 0.002                              | <0.002               | 0.008                | 0.008                | 0.002                                            | 0.025           | 0.005                        |
| Barium                | 0.578                                  | 0.056                              | 1.36                 | 0.564                | 0.359                | 0.005                                            | 1.0             | NG                           |
| Beryllium             | <0.001 <sup>4</sup>                    | <0.005                             | <0.001 <sup>4</sup>  | <0.001 <sup>4</sup>  | <0.001 <sup>4</sup>  | 0.005                                            | NG              | NG                           |
| Cadmium               | <0.0001 <sup>4</sup>                   | <0.0005                            | <0.0001 <sup>4</sup> | <0.0001 <sup>4</sup> | <0.0001 <sup>4</sup> | 0.0005                                           | 0.0050          | 0.002 - 0.00038 <sup>6</sup> |
| Chromium              | <0.050 <sup>5</sup>                    | <0.002                             | <0.050 <sup>5</sup>  | <0.050 <sup>5</sup>  | <0.050 <sup>5</sup>  | 0.002                                            | 0.050           | NG                           |
| Cobalt                | 0.0027                                 | 0.001                              | 0.0001               | 0.0037               | 0.0036               | 0.001                                            | NG              | NG                           |
| Copper                | 0.0044                                 | 0.007                              | 0.0020               | <0.0005 <sup>4</sup> | <0.0005 <sup>4</sup> | 0.002                                            | ≤1.0            | 0.004 (hardness >180 mg/L)   |
| Iron                  | 0.03                                   | <0.02                              | <0.03 <sup>4</sup>   | 6.81                 | 6.41                 | 0.02                                             | ≤0.3            | 0.3                          |
| Lead                  | <0.0005 <sup>4</sup>                   | 0.0006                             | <0.0005 <sup>4</sup> | 0.0005 <sup>4</sup>  | <0.0005 <sup>4</sup> | 0.0001                                           | 0.0100          | 0.007 (hardness >180 mg/L)   |
| Manganese             | 0.860                                  | 0.373                              | 0.131                | 1.95                 | 1.89                 | 0.002                                            | ≤0.05           | NG                           |
| Molybdenum            | 0.014                                  | 0.005                              | 0.009                | 0.004                | 0.004                | 0.002                                            | NG              | 0.073                        |
| Nickel                | 0.013                                  | 0.008                              | 0.005                | 0.009                | 0.009                | 0.002                                            | NG              | 0.150 (hardness >180 mg/L)   |
| Selenium              | 0.002                                  | 0.005                              | <0.002               | <0.002               | <0.002               | 0.002                                            | 0.01            | 0.001                        |
| Silver                | <0.0001 <sup>4</sup>                   | <0.0005                            | <0.0001 <sup>4</sup> | <0.0001 <sup>4</sup> | <0.0001 <sup>4</sup> | 0.0005                                           | NG              | 0.0001                       |
| Vanadium              | 0.0046                                 | <0.002                             | 0.0035               | 0.0036               | 0.0037               | 0.002                                            | NG              | NG                           |
| Zinc                  | 0.233                                  | 0.019                              | 0.249                | 0.076                | 0.027                | 0.002                                            | ≤5.0            | 0.03                         |

Results expressed in milligrams per litre (mg/L)

NG - no guideline

<sup>1</sup> - Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment (CCME), 1999<sup>2</sup> - There are no applicable guidelines/criteria for the parameters listed. However, the CCME (1999) Community Water and Freshwater Aquatic Life guidelines are shown for informational purposes only.<sup>3</sup> - calculated using: total hardness =  $2.5(\text{Ca}^{2+}) + 4.1(\text{Mg}^{2+})$  as  $\text{CaCO}_3$ <sup>4</sup> - limit of quantitation changed due to laboratory limit of quantitation study<sup>5</sup> - limit of quantitation raised due to sample dilution<sup>6</sup> - guideline changes with hardness

**TABLE 15: Summary of Analytical Results for Hydrocarbons in Soil - QA/QC**

| Area of Concern:                 |                 | Former Locomotive Fuelling Facility (Drawing W8140B-003) |                                 |                      |                                 | Environmental Quality Guidelines <sup>1</sup> |                     |
|----------------------------------|-----------------|----------------------------------------------------------|---------------------------------|----------------------|---------------------------------|-----------------------------------------------|---------------------|
| Borehole/Test Pit No.:           | BH 98-3         | BH 98-3                                                  | BH 99-36                        | BH 99-36             |                                 |                                               |                     |
| Sample No.:                      | BH98-3-3-981109 | BH98-3-3-981109                                          | BH99-36-3-990713                | BH99-36-8-990713     |                                 |                                               |                     |
| Depth (m):                       | 2.4             | 2.4                                                      | 2.1                             | 2.1                  |                                 |                                               |                     |
| Soil Vapour Concentration (ppm): | 990             | duplicate of 98-3-3                                      | 1,000                           | duplicate of 99-36-3 |                                 |                                               |                     |
| Visual Soil Classification:      | silt            | silt                                                     | silt                            | silt                 |                                 |                                               |                     |
| Parameter                        |                 |                                                          | RPD <sub>DUP</sub> <sup>7</sup> |                      | RPD <sub>DUP</sub> <sup>7</sup> | Limit of Quantitation                         | Industrial Land Use |
| Benzene                          | 0.24            | 0.16                                                     | 40%                             | <0.02                | <0.02                           | -                                             | 39 <sup>5</sup>     |
| Toluene                          | 0.47            | 0.43                                                     | 9%                              | 0.84                 | 0.74                            | 13%                                           | 14 <sup>5</sup>     |
| Ethylbenzene                     | 6.60            | 5.79                                                     | 13%                             | 6.51                 | 1.24                            | 136%                                          | 20                  |
| Xylene(s)                        | 35.8            | 24.8                                                     | 36%                             | 30.7                 | 8.20                            | 116%                                          | 20                  |
| TVH <sup>2</sup>                 | 857             | 784                                                      | 9%                              | 1,090                | 638                             | 52%                                           | 800 <sup>6</sup>    |
| TEH <sup>3</sup>                 | 7,830           | 6,010                                                    | 26%                             | 6,160                | 4,240                           | 37%                                           | 2,000 <sup>6</sup>  |

Results expressed in milligrams per dry kilogram (mg/kg)

TVH - total volatile hydrocarbons

TEH - total extractable hydrocarbons

RPD<sub>DUP</sub> - relative percent difference between duplicate samples

<sup>1</sup> - Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment (CCME), 1999

<sup>2</sup> - C<sub>5</sub> to C<sub>10</sub>

<sup>3</sup> - C<sub>11</sub> to C<sub>32</sub>

<sup>4</sup> - limit of quantitation raised due to sample dilution

<sup>5</sup> - Provisional Soil Quality Guidelines for Environmental Health (SQGE), CCME, 1999

<sup>6</sup> - A Guideline for the Environmental Investigation and Remediation of Petroleum Storage Sites in Manitoba, Manitoba Environment, July 1993

<sup>7</sup> - RPD<sub>DUP</sub> - can only be calculated when the concentrations are above the practical quantitation limit which is defined as five times the limit of quantitation

**TABLE 15: Summary of Analytical Results for Hydrocarbons in Soil - QA/QC**

| Area of Concern:                    | Former Locomotive Fuelling Facility<br>(Drawing W8140B-003) |                         |                                 | Above Ground Diesel Fuel Storage Tanks<br>(Drawing W8140B-006) |                         |                                 |                      | Environmental<br>Quality<br>Guidelines <sup>1</sup> |                                 |                          |                        |
|-------------------------------------|-------------------------------------------------------------|-------------------------|---------------------------------|----------------------------------------------------------------|-------------------------|---------------------------------|----------------------|-----------------------------------------------------|---------------------------------|--------------------------|------------------------|
| Borehole/Test Pit No.:              | BH 99-58                                                    | BH 99-58                |                                 | TP 98-1                                                        | TP 98-1                 |                                 | BH 98-19             | BH 98-19                                            |                                 |                          |                        |
| Sample No.:                         | BH99-58-3-<br>990720                                        | BH99-58-8-<br>990720    |                                 | TP98-1-2-<br>981118                                            | TP98-1-5-<br>981118     |                                 | BH98-19-8-<br>981112 | BH98-19-<br>12-981112                               |                                 |                          |                        |
| Depth (m):                          | 1.8                                                         | 1.8                     |                                 | 0.7                                                            | 0.7                     |                                 | 1.1                  | 1.1                                                 |                                 |                          |                        |
| Soil Vapour<br>Concentration (ppm): | 800                                                         | duplicate<br>of 99-58-3 |                                 | 125                                                            | duplicate<br>of 98-1-2  |                                 | 230                  | duplicate<br>of 98-19-8                             |                                 |                          |                        |
| Visual Soil<br>Classification:      | silt                                                        | silt                    |                                 | sand and<br>gravel fill                                        | sand and<br>gravel fill |                                 | sand fill            | sand fill                                           |                                 |                          |                        |
| Parameter                           |                                                             |                         | RPD <sub>DUP</sub> <sup>7</sup> |                                                                |                         | RPD <sub>DUP</sub> <sup>7</sup> |                      |                                                     | RPD <sub>DUP</sub> <sup>7</sup> | Limit of<br>Quantitation | Industrial Land<br>Use |
| Benzene                             | <0.02                                                       | <0.02                   | -                               | <0.02                                                          | <0.02                   | -                               | 0.03                 | 0.04                                                | -                               | 0.02                     | 39 <sup>5</sup>        |
| Toluene                             | <0.02                                                       | <0.02                   | -                               | 0.07                                                           | 0.06                    | -                               | 0.06                 | 0.08                                                | -                               | 0.02                     | 14 <sup>5</sup>        |
| Ethylbenzene                        | 1.86                                                        | 2.28                    | 20%                             | 0.26                                                           | 0.24                    | 8%                              | 0.06                 | 0.14                                                | -                               | 0.02                     | 20                     |
| Xylene(s)                           | 8.11                                                        | 10.9                    | 29%                             | 1.06                                                           | 0.61                    | 54%                             | 0.20                 | 0.27                                                | 30%                             | 0.04                     | 20                     |
| TVH <sup>2</sup>                    | 253                                                         | 332                     | 27%                             | 82                                                             | 61                      | 29%                             | <10                  | <10                                                 | -                               | 10                       | 800 <sup>6</sup>       |
| TEH <sup>3</sup>                    | 6,040                                                       | 7,550                   | 22%                             | 3,550                                                          | 3,020                   | 16%                             | 26,600               | 36,100                                              | 30%                             | 10                       | 2,000 <sup>6</sup>     |

Results expressed in milligrams per dry kilogram (mg/kg)

TVH - total volatile hydrocarbons

TEH - total extractable hydrocarbons

RPD<sub>DUP</sub> - relative percent difference between duplicate samples

<sup>1</sup> - Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment (CCME), 1999

<sup>2</sup> - C<sub>5</sub> to C<sub>10</sub>

<sup>3</sup> - C<sub>11</sub> to C<sub>32</sub>

<sup>4</sup> - limit of quantitation raised due to sample dilution

<sup>5</sup> - Provisional Soil Quality Guidelines for Environmental Health (SQGE), CCME, 1999

<sup>6</sup> - A Guideline for the Environmental Investigation and Remediation of Petroleum Storage Sites in Manitoba, Manitoba Environment, July 1993

<sup>7</sup> - RPD<sub>DUP</sub> - can only be calculated when the concentrations are above the practical quantitation limit which is defined as five times the limit of quantitation

**TABLE 16: Summary of Analytical Results for Hydrocarbons in Groundwater - QA/QC**

| Area of Concern:     | Former Locomotive Fuelling Facility<br>(Drawing W8140B-003) |                        |                                 | Frog Shop<br>(Drawing W8140B-006) |                         |                                 | Environmental Quality<br>Guidelines <sup>1, 2</sup> |                    |                            |
|----------------------|-------------------------------------------------------------|------------------------|---------------------------------|-----------------------------------|-------------------------|---------------------------------|-----------------------------------------------------|--------------------|----------------------------|
| Monitoring Well No.: | 98-2                                                        | 98-44                  |                                 | 98-34                             | 98-34                   |                                 |                                                     |                    |                            |
| Sample No.:          | MW98-2-<br>981215                                           | MW98-44-<br>981215     |                                 | MW98-34-<br>981215                | MW98-37-<br>981215      |                                 |                                                     |                    |                            |
| Parameter            |                                                             | Duplicate<br>of MW98-2 | RPD <sub>DUP</sub> <sup>5</sup> |                                   | Duplicate of<br>MW98-34 | RPD <sub>DUP</sub> <sup>5</sup> | Limit of<br>Quantitation                            | Community<br>Water | Freshwater<br>Aquatic Life |
| Benzene              | 0.0435                                                      | 0.0398                 | 9%                              | <0.0002                           | <0.0002                 | -                               | 0.0002                                              | 0.0050             | 0.370                      |
| Toluene              | 0.0817                                                      | 0.0663                 | 21%                             | 0.0009                            | 0.0011                  | -                               | 0.0002                                              | ≤0.0024            | 0.002                      |
| Ethylbenzene         | 0.0766                                                      | 0.0629                 | 20%                             | 0.0007                            | 0.0011                  | -                               | 0.0002                                              | ≤0.0024            | 0.09                       |
| Xylene(s)            | 0.4690                                                      | 0.4290                 | 9%                              | 0.0030                            | 0.0041                  | 31%                             | 0.0004                                              | ≤0.03              | NG                         |
| TVH <sup>3</sup>     | 3.25                                                        | 2.59                   | 23%                             | 0.157                             | 0.154                   | -                               | 0.100                                               | NG                 | NG                         |
| TEH <sup>4</sup>     | 2.05                                                        | 1.53                   | 29%                             | 1.69                              | 2.77                    | 48%                             | 0.100                                               | NG                 | NG                         |

Results expressed in milligrams per litre (mg/L)

TVH - total volatile hydrocarbons

TEH - total extractable hydrocarbons

RPD<sub>DUP</sub> - relative percent difference between duplicate samples

NG - no guideline

<sup>1</sup> - *Canadian Environmental Quality Guidelines*, Canadian Council of Ministers of the Environment (CCME), 1999

<sup>2</sup> - There are no applicable guidelines/criteria for the parameters listed. However, the CCME (1999) Community Water and Freshwater Aquatic Life guidelines are shown for informational purposes only.

<sup>3</sup> - C<sub>5</sub> to C<sub>10</sub>

<sup>4</sup> - C<sub>11</sub> to C<sub>32</sub>

<sup>5</sup> - RPD<sub>DUP</sub> - can only be calculated when the concentrations are above the practical quantitation limit which is defined as five times the limit of quantitation

**TABLE 17: Summary of Analytical Results for VOCs in Groundwater - QA/QC**

| Area of Concern:          |                   | Component Shop<br>(Drawing W8140B-010) |                                 | Environmental<br>Quality<br>Guidelines <sup>1,2</sup> |                    |                            |
|---------------------------|-------------------|----------------------------------------|---------------------------------|-------------------------------------------------------|--------------------|----------------------------|
| Monitoring Well No.:      |                   | 98-35                                  |                                 |                                                       |                    |                            |
| Sample No.:               |                   | MW98-35-<br>981215                     |                                 |                                                       |                    |                            |
| Parameter                 |                   | Duplicate<br>of MW98-35                | RPD <sub>DUP</sub> <sup>4</sup> | Limit of<br>Quantitation                              | Community<br>Water | Freshwater<br>Aquatic Life |
| Acetone                   | <10 <sup>3</sup>  | <10 <sup>3</sup>                       | -                               | 0.010                                                 | NG                 | NG                         |
| Carbon Tetrachloride      | <0.2 <sup>3</sup> | <0.2 <sup>3</sup>                      | -                               | 0.0002                                                | 0.005              | 0.0133                     |
| Chloroethane              | <0.5 <sup>3</sup> | <0.5 <sup>3</sup>                      | -                               | 0.0005                                                | NG                 | NG                         |
| Chloroform                | <0.2 <sup>3</sup> | <0.2 <sup>3</sup>                      | -                               | 0.0002                                                | NG                 | 0.0018                     |
| Chloromethane             | <1 <sup>3</sup>   | <1 <sup>3</sup>                        | -                               | 0.001                                                 | NG                 | NG                         |
| 1,1-Dichloroethane        | 0.910             | 0.985                                  | 8%                              | 0.0002                                                | NG                 | NG                         |
| 1,2-Dichloroethane        | <0.2 <sup>3</sup> | <0.2 <sup>3</sup>                      | -                               | 0.0002                                                | 0.005              | 0.1                        |
| 1,1-Dichloroethene        | 3.040             | 3.390                                  | 11%                             | 0.0002                                                | 0.014              | NG                         |
| cis-1,2-Dichloroethene    | 3.640             | 4.490                                  | 21%                             | 0.0002                                                | NG                 | NG                         |
| trans-1,2-Dichloroethene  | <0.2 <sup>3</sup> | <0.2 <sup>3</sup>                      | -                               | 0.0002                                                | NG                 | NG                         |
| Dichloromethane           | <1 <sup>3</sup>   | <1 <sup>3</sup>                        | -                               | 0.001                                                 | 0.05               | 0.0981                     |
| Styrene                   | <0.2 <sup>3</sup> | <0.2 <sup>3</sup>                      | -                               | 0.0002                                                | NG                 | 0.072                      |
| 1,1,1,2-Tetrachloroethane | <0.2 <sup>3</sup> | <0.2 <sup>3</sup>                      | -                               | 0.0002                                                | NG                 | NG                         |
| 1,1,2,2-Tetrachloroethane | <0.2 <sup>3</sup> | <0.2 <sup>3</sup>                      | -                               | 0.0002                                                | NG                 | NG                         |
| Tetrachloroethene         | 0.570             | 0.788                                  | 32%                             | 0.0002                                                | 0.03               | 0.111                      |
| Trichloroethene           | 11.8              | 11.6                                   | 2%                              | 0.0002                                                | 0.05               | 0.021                      |
| 1,1,1-Trichloroethane     | 1.45              | 1.71                                   | 16%                             | 0.0002                                                | NG                 | NG                         |
| 1,1,2-Trichloroethane     | <0.2 <sup>3</sup> | <0.2 <sup>3</sup>                      | -                               | 0.0002                                                | NG                 | NG                         |
| Vinyl Chloride            | 0.560             | 0.612                                  | 9%                              | 0.0005                                                | 0.002              | NG                         |

Results expressed in milligrams per litre (mg/L)

NG - no guideline

RPD<sub>DUP</sub> - relative percent difference between duplicate samples

<sup>1</sup> - Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment (CCME), 1999

<sup>2</sup> - There are no applicable guidelines/criteria for the parameters listed. However, the CCME (1999) Community Water and Freshwater Aquatic Life guidelines are shown for informational purposes only.

<sup>3</sup> - limit of quantitation raised due to sample dilution

<sup>4</sup> - RPD<sub>DUP</sub> can only be calculated when the concentrations are above the practical quantitation limit which is defined as five times the limit of quantitation

**TABLE 17: Summary of Analytical Results for VOCs in Groundwater - QA/QC**

| Area of Concern:          |                     | Component Shop<br>(Drawing W8140B-010) |                                 | Environmental<br>Quality<br>Guidelines <sup>1,2</sup> |                    |                            |
|---------------------------|---------------------|----------------------------------------|---------------------------------|-------------------------------------------------------|--------------------|----------------------------|
| Monitoring Well No.:      |                     | 99-63                                  |                                 |                                                       |                    |                            |
| Sample No.:               |                     | MW99-63-990914                         |                                 |                                                       |                    |                            |
| Parameter                 |                     | Duplicate<br>of MW99-63                | RPD <sub>DUP</sub> <sup>4</sup> | Limit of<br>Quantitation                              | Community<br>Water | Freshwater<br>Aquatic Life |
| Acetone                   | <0.05 <sup>3</sup>  | <0.05 <sup>3</sup>                     | -                               | 0.010                                                 | NG                 | NG                         |
| Carbon Tetrachloride      | <0.020 <sup>3</sup> | <0.020 <sup>3</sup>                    | -                               | 0.0002                                                | 0.005              | 0.0133                     |
| Chloroethane              | 0.088               | 0.088                                  | 0%                              | 0.0005                                                | NG                 | NG                         |
| Chloroform                | <0.020 <sup>3</sup> | <0.020 <sup>3</sup>                    | -                               | 0.0002                                                | NG                 | 0.0018                     |
| Chloromethane             | <0.60 <sup>3</sup>  | <0.100 <sup>2</sup>                    | -                               | 0.001                                                 | NG                 | NG                         |
| 1,1-Dichloroethane        | 0.720               | 0.742                                  | 3%                              | 0.0002                                                | NG                 | NG                         |
| 1,2-Dichloroethane        | 0.020               | 0.020                                  | -                               | 0.0002                                                | 0.005              | 0.1                        |
| 1,1-Dichloroethene        | 0.445               | 0.466                                  | 5%                              | 0.0002                                                | 0.014              | NG                         |
| cis-1,2-Dichloroethene    | 0.207               | 0.214                                  | 3%                              | 0.0002                                                | NG                 | NG                         |
| trans-1,2-Dichloroethene  | <0.020 <sup>3</sup> | <0.020 <sup>3</sup>                    | -                               | 0.0002                                                | NG                 | NG                         |
| Dichloromethane           | <0.100 <sup>3</sup> | <0.100 <sup>3</sup>                    | -                               | 0.001                                                 | 0.05               | 0.0981                     |
| Styrene                   | <0.020 <sup>3</sup> | <0.020 <sup>3</sup>                    | -                               | 0.0002                                                | NG                 | 0.072                      |
| 1,1,1,2-Tetrachloroethane | <0.020 <sup>3</sup> | <0.020 <sup>3</sup>                    | -                               | 0.0002                                                | NG                 | NG                         |
| 1,1,2,2-Tetrachloroethane | <0.020 <sup>3</sup> | <0.020 <sup>3</sup>                    | -                               | 0.0002                                                | NG                 | NG                         |
| Tetrachloroethene         | <0.020 <sup>3</sup> | <0.020 <sup>3</sup>                    | -                               | 0.0002                                                | 0.03               | 0.111                      |
| Trichloroethene           | 0.111               | 0.114                                  | 3%                              | 0.0002                                                | 0.05               | 0.021                      |
| 1,1,1-Trichloroethane     | 0.905               | 0.957                                  | 6%                              | 0.0002                                                | NG                 | NG                         |
| 1,1,2-Trichloroethane     | <0.020 <sup>3</sup> | <0.020 <sup>3</sup>                    | -                               | 0.0002                                                | NG                 | NG                         |
| Vinyl Chloride            | 0.032               | 0.034                                  | -                               | 0.0005                                                | 0.002              | NG                         |

Results expressed in milligrams per litre (mg/L)

NG - no guideline

RPD<sub>DUP</sub> - relative percent difference between duplicate samples

<sup>1</sup> - Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment (CCME), 1999

<sup>2</sup> - There are no applicable guidelines/criteria for the parameters listed. However, the CCME (1999) Community Water and Freshwater Aquatic Life guidelines are shown for informational purposes only.

<sup>3</sup> - limit of quantitation raised due to sample dilution

<sup>4</sup> - RPD<sub>DUP</sub> can only be calculated when the concentrations are above the practical quantitation limit which is defined as five times the limit of quantitation

**TABLE 17: Summary of Analytical Results for VOCs in Groundwater - QA/QC**

| Area of Concern:          |                    | Wheel Shop<br>(Drawing W8140B-010) |                                 |                          | Environmental<br>Quality<br>Guidelines <sup>1,2</sup> |                            |
|---------------------------|--------------------|------------------------------------|---------------------------------|--------------------------|-------------------------------------------------------|----------------------------|
| Monitoring Well No.:      |                    | 98-33                              | 98-33                           |                          |                                                       |                            |
| Sample No.:               |                    | MW98-33-<br>981215                 | MW98-43-<br>981215              |                          |                                                       |                            |
| Parameter                 |                    | Duplicate<br>of MW98-33            | RPD <sub>DUP</sub> <sup>4</sup> | Limit of<br>Quantitation | Community<br>Water                                    | Freshwater<br>Aquatic Life |
| Acetone                   | <250 <sup>3</sup>  | <100 <sup>3</sup>                  | -                               | 0.010                    | NG                                                    | NG                         |
| Carbon Tetrachloride      | <5 <sup>3</sup>    | <2 <sup>3</sup>                    | -                               | 0.0002                   | 0.005                                                 | 0.0133                     |
| Chloroethane              | <12.5 <sup>3</sup> | <5 <sup>3</sup>                    | -                               | 0.0005                   | NG                                                    | NG                         |
| Chloroform                | <5 <sup>3</sup>    | <2 <sup>3</sup>                    | -                               | 0.0002                   | NG                                                    | 0.0018                     |
| Chloromethane             | <25 <sup>3</sup>   | <10 <sup>3</sup>                   | -                               | 0.001                    | NG                                                    | NG                         |
| 1,1-Dichloroethane        | <5 <sup>3</sup>    | <2 <sup>3</sup>                    | -                               | 0.0002                   | NG                                                    | NG                         |
| 1,2-Dichloroethane        | <5 <sup>3</sup>    | <2 <sup>3</sup>                    | -                               | 0.0002                   | 0.005                                                 | 0.1                        |
| 1,1-Dichloroethene        | <5 <sup>3</sup>    | <2 <sup>3</sup>                    | -                               | 0.0002                   | 0.014                                                 | NG                         |
| cis-1,2-Dichloroethene    | <5 <sup>3</sup>    | <2 <sup>3</sup>                    | -                               | 0.0002                   | NG                                                    | NG                         |
| trans-1,2-Dichloroethene  | <5 <sup>3</sup>    | <2 <sup>3</sup>                    | -                               | 0.0002                   | NG                                                    | NG                         |
| Dichloromethane           | <25 <sup>3</sup>   | <10 <sup>3</sup>                   | -                               | 0.001                    | 0.05                                                  | 0.0981                     |
| Styrene                   | <5 <sup>3</sup>    | <2 <sup>3</sup>                    | -                               | 0.0002                   | NG                                                    | 0.072                      |
| 1,1,1,2-Tetrachloroethane | <5 <sup>3</sup>    | <2 <sup>3</sup>                    | -                               | 0.0002                   | NG                                                    | NG                         |
| 1,1,2,2-Tetrachloroethane | <5 <sup>3</sup>    | <2 <sup>3</sup>                    | -                               | 0.0002                   | NG                                                    | NG                         |
| Tetrachloroethene         | 133                | 101                                | 27%                             | 0.0002                   | 0.03                                                  | 0.111                      |
| Trichloroethene           | <5 <sup>3</sup>    | <2 <sup>3</sup>                    | -                               | 0.0002                   | 0.05                                                  | 0.021                      |
| 1,1,1-Trichloroethane     | <5 <sup>3</sup>    | <2 <sup>3</sup>                    | -                               | 0.0002                   | NG                                                    | NG                         |
| 1,1,2-Trichloroethane     | <5 <sup>3</sup>    | <2 <sup>3</sup>                    | -                               | 0.0002                   | NG                                                    | NG                         |
| Vinyl Chloride            | <12.5 <sup>3</sup> | <5 <sup>3</sup>                    | -                               | 0.0005                   | 0.002                                                 | NG                         |

Results expressed in milligrams per litre (mg/L)

NG - no guideline

RPD<sub>DUP</sub> - relative percent difference between duplicate samples<sup>1</sup> - Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment (CCME), 1999<sup>2</sup> - There are no applicable guidelines/criteria for the parameters listed. However, the CCME (1999) Community Water and Freshwater Aquatic Life guidelines are shown for informational purposes only.<sup>3</sup> - limit of quantitation raised due to sample dilution<sup>4</sup> - RPD<sub>DUP</sub> can only be calculated when the concentrations are above the practical quantitation limit which is defined as five times the limit of quantitation

**TABLE 18: Summary of Analytical Results for Metals in Groundwater - QA/QC**

| Area of Concern:      |                      | Wheel Shop<br>(Drawing W8140B-010) |                                 |                          | Environmental<br>Quality<br>Guidelines <sup>1,2</sup> |                               |
|-----------------------|----------------------|------------------------------------|---------------------------------|--------------------------|-------------------------------------------------------|-------------------------------|
| Monitoring Well No.:  | 99-59                | 99-59                              |                                 |                          |                                                       |                               |
| Sample No.:           | MW99-59-<br>990914   | MW99-82-<br>990914                 |                                 |                          |                                                       |                               |
| Parameter             |                      | Duplicate of<br>MW99-59            | RPD <sub>DUP</sub> <sup>3</sup> | Limit of<br>Quantitation | Community<br>Water                                    | Freshwater<br>Aquatic Life    |
| Hardness <sup>4</sup> | 1,366                | 1,313                              | 4%                              | -                        | NG                                                    | NG                            |
| Antimony              | 0.0075               | 0.0037                             | -                               | 0.002                    | 0.006                                                 | NG                            |
| Arsenic               | 0.008                | 0.008                              | -                               | 0.002                    | 0.025                                                 | 0.005                         |
| Barium                | 0.564                | 0.359                              | 44%                             | 0.005                    | 1.000                                                 | NG                            |
| Beryllium             | <0.001 <sup>5</sup>  | <0.001 <sup>5</sup>                | -                               | 0.005                    | NG                                                    | NG                            |
| Cadmium               | <0.0001 <sup>5</sup> | <0.0001 <sup>5</sup>               | -                               | 0.0005                   | 0.0050                                                | 0.002 - 0.00038 <sup>7</sup>  |
| Chromium              | <0.050 <sup>6</sup>  | <0.050 <sup>6</sup>                | -                               | 0.002                    | 0.050                                                 | NG                            |
| Cobalt                | 0.0037               | 0.0036                             | -                               | 0.001                    | NG                                                    | NG                            |
| Copper                | <0.0005 <sup>5</sup> | <0.0005 <sup>5</sup>               | -                               | 0.002                    | ≤1.0                                                  | 0.004 (hardness<br>>180 mg/L) |
| Iron                  | 6.81                 | 6.41                               | 6%                              | 0.02                     | ≤0.3                                                  | 0.3                           |
| Lead                  | 0.0005 <sup>5</sup>  | <0.0005 <sup>5</sup>               | -                               | 0.0001                   | 0.0100                                                | 0.007 (hardness<br>>180 mg/L) |
| Manganese             | 1.95                 | 1.89                               | 3%                              | 0.002                    | ≤0.05                                                 | NG                            |
| Molybdenum            | 0.004                | 0.004                              | -                               | 0.002                    | NG                                                    | 0.073                         |
| Nickel                | 0.009                | 0.009                              | -                               | 0.002                    | NG                                                    | 0.150 (hardness<br>>180 mg/L) |
| Selenium              | <0.002               | <0.002                             | -                               | 0.002                    | 0.010                                                 | 0.001                         |
| Silver                | <0.0001 <sup>5</sup> | <0.0001 <sup>5</sup>               | -                               | 0.0005                   | NG                                                    | 0.0001                        |
| Vanadium              | 0.0036               | 0.0037                             | -                               | 0.002                    | NG                                                    | NG                            |
| Zinc                  | 0.076                | 0.027                              | 95%                             | 0.002                    | ≤5.0                                                  | 0.03                          |

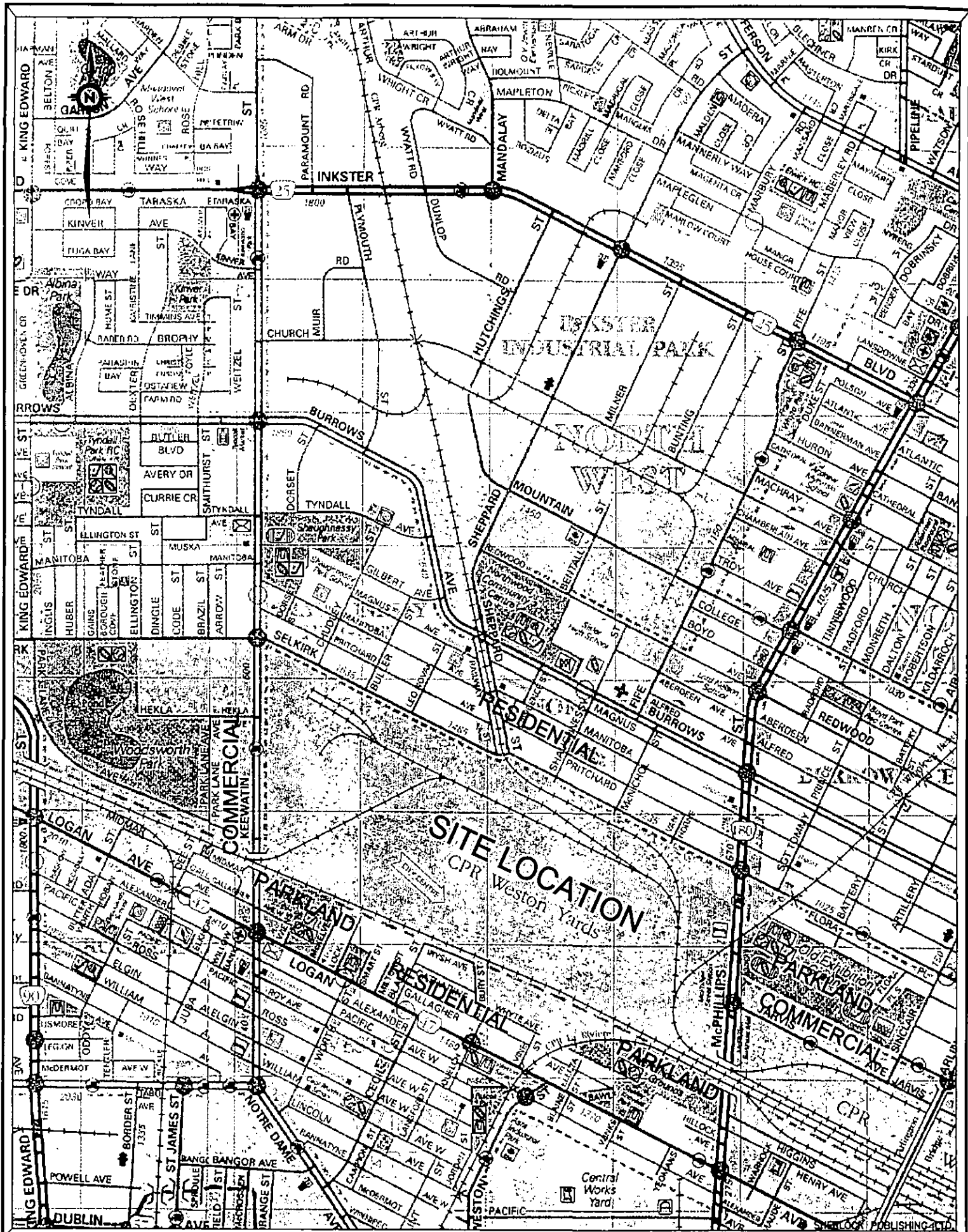
Results expressed in milligrams per litre (mg/L)

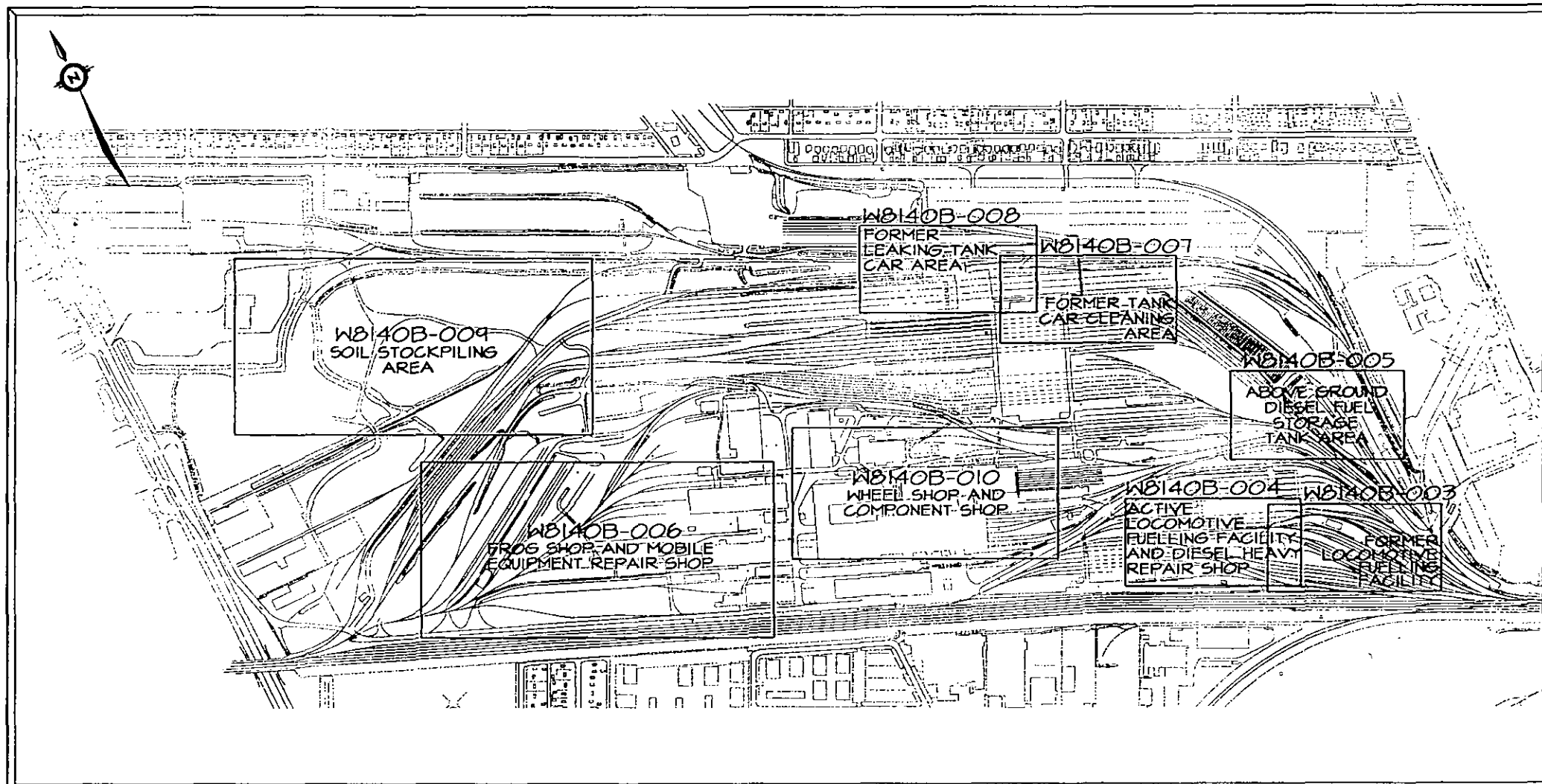
NG - no guideline

<sup>1</sup> - Canadian Environmental Quality Guidelines, Canadian Council of Ministers of the Environment (CCME), 1999<sup>2</sup> - There are no applicable guidelines/criteria for the parameters listed. However, the CCME (1999) Community Water and Freshwater Aquatic Life guidelines are shown for informational purposes only.<sup>3</sup> - RPD<sub>DUP</sub> can only be calculated when the concentrations are above the practical quantitation limit which is defined as five times the limit of quantitation<sup>4</sup> - calculated using: total hardness = 2.5(Ca<sup>2+</sup>) + 4.1(Mg<sup>2+</sup>) as CaCO<sub>3</sub><sup>5</sup> - limit of quantitation changed due to laboratory limit of quantitation study<sup>6</sup> - limit of quantitation raised due to sample dilution<sup>7</sup> - guideline changes with hardness

## **APPENDIX I**

### **Drawings**





# LEGEND

SITE PLAN

# BAR SCALE

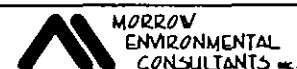


# NOTES

1. DRAWING IS DERIVED FROM PLAN SUPPLIED BY CP RAIL. DRAWING NUMBER 90-033-06-05-P5.
2. UTILITY LOCATIONS ARE NOT SHOWN.

# REVISIONS

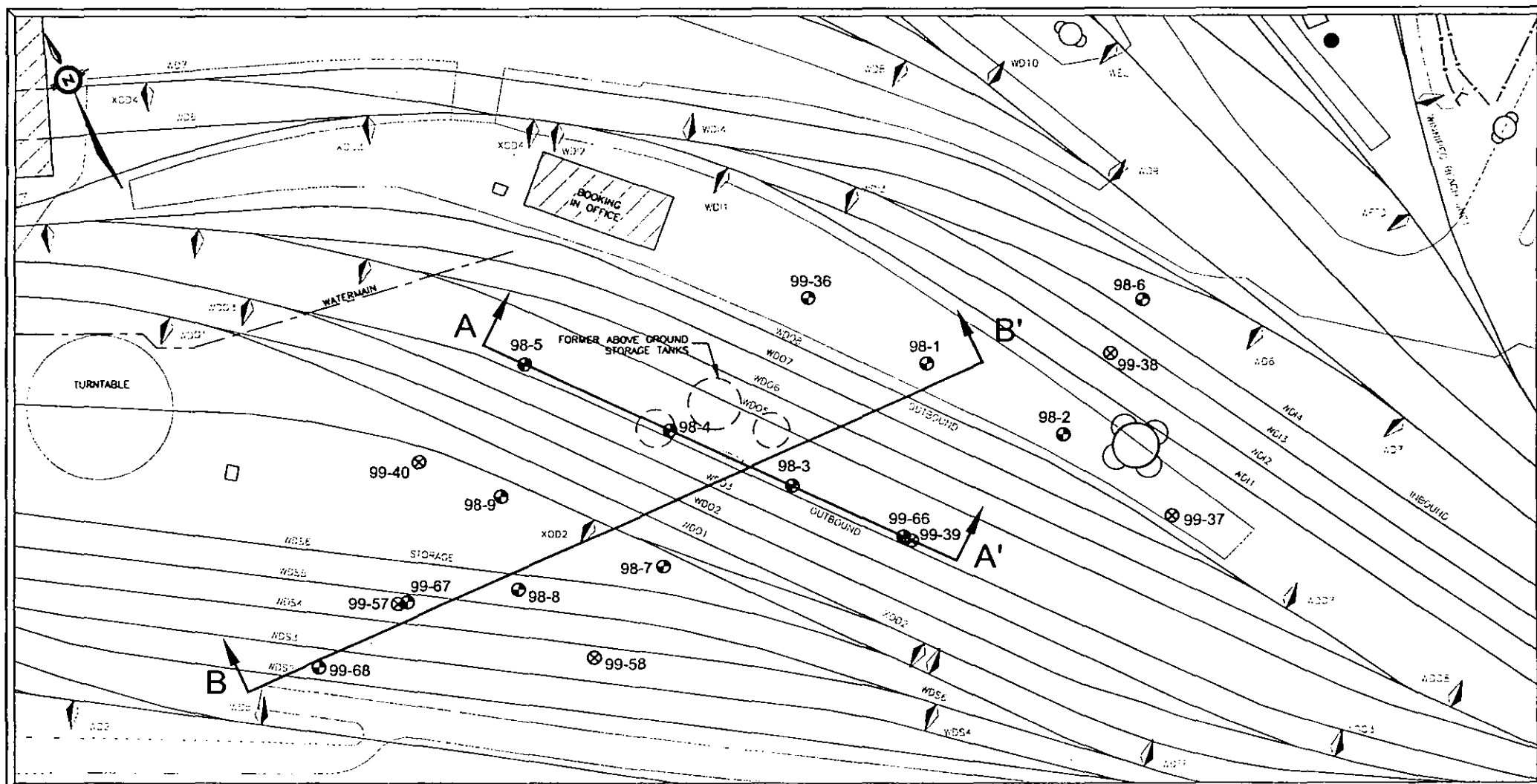
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# SITE LOCATION PLAN

DRAWING NUMBER: W8140B-002



# LEGEND

- BOREHOLE LOCATION (MONITORING WELL INSTALLED)
- ⊗ BOREHOLE LOCATION (MONITORING WELL NOT INSTALLED)

# BAR SCALE



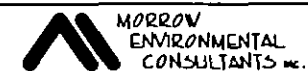
- FENCE
- BUILDINGS
- HAND SWITCH
- POWER SWITCH
- POWER POLES
- OVERHEAD LIGHTS

# NOTES

1. DRAWING IS DERIVED FROM PLAN SUPPLIED BY CP RAIL, DRAWING NUMBER 98-033-06-05-PS.
2. UTILITY LOCATIONS AND FORMER TANK LOCATIONS ARE APPROXIMATE AND LIMITED TO INFORMATION PROVIDED BY CP RAIL DRAWINGS. UTILITY LOCATIONS SHOULD BE CONFIRMED ON-SITE.
3. CROSS SECTIONS A-A' AND B-B' ARE FOUND ON DRAWINGS WB140B-011 AND WB140B-012, RESPECTIVELY.

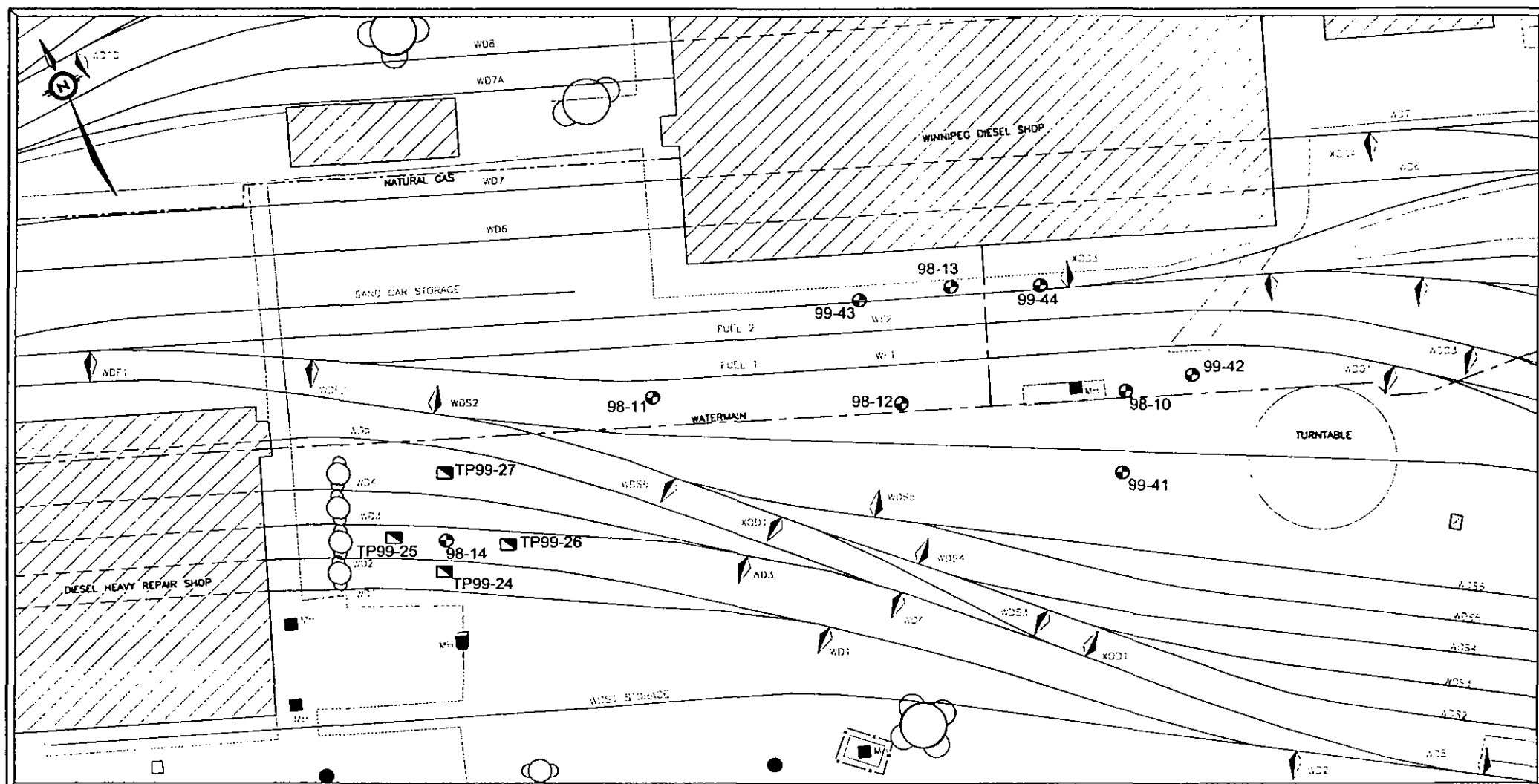
# REVISIONS

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| SCALE: AS SHOWN | DATE: 2000 02 25 | CLIENT: CP RAIL | APPROVED BY: CDC |
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|                 |                  |                 |                  |

**SITE PLAN - FORMER LOCOMOTIVE FUELLING FACILITY**  
DRAWING NUMBER WB140B-003



# LEGEND

## BAR SCALE

## NOTES

## REVISIONS

⊕ BOREHOLE LOCATION  
(MONITORING WELL INSTALLED)

■ TEST PIT LOCATION

— FENCE  
 ■ BUILDING  
 — HAND SWITCH  
 — POWER SWITCH  
 — POWER POLES  
 ○ OVERHEAD LIGHTS

1. DRAWING IS DERIVED FROM PLAN  
 SUPPLIED BY CP RAIL, DRAWING NUMBER  
 98-033-06-05-P5.

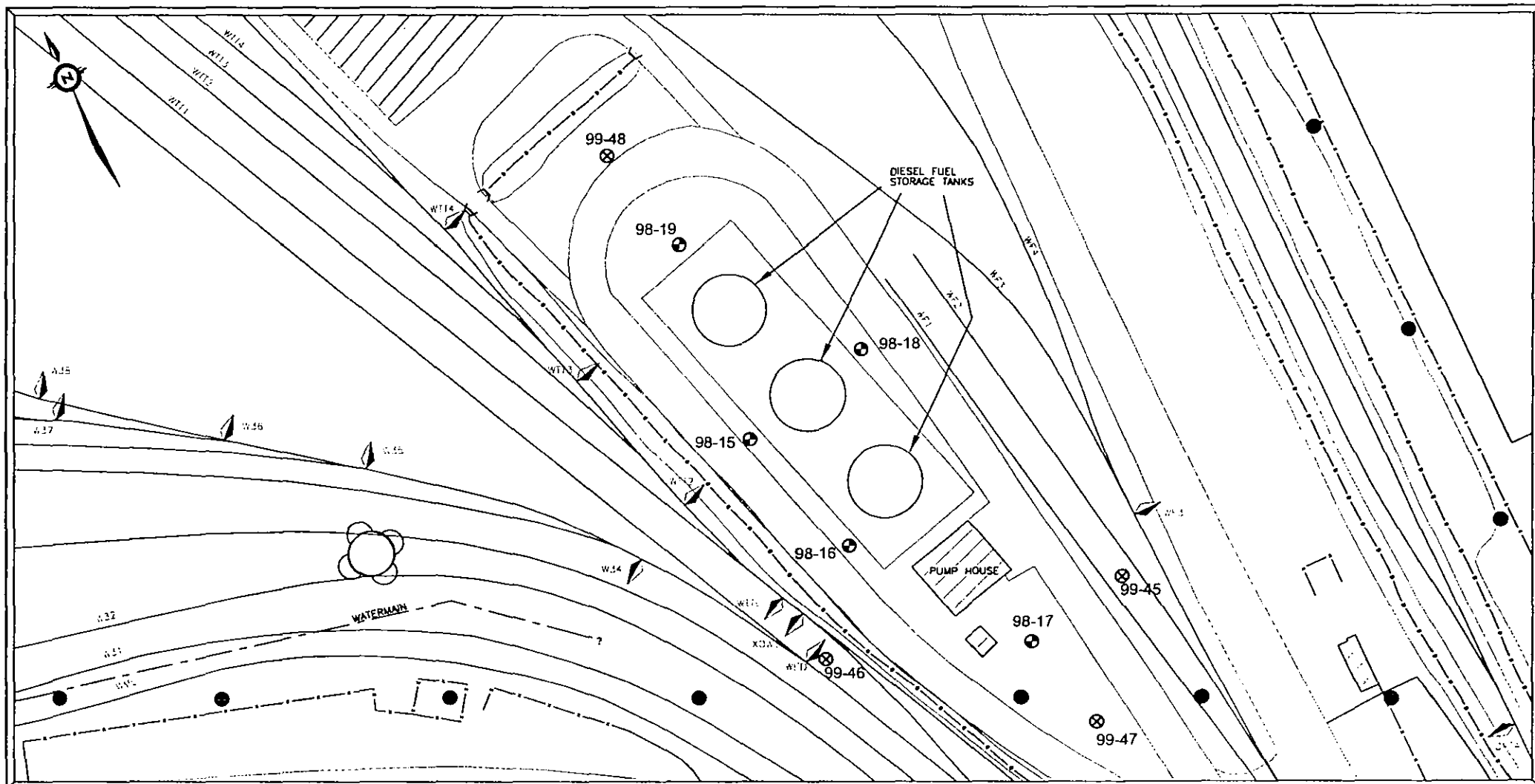
2. UTILITY LOCATIONS ARE APPROXIMATE  
 AND LIMITED TO INFORMATION PROVIDED  
 BY CP RAIL DRAWINGS. LOCATIONS  
 SHOULD BE CONFIRMED ON-SITE.

| REV. | DATE | DESCRIPTION | BY |
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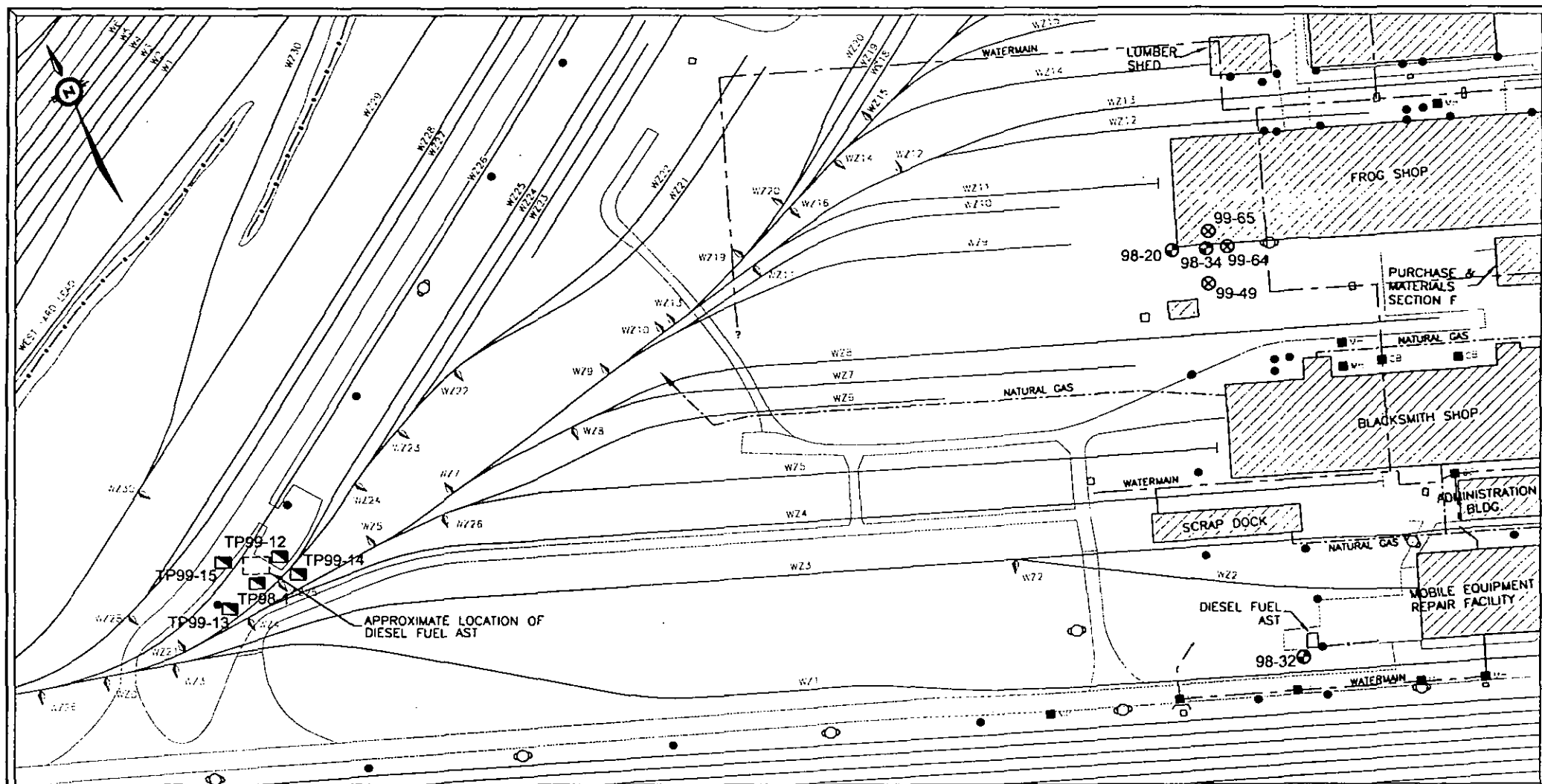
**MORROW**  
 ENVIRONMENTAL  
 CONSULTANTS INC.

SCALE: AS SHOWN  
 DATE: 2000 02 25  
 CLIENT NAME: CP RAIL  
 SITE ADDRESS: WINNIPEG DIESEL SHOPS AND  
 WESTON SHOPS, WINNIPEG, MB

**SITE PLAN - ACTIVE LOCOMOTIVE FUELLING  
 FACILITY AND DIESEL HEAVY REPAIR SHOP**  
 DRAWING NUMBER: W81408-004



| LEGEND                                                                                                            | BAR SCALE         | NOTES                                                                                                                                                                                                                                   | REVISIONS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | MORROW ENVIRONMENTAL CONSULTANTS INC. |      |             |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                 |                  |                 |                                                                    |                  |              |               |  |
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| <p>⊙ BOREHOLE LOCATION (MONITORING WELL INSTALLED)</p> <p>⊗ BOREHOLE LOCATION (MONITORING WELL NOT INSTALLED)</p> | <p>0m 10m 20m</p> | <p>1. DRAWING IS DERIVED FROM PLAN SUPPLIED BY CP RAIL, DRAWING NUMBER 98-033-06-05-P5.</p> <p>2. UTILITY LOCATIONS ARE APPROXIMATE AND LIMITED TO INFORMATION PROVIDED BY CP RAIL DRAWINGS. LOCATIONS SHOULD BE CONFIRMED ON-SITE.</p> | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>REV.</th> <th>DATE</th> <th>DESCRIPTION</th> <th>BY</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table> | REV.                                  | DATE | DESCRIPTION | BY |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | <div style="text-align: center;"> <p><b>MORROW ENVIRONMENTAL CONSULTANTS INC.</b></p> </div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>SCALE: AS SHOWN</td> <td>DATE: 2000 02 25</td> <td>CLIENT: CP RAIL</td> <td>SITE ADDRESS: WINNIPEG DIESEL SHOPS AND WESLON SHOPS, WINNIPEG, MB</td> </tr> <tr> <td>APPROVED BY: AGM</td> <td>CHECKED: JOT</td> <td colspan="2">DRAWN BY: CDC</td> </tr> </table> <p style="text-align: center;"><b>SITE PLAN - ABOVE GROUND DIESEL FUEL STORAGE TANK AREA</b></p> <p style="text-align: center;">DRAWING NUMBER: W81408-005</p> | SCALE: AS SHOWN | DATE: 2000 02 25 | CLIENT: CP RAIL | SITE ADDRESS: WINNIPEG DIESEL SHOPS AND WESLON SHOPS, WINNIPEG, MB | APPROVED BY: AGM | CHECKED: JOT | DRAWN BY: CDC |  |
| REV.                                                                                                              | DATE              | DESCRIPTION                                                                                                                                                                                                                             | BY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                       |      |             |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                 |                  |                 |                                                                    |                  |              |               |  |
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| SCALE: AS SHOWN                                                                                                   | DATE: 2000 02 25  | CLIENT: CP RAIL                                                                                                                                                                                                                         | SITE ADDRESS: WINNIPEG DIESEL SHOPS AND WESLON SHOPS, WINNIPEG, MB                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                       |      |             |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                 |                  |                 |                                                                    |                  |              |               |  |
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# LEGEND

BAR SCALE

0m

50

100m

# NOTES

# REVISIONS

- ⊙ BOREHOLE LOCATION (MONITORING WELL INSTALLED)
- ⊗ BOREHOLE LOCATION (MONITORING WELL NOT INSTALLED)
- TEST PIT LOCATION

- FENCE
- ▨ BUILDING
- HAND SWITCH
- POWER SWITCH
- POWER POLES
- OVERHEAD LIGHTS

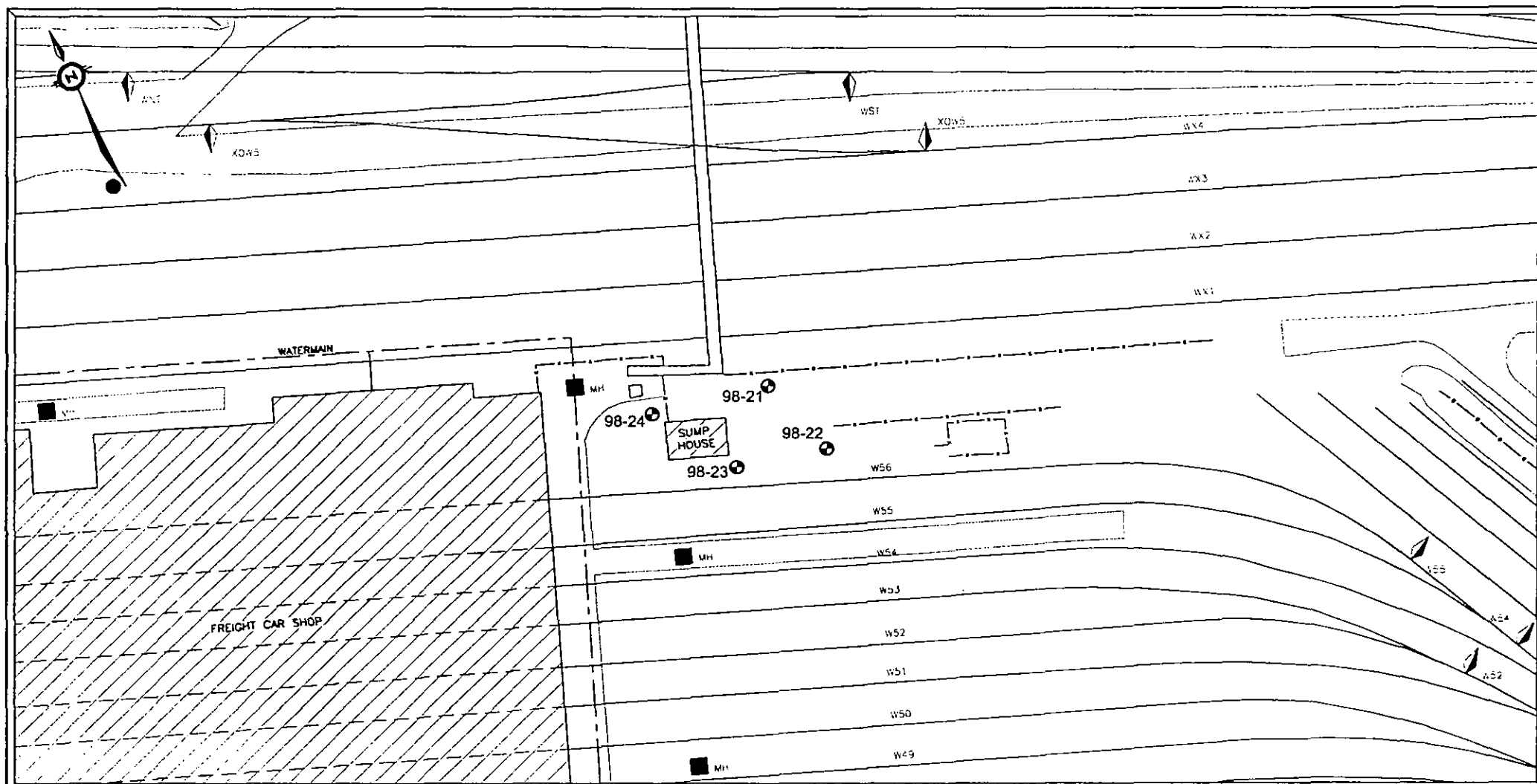
1. DRAWING IS DERIVED FROM PLAN SUPPLIED BY CP RAIL, DRAWING NUMBER 96-033-06-05-P5.
2. UTILITY LOCATIONS ARE APPROXIMATE AND LIMITED TO INFORMATION PROVIDED BY CP RAIL DRAWINGS. LOCATIONS SHOULD BE CONFIRMED ON-SITE.

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MORROW ENVIRONMENTAL CONSULTANTS INC.

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| SCALE: AS SHOWN                                                     | DATE: 2000 02 25 | CLIENT: CP RAIL | APPROVED BY: JOT |
| CLIENT NAME: CP RAIL                                                | DATE: 2000 02 25 | CLIENT: CP      | CHECKED: JOT     |
| SITE ADDRESS: WINNIPEG DIESEL SHOPS AND WESTON SHOPS, WINNIPEG, MB  |                  |                 |                  |
| <b>SITE PLAN - FROG SHOP &amp; MOBILE EQUIPMENT REPAIR FACILITY</b> |                  |                 |                  |
| DRAWING NUMBER: W81408-006                                          |                  |                 |                  |



# LEGEND

BAR SCALE 0m 10m 50m

- BOREHOLE LOCATION (MONITORING WELL INSTALLED)
- POWER POLES
- OVERHEAD LIGHTS

- FENCE
- ▨ BUILDING
- ⬇ HAND SWITCH
- ⬆ POWER SWITCH

# NOTES

1. DRAWING IS DERIVED FROM PLAN SUPPLIED BY CP RAIL, DRAWING NUMBER 98-033-06-05-PS.
2. UTILITY LOCATIONS ARE APPROXIMATE AND LIMITED TO INFORMATION PROVIDED BY CP RAIL DRAWINGS. LOCATIONS SHOULD BE CONFIRMED ON-SITE.

# REVISIONS

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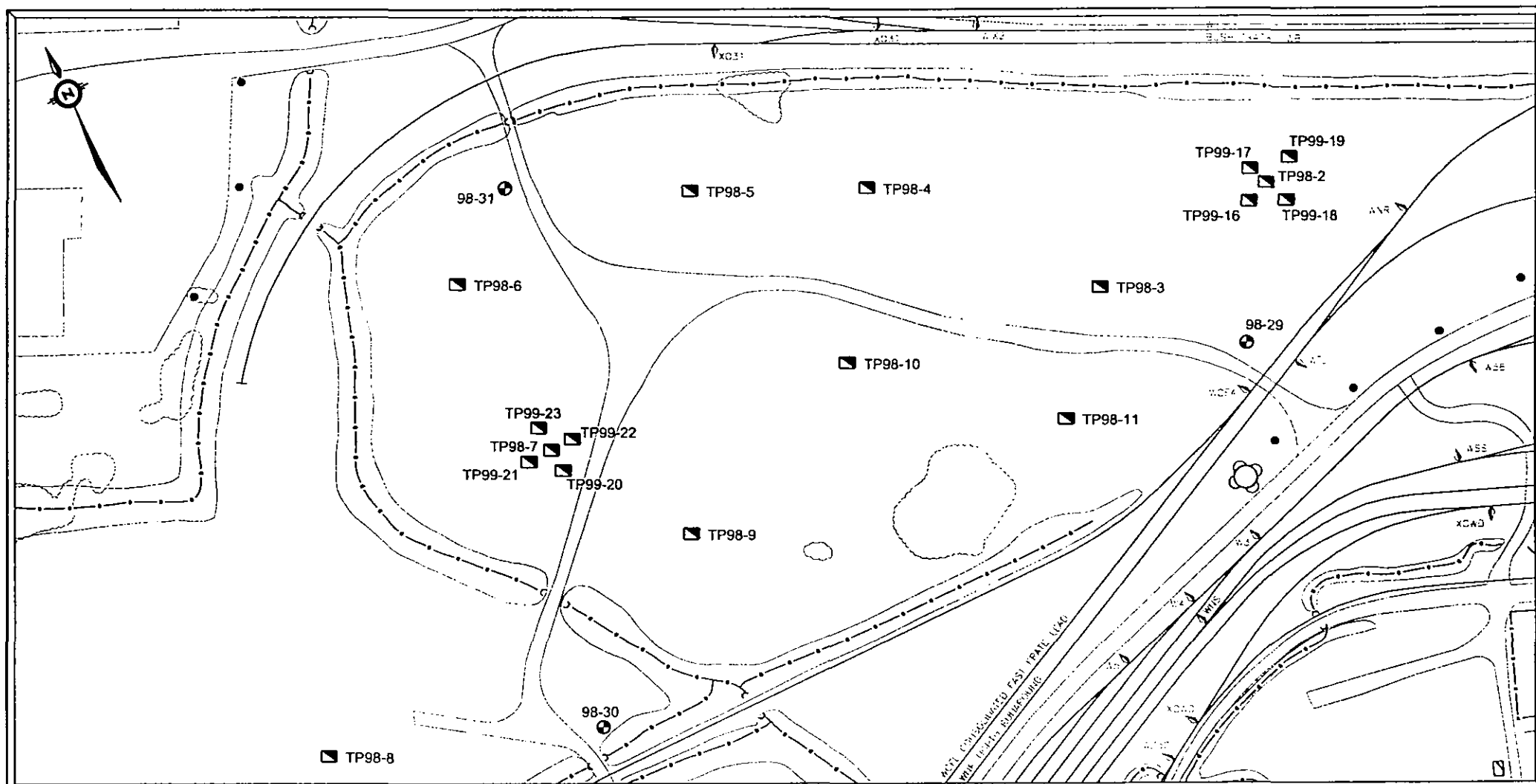
MORROW ENVIRONMENTAL CONSULTANTS INC.

SCALE: AS SHOWN  
DATE: 2000 02 25  
CLIENT: CP RAIL  
DRAWN BY: CDC  
CHECKED: JOT  
SITE ADDRESS: WINNIPEG DIESEL SHOPS AND WESTON SHOPS, WINNIPEG, MB

# SITE PLAN - FORMER TANK CAR CLEANING AREA

DRAWING NUMBER: WB1408-007





# LEGEND

BAR SCALE: 0m 50 100m

- BOREHOLE LOCATION (MONITORING WELL INSTALLED)
- TEST PIT LOCATION

- POWER POLES
- OVERHEAD LIGHTS
- FENCE
- ▨ BUILDING
- ⚡ HAND SWITCH
- ⚡ POWER SWITCH

# NOTES

1. DRAWING IS DERIVED FROM PLAN SUPPLIED BY CP RAIL, DRAWING NUMBER 98-033-06-05-PS.
2. UTILITY LOCATIONS ARE NOT SHOWN AND ARE LIMITED TO INFORMATION PROVIDED BY CP RAIL DRAWINGS. LOCATIONS SHOULD BE CONFIRMED ON-SITE.

# REVISIONS

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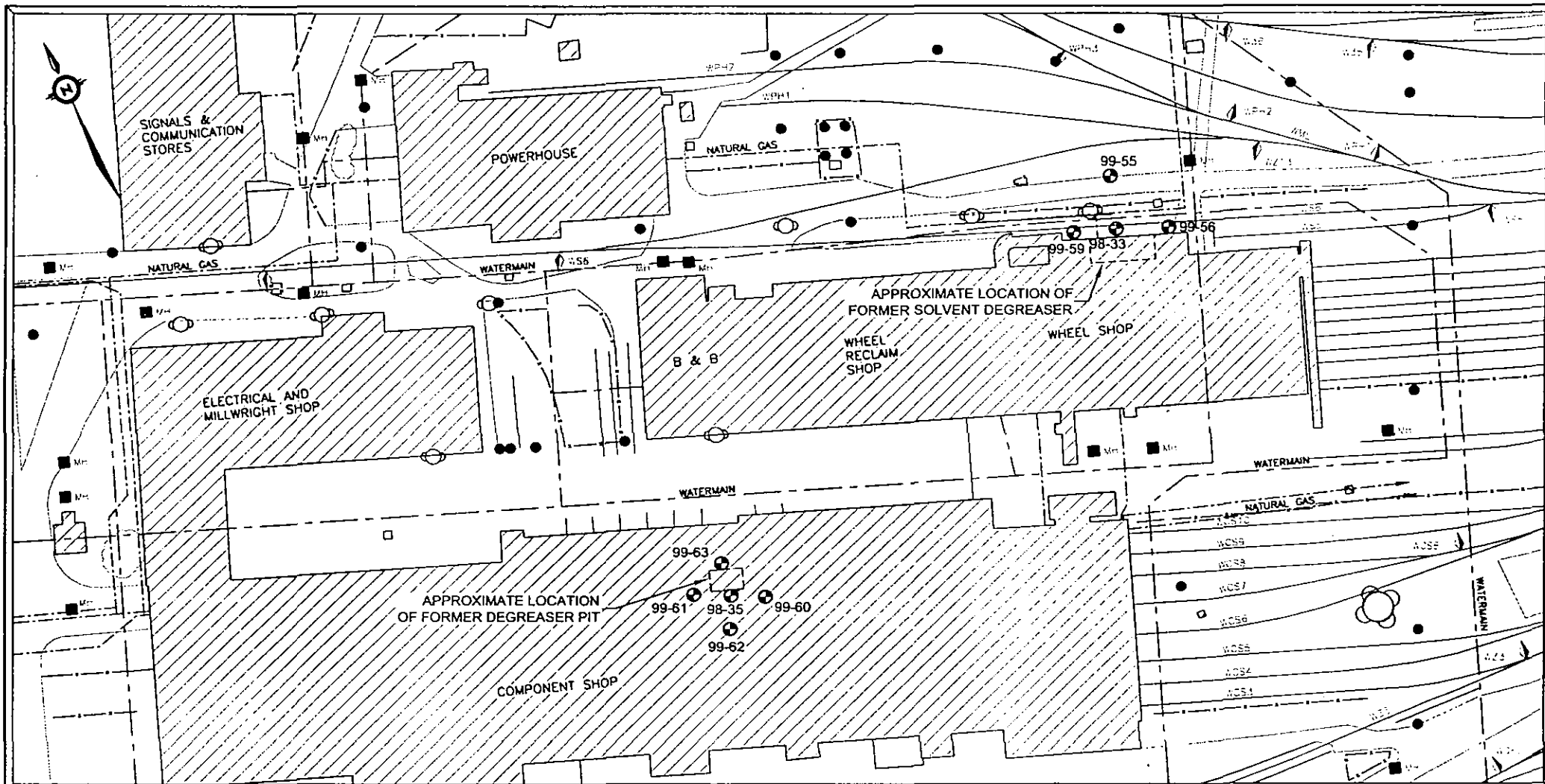


**MORROW ENVIRONMENTAL CONSULTANTS INC.**

SCALE: AS SHOWN  
DATE: 2000 02 25  
CLIENT: CP RAIL  
DRAWN BY: CDC  
CHECKED: JDT  
SITE ADDRESS: WESTON SHOPS WINNIPEG, MANITOBA

# SITE PLAN - SOIL STOCKPILING AREA

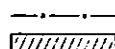
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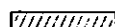
# LEGEND

BAR SCALE 0m 50 75m

● BOREHOLE LOCATION  
(MONITORING WELL INSTALLED)



FENCE



BUILDING



HAND SWITCH



POWER SWITCH



POWER POLES



OVERHEAD LIGHTS

# NOTES

1. DRAWING IS DERIVED FROM PLAN  
SUPPLIED BY CP RAIL, DRAWING NUMBER  
98-033-06-05-P5.

2. UTILITY LOCATIONS ARE APPROXIMATE  
AND LIMITED TO INFORMATION PROVIDED  
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# REVISIONS

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MORROW  
ENVIRONMENTAL  
CONSULTANTS INC.

SCALE: AS SHOWN MEG AGM CLIENT: CP DRAWN BY: CDC

DATE: 2000 02 25 CHECKED: JOT

CLIENT NAME: WESTON SHOPS SITE ADDRESS: WESTON SHOPS

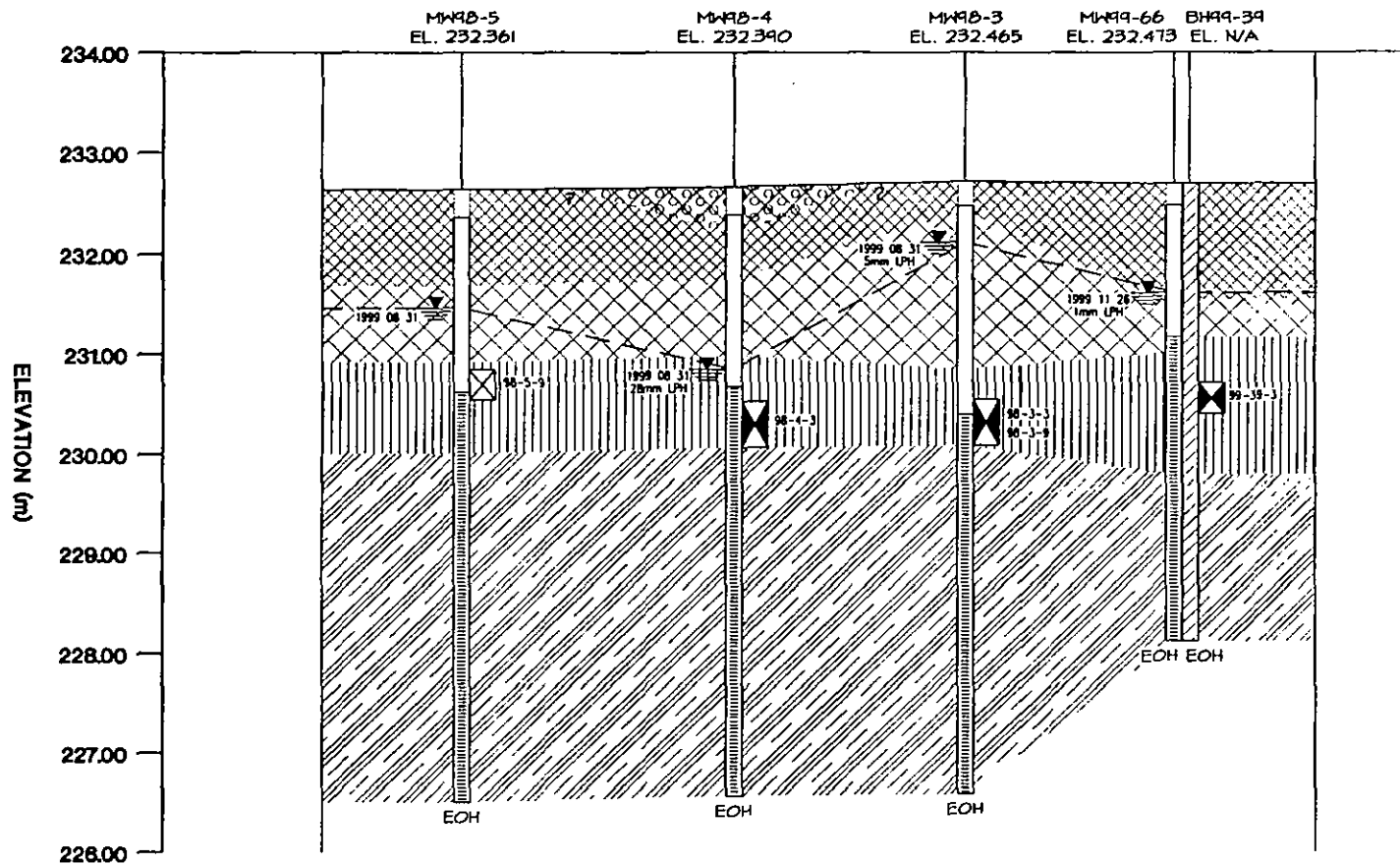
CP RAIL MINNIEPG, MANITOBA

# SITE PLAN - COMPONENT AND WHEEL SHOPS

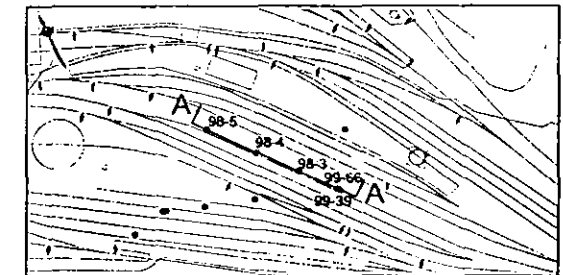
DRAWING NUMBER: WB1408-010

A

A'



SITE PLAN



## LEGEND

## BAR SCALE

- BALLAST (FILL)
- SAND & GRAVEL (FILL)
- CLAY
- SILT
- CLAY & SILT (FILL)

- BENTONITE
- WATER LEVEL (DATES AS SHOWN)
- EOH END OF HOLE

- 98-3-1 SOIL SAMPLE LOCATION AND SAMPLE ID

- HYDROCARBON CONCENTRATIONS IN SOIL GREATER THAN THE APPLICABLE GUIDELINE/CRITERIA

## BOREHOLE DESIGNATION

30 mm Ø SOLID PVC PIPE

30 mm Ø SLOTTED PVC PIPE

END OF BOREHOLE

## NOTES

THE STRATIGRAPHIC AND HYDROGEOLOGICAL INFORMATION SHOWN ON THIS DRAWING HAS BEEN INTERPRETED FROM SITE SPECIFIC BOREHOLE DATA. SUBSURFACE CONDITIONS ARE KNOWN WITH SOME DEGREE OF ACCURACY ONLY AT THE BOREHOLE LOCATIONS. ACTUAL STRATIGRAPHIC AND HYDROGEOLOGICAL CONDITIONS BETWEEN BOREHOLES MAY VARY FROM THOSE INDICATED ON THIS DRAWING.

VERTICAL DISTANCES ARE SHOWN AT AN EXAGGERATED SCALE OF TEN TIMES THE HORIZONTAL DISTANCES AS SHOWN.

## REVISIONS

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MORROW  
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CONSULTANTS INC.

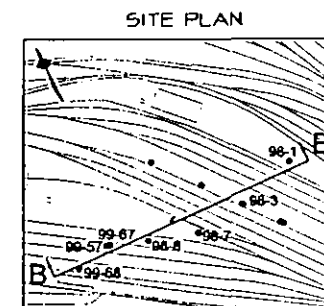
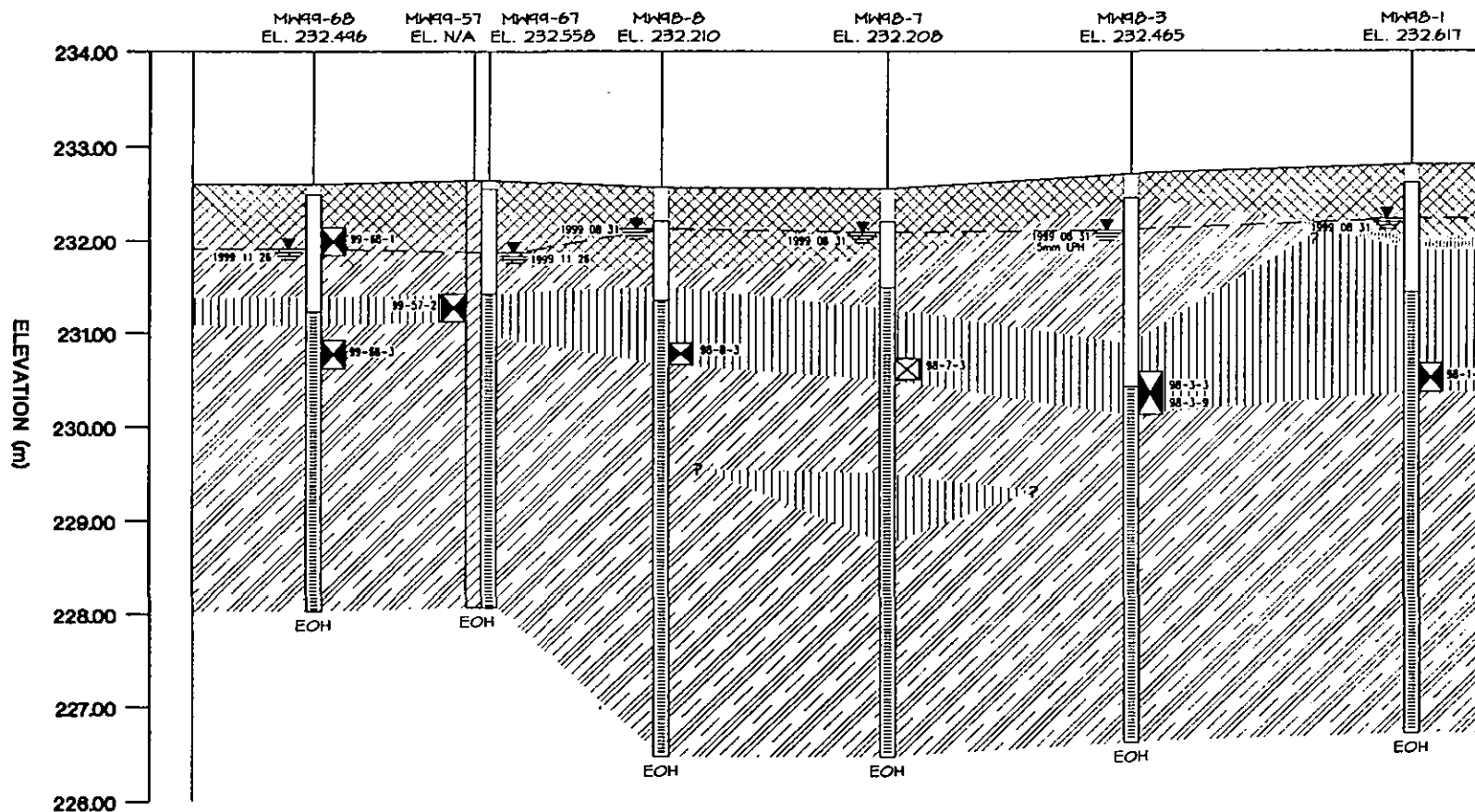
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| SCALE: AS SHOWN | DATE: 2000 02 25 | CLIENT: CP RAIL | BY: ADDRESS: WINNIPEG DIESEL SHOPS AND WESTON SHOPS, WINNIPEG, MB |
| APPROVED BY: AE | CHECKED: AE      | Drawn BY: CDC   |                                                                   |

## CROSS SECTION A-A'

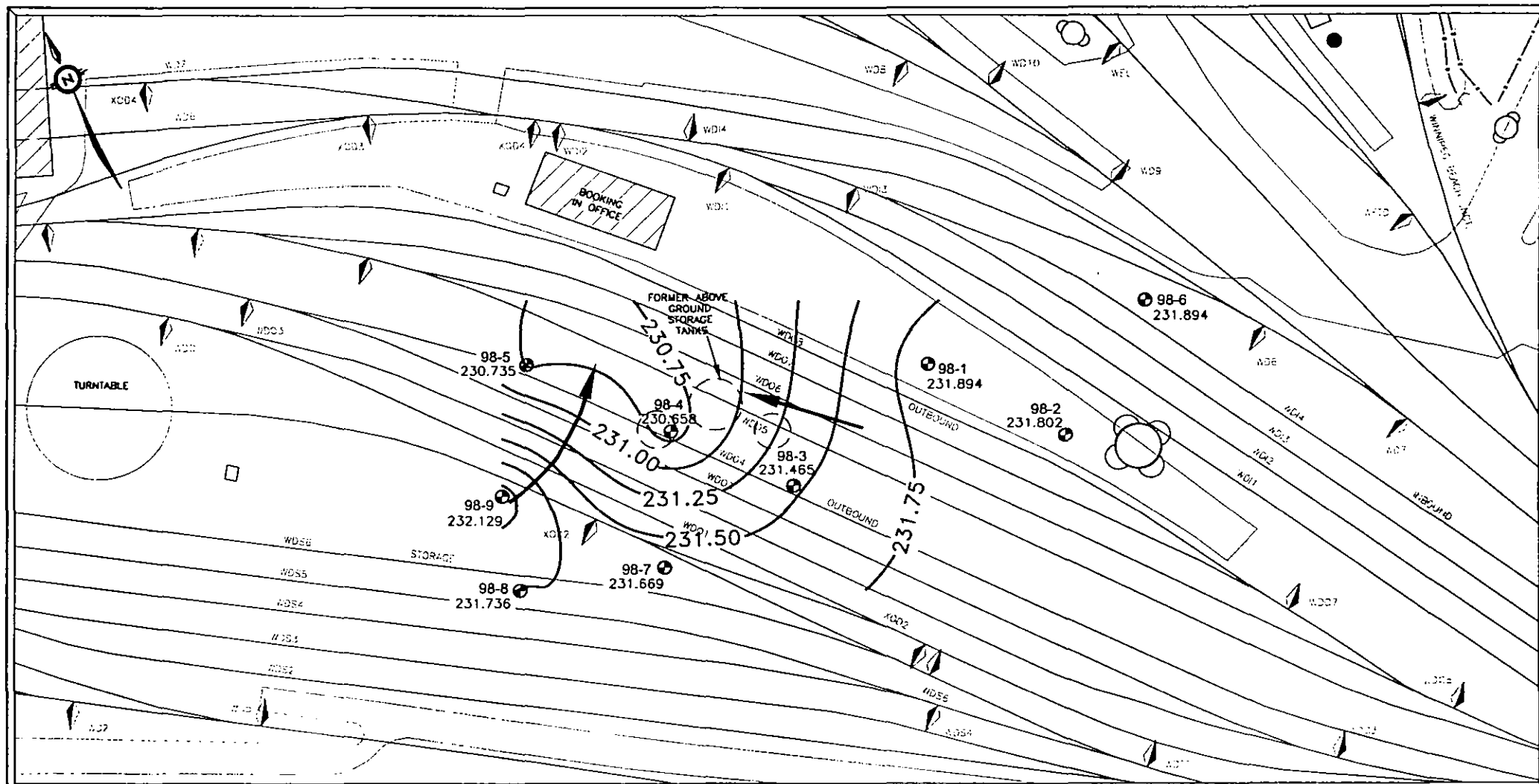
DRAWING NUMBER: W8140B-011

B

B'



| LEGEND                                                                                                                                                                                                                                                                                                                                           |                      | BAR SCALE |                                                                                   | NOTES |                          | REVISIONS |      | MORROW ENVIRONMENTAL CONSULTANTS INC. |                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------|-----------------------------------------------------------------------------------|-------|--------------------------|-----------|------|---------------------------------------|--------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                  | ORGANIC SILT         |           | WATER LEVEL (DATES AS SHOWN)                                                      |       | BOREHOLE DESIGNATION     |           |      |                                       |                                                                    |
|                                                                                                                                                                                                                                                                                                                                                  | SAND & GRAVEL (FILL) |           | EOH END OF HOLE                                                                   |       | 50 mm • SOLID PVC PIPE   |           |      | SCALE: AS SHOWN                       | APPROVED BY: DRIVEN BY: CDC                                        |
|                                                                                                                                                                                                                                                                                                                                                  | CLAY                 |           | 98-5-1 SOIL SAMPLE LOCATION AND SAMPLE ID                                         |       | 50 mm • SLOTTED PVC PIPE |           |      | DATE: 2000 02 25                      | HECK: AE CLIENT: CP CHECKED: AE                                    |
|                                                                                                                                                                                                                                                                                                                                                  | SILT                 |           | HYDROCARBON CONCENTRATIONS IN SOIL GREATER THAN THE APPLICABLE GUIDELINE/CRITERIA |       | END OF BOREHOLE          |           |      | CLIENT NAME: CP RAIL                  | SITE ADDRESS: WINNIPEG DIESEL SHOPS AND WESTON SHOPS, WINNIPEG, MB |
|                                                                                                                                                                                                                                                                                                                                                  | BENTONITE            |           |                                                                                   |       |                          |           |      | CROSS SECTION B-B'                    |                                                                    |
| THE STRATIGRAPHIC AND HYDROGEOLOGICAL INFORMATION SHOWN ON THIS DRAWING HAS BEEN INTERPRETED FROM SITE SPECIFIC BOREHOLE DATA. SUBSURFACE CONDITIONS ARE KNOWN WITH SOME DEGREE OF ACCURACY ONLY AT THE BOREHOLE LOCATIONS. ACTUAL STRATIGRAPHIC AND HYDROGEOLOGICAL CONDITIONS BETWEEN BOREHOLES MAY VARY FROM THOSE INDICATED ON THIS DRAWING. |                      |           |                                                                                   |       |                          |           |      |                                       |                                                                    |
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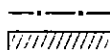


# LEGEND

## BAR SCALE

0m 50m

- BOREHOLE LOCATION (MONITORING WELL INSTALLED)
- APPARENT DIRECTION OF GROUNDWATER FLOW
- MEASURED GROUNDWATER ELEVATION ON 1998 12 02



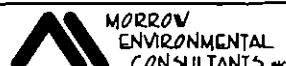
- FENCE
- BUILDINGS
- HAND SWITCH
- POWER SWITCH
- POWER POLES
- OVERHEAD LIGHTS

# NOTES

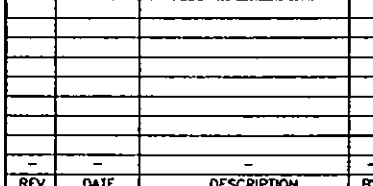
1. DRAWING IS DERIVED FROM PLAN SUPPLIED BY CP RAIL, DRAWING NUMBER 98-033-06-05-P5.
2. UTILITY LOCATIONS ARE NOT SHOWN.
3. ONLY LABELLED MONITORING WELLS WERE USED FOR CONTOURING.
4. ALL CONTOURS ARE IN METRES.

# REVISIONS

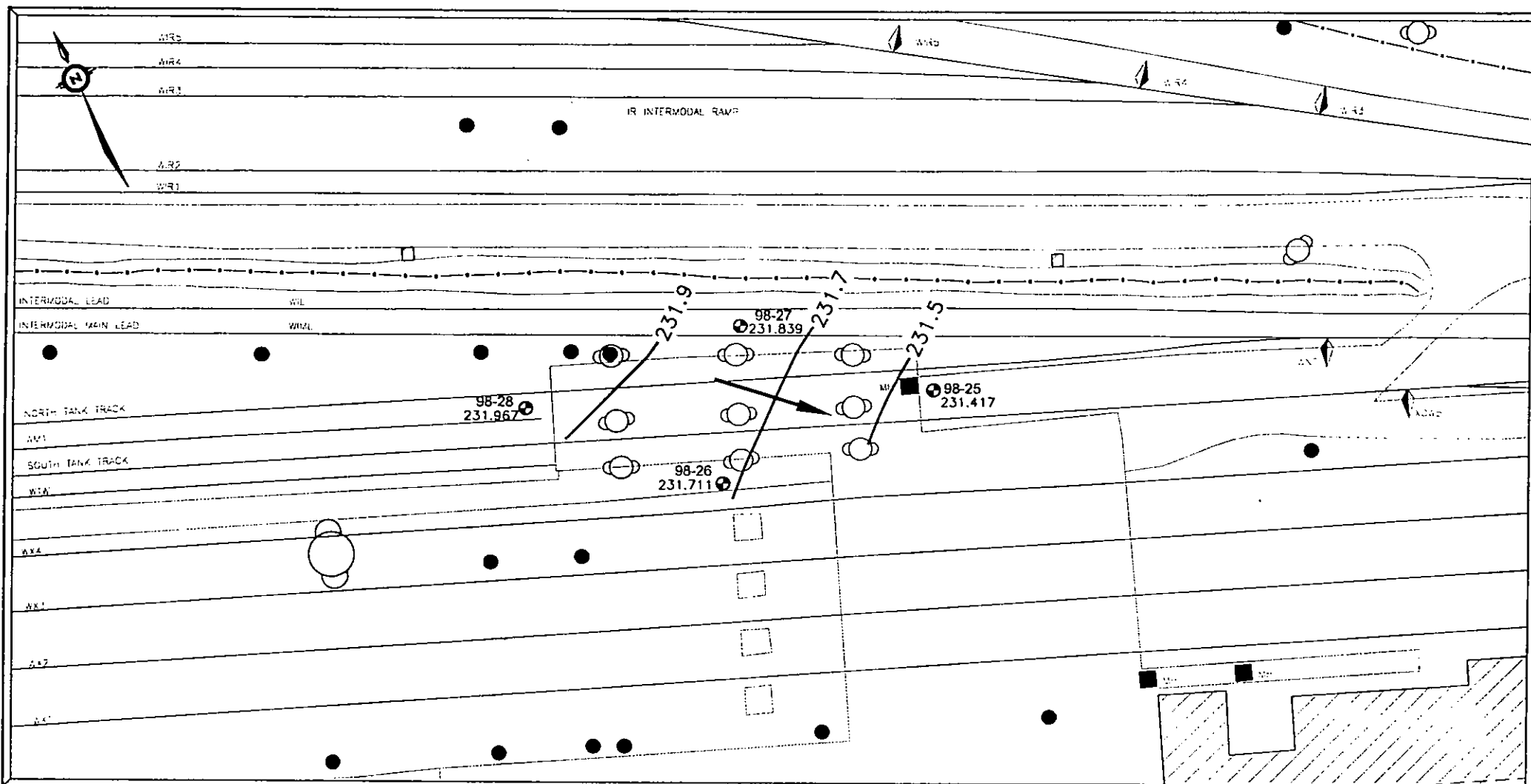
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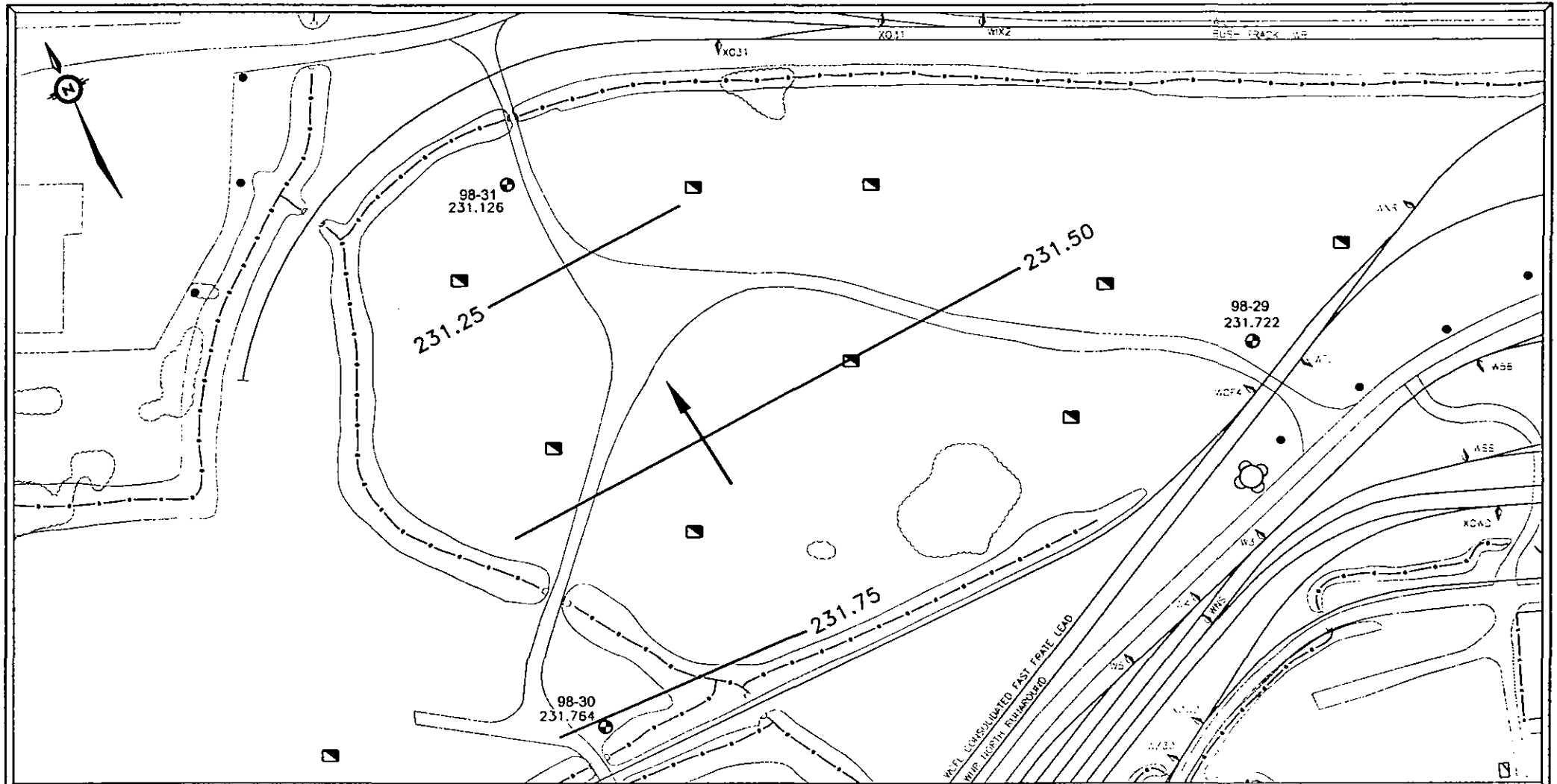
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| SCALE: AS SHOWN                                                                | DATE: 2000 02 25 | CLIENT: CP RAIL | PROJECT: WINNIPEG DIESEL SHOPS AND WESTON SHOPS, WINNIPEG, MB | DRAWN BY: CDC | CHECKED: JOT |
| INFERRED GROUNDWATER CONTOURS - FORMER LOCOMOTIVE FUELLING FACILITY 0998 12 02 |                  |                 |                                                               |               |              |
| DRAWING NUMBER: W81408-013                                                     |                  |                 |                                                               |               |              |



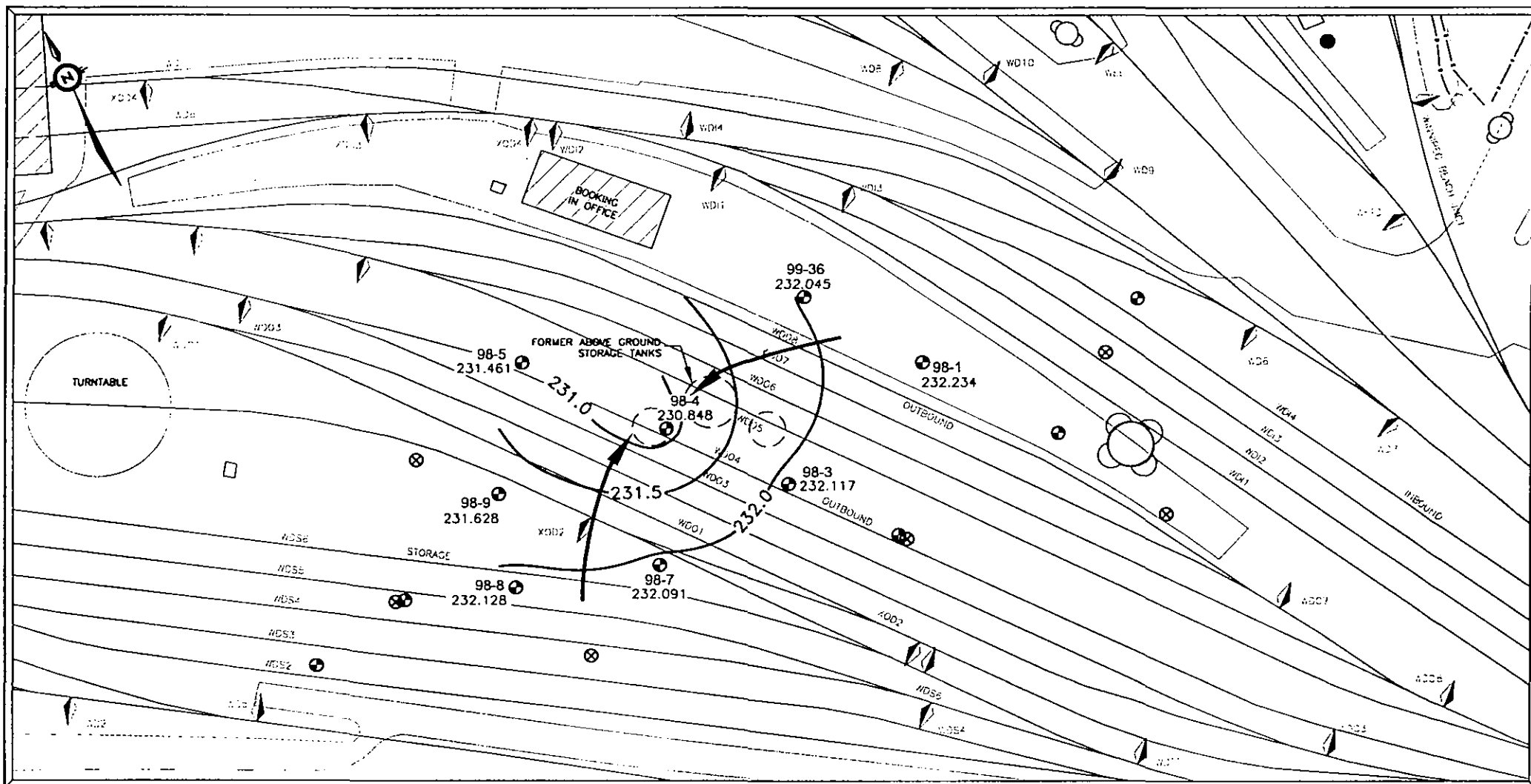




| <b>LEGEND</b><br>● BOREHOLE LOCATION (MONITORING WELL INSTALLED)<br>— APPARENT DIRECTION OF GROUNDWATER FLOW<br>231.736 MEASURED GROUNDWATER ELEVATION ON 1998 12 01<br>— FENCE<br>■ BUILDING<br>— HAND SWITCH<br>— POWER SWITCH<br>● POWER POLES<br>○ OVERHEAD LIGHTS |                 | <b>NOTES</b><br>1. DRAWING IS DERIVED FROM PLAN SUPPLIED BY CP RAIL, DRAWING NUMBER 98-033-06-05-PS.<br>2. UTILITY LOCATIONS ARE NOT SHOWN.<br>3. ONLY LABELLED MONITORING WELLS WERE USED FOR CONTOURING.<br>4. ALL CONTOURS ARE IN METRES. |               | <b>REVISIONS</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>REV.</th> <th>DATE</th> <th>DESCRIPTION</th> <th>BY</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table> |  | REV. | DATE | DESCRIPTION | BY |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | <div style="text-align: center;"> <br/> <b>MORROW ENVIRONMENTAL CONSULTANTS INC.</b> </div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>SCALE: AS SHOWN</td> <td>WELL: AGM</td> <td>APPROVED BY: CP</td> <td>DRAWN BY: CDC</td> </tr> <tr> <td>DATE: 2000 02 25</td> <td>CLIENT: CP RAIL</td> <td>CHECKED: JDT</td> <td> </td> </tr> <tr> <td colspan="2">SITE ADDRESS: WINNIPEG DIESEL SHOPS AND WESTON SHOPS, WINNIPEG, MB</td> <td colspan="2"> </td> </tr> <tr> <td colspan="4" style="text-align: center;"> <b>INFERRED GROUNDWATER CONTOURS - FORMER LEAKING TANK CAR AREA (1998 12 01)</b> </td> </tr> <tr> <td colspan="4">DRAWING NUMBER: W81406-016</td> </tr> </table> |  | SCALE: AS SHOWN | WELL: AGM | APPROVED BY: CP | DRAWN BY: CDC | DATE: 2000 02 25 | CLIENT: CP RAIL | CHECKED: JDT |  | SITE ADDRESS: WINNIPEG DIESEL SHOPS AND WESTON SHOPS, WINNIPEG, MB |  |  |  | <b>INFERRED GROUNDWATER CONTOURS - FORMER LEAKING TANK CAR AREA (1998 12 01)</b> |  |  |  | DRAWING NUMBER: W81406-016 |  |  |  |
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| SCALE: AS SHOWN                                                                                                                                                                                                                                                        | WELL: AGM       | APPROVED BY: CP                                                                                                                                                                                                                              | DRAWN BY: CDC |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |             |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |                 |           |                 |               |                  |                 |              |  |                                                                    |  |  |  |                                                                                  |  |  |  |                            |  |  |  |
| DATE: 2000 02 25                                                                                                                                                                                                                                                       | CLIENT: CP RAIL | CHECKED: JDT                                                                                                                                                                                                                                 |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |             |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |                 |           |                 |               |                  |                 |              |  |                                                                    |  |  |  |                                                                                  |  |  |  |                            |  |  |  |
| SITE ADDRESS: WINNIPEG DIESEL SHOPS AND WESTON SHOPS, WINNIPEG, MB                                                                                                                                                                                                     |                 |                                                                                                                                                                                                                                              |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |             |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |                 |           |                 |               |                  |                 |              |  |                                                                    |  |  |  |                                                                                  |  |  |  |                            |  |  |  |
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| DRAWING NUMBER: W81406-016                                                                                                                                                                                                                                             |                 |                                                                                                                                                                                                                                              |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |             |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |                 |           |                 |               |                  |                 |              |  |                                                                    |  |  |  |                                                                                  |  |  |  |                            |  |  |  |



| <b>LEGEND</b><br>● BOREHOLE LOCATION (MONITORING WELL INSTALLED)<br>■ TEST PIT LOCATION<br>↖ APPARENT DIRECTION OF GROUNDWATER FLOW<br>231.734 MEASURED GROUNDWATER ELEVATION ON 1998 12 01 |                  | <b>BAR SCALE</b><br>0m 50 100m<br>FENCE<br>BUILDING<br>HAND SWITCH<br>POWER SWITCH<br>POWER POLES<br>OVERHEAD LIGHTS |               | <b>NOTES</b><br>1. DRAWING IS DERIVED FROM PLAN SUPPLIED BY CP RAIL, DRAWING NUMBER 98-033-06-05-P5.<br>2. UTILITY LOCATIONS ARE NOT SHOWN.<br>3. ONLY LABELLED MONITORING WELLS WERE USED FOR CONTOURING.<br>4. ALL CONTOURS ARE IN METRES. |  | <b>REVISIONS</b><br><table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>REV.</th> <th>DATE</th> <th>DESCRIPTION</th> <th>BY</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table> |  | REV. | DATE | DESCRIPTION | BY |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | <div style="text-align: center;"> <br/> <b>MORROW ENVIRONMENTAL CONSULTANTS INC.</b> </div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>SCALE: AS SHOWN</td> <td>DATE: 2000 02 25</td> <td>CLIENT: CP RAIL</td> <td>DRAWN BY: CDC</td> </tr> <tr> <td></td> <td></td> <td>SITE ADDRESS: WINNIPEG DIESEL SHOPS AND WESTON SHOPS, WINNIPEG, MB</td> <td>CHECKED: JOT</td> </tr> </table> <p style="text-align: center;"><b>INFERRED GROUNDWATER CONTOURS - SOIL STOCKPILING AREA (0998 12 01)</b></p> <p>DRAWING NUMBER: W81408-017</p> |  | SCALE: AS SHOWN | DATE: 2000 02 25 | CLIENT: CP RAIL | DRAWN BY: CDC |  |  | SITE ADDRESS: WINNIPEG DIESEL SHOPS AND WESTON SHOPS, WINNIPEG, MB | CHECKED: JOT |
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| SCALE: AS SHOWN                                                                                                                                                                             | DATE: 2000 02 25 | CLIENT: CP RAIL                                                                                                      | DRAWN BY: CDC |                                                                                                                                                                                                                                              |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |             |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |                 |                  |                 |               |  |  |                                                                    |              |
|                                                                                                                                                                                             |                  | SITE ADDRESS: WINNIPEG DIESEL SHOPS AND WESTON SHOPS, WINNIPEG, MB                                                   | CHECKED: JOT  |                                                                                                                                                                                                                                              |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |             |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |                 |                  |                 |               |  |  |                                                                    |              |



# LEGEND

## BAR SCALE

0m 10m 50m

- BOREHOLE LOCATION (MONITORING WELL INSTALLED)
- BOREHOLE LOCATION (MONITORING WELL NOT INSTALLED)
- APPARENT DIRECTION OF GROUNDWATER FLOW
- MEASURED GROUNDWATER ELEVATION ON 1999 08 31

- FENCE
- BUILDING
- HAND SWITCH
- POWER SWITCH
- POWER POLES
- OVERHEAD LIGHTS

## NOTES

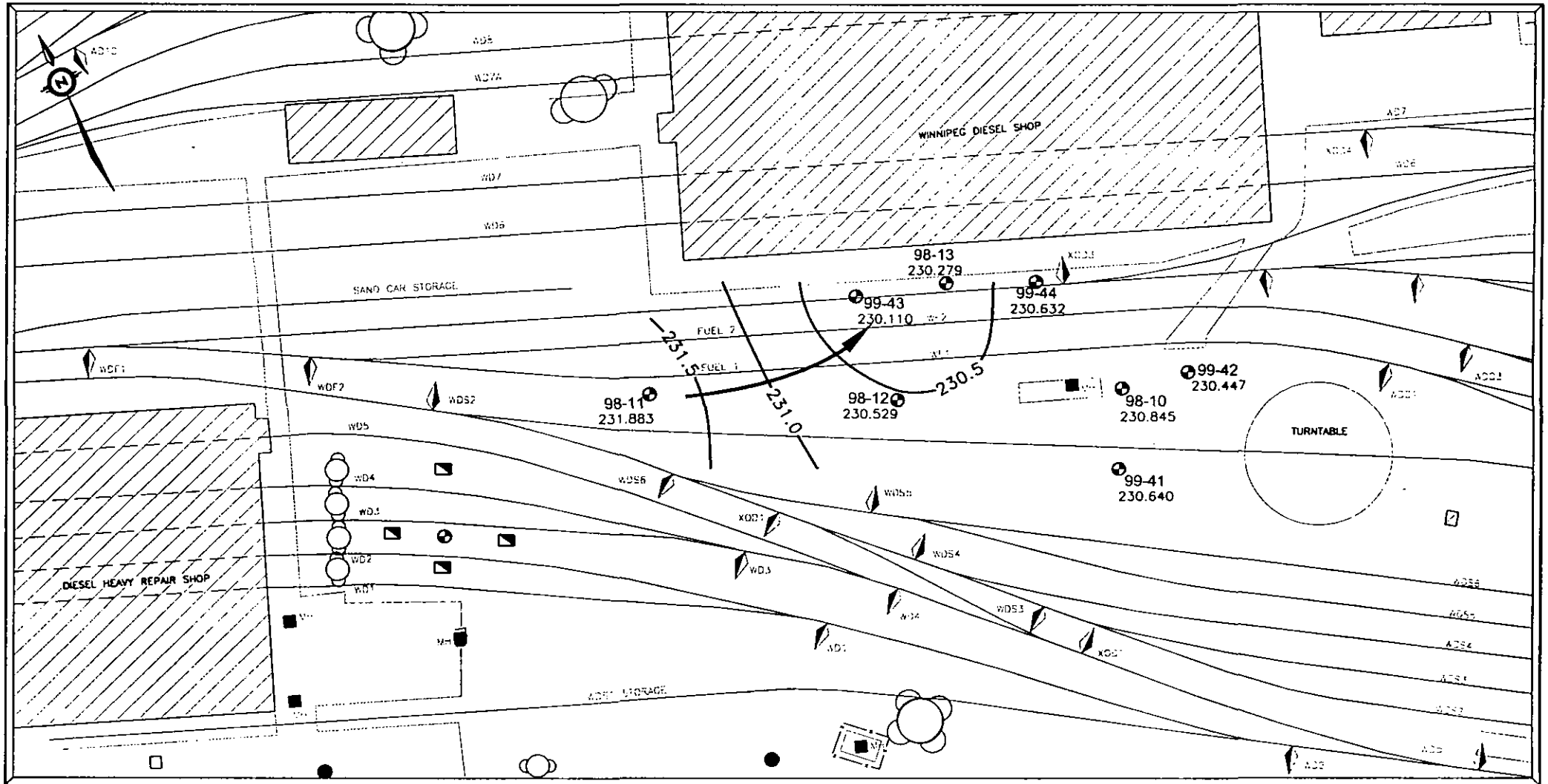
- DRAWING IS DERIVED FROM PLAN SUPPLIED BY CP RAIL, DRAWING NUMBER 98-033-06-05-P5.
- UTILITY LOCATIONS ARE NOT SHOWN.
- ONLY LABELLED MONITORING WELLS WERE USED FOR CONTOURING.
- ALL CONTOURS ARE IN METRES.

## REVISIONS

| REV. | DATE | DESCRIPTION | BY |
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**MORROW ENVIRONMENTAL CONSULTANTS INC.**

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|----------------------------------------------------------------------------------|---------------------------------------------------------------|--------------|---------------|
| SCALE: AS SHOWN                                                                  | DATE: 2000 02 25                                              | CLIENT: CP   | DRAWN BY: CDC |
| CLIENT NAME: CP RAIL                                                             | PROJECT: WINNIPEG DIESEL SHOPS AND WESTON SHOPS, WINNIPEG, MB | CHECKED: JDT |               |
| INFERRED GROUNDWATER CONTOURS - FORMER LOCOMOTIVE FUELLING FACILITY (1999 08 31) |                                                               |              |               |
| DRAWING NUMBER: W8140B-018                                                       |                                                               |              |               |



**LEGEND**

- BOREHOLE LOCATION (MONITORING WELL INSTALLED)
- TEST PIT LOCATION
- ↖ APPARENT DIRECTION OF GROUNDWATER FLOW
- 231.736 MEASURED GROUNDWATER ELEVATION ON 1999 08 31

**BAR SCALE**

0m 10m 50m

**NOTES**

1. DRAWING IS DERIVED FROM PLAN SUPPLIED BY CP RAIL, DRAWING NUMBER 98-033-06-05-PS.
2. UTILITY LOCATIONS ARE NOT SHOWN.
3. ONLY LABELLED MONITORING WELLS WERE USED FOR CONTOURING.
4. ALL CONTOURS ARE IN METRES.

**REVISIONS**

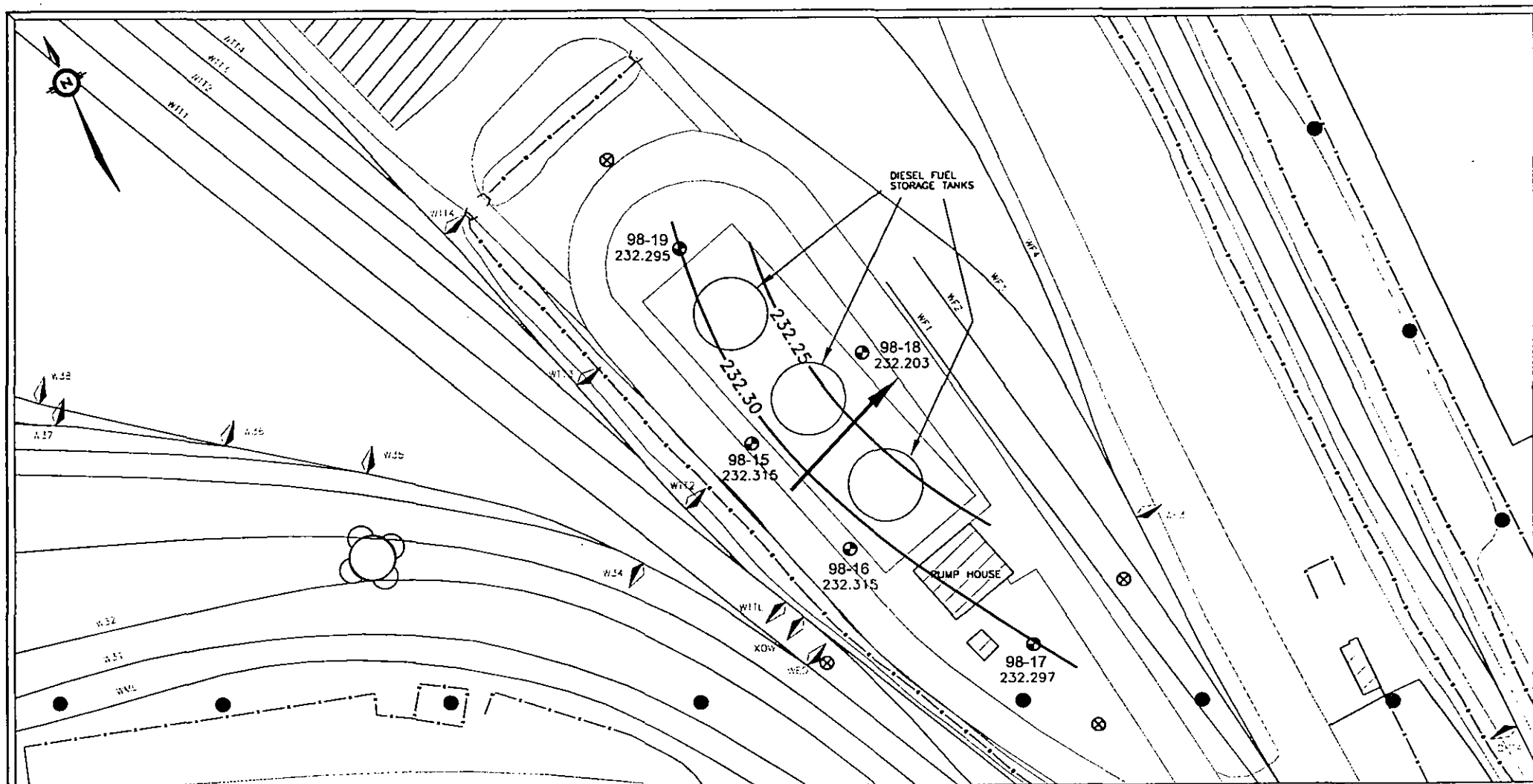
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**MORROW ENVIRONMENTAL CONSULTANTS INC.**

|                 |                  |                 |                                                               |
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| SCALE: AS SHOWN | DATE: 2000 02 25 | CLIENT: CP RAIL | PROJECT: WINNIPEG DIESEL SHOPS AND WESTON SHOPS, WINNIPEG, MB |
| DRAWN BY: CDC   |                  | CHECKER: JDT    |                                                               |

**INFERRED GROUNDWATER CONTOURS - ACTIVE LOCOMOTIVE FUELLING FACILITY 0999 08 30**

DRAWING NUMBER: WB140B-019



# LEGEND

BAR SCALE 0m 10 50m

- ⊕ BOREHOLE LOCATION (MONITORING WELL INSTALLED)
- ⊗ BOREHOLE LOCATION (MONITORING WELL NOT INSTALLED)
- APPARENT DIRECTION OF GROUNDWATER FLOW
- 231.738 MEASURED GROUNDWATER ELEVATION ON 1999 08 31

- FENCE
- ▨ BUILDING
- HAND SWITCH
- POWER SWITCH
- POWER POLES
- OVERHEAD LIGHTS

# NOTES

1. DRAWING IS DERIVED FROM PLAN SUPPLIED BY CP RAIL, DRAWING NUMBER 98-033-06-05-PS.
2. UTILITY LOCATIONS ARE NOT SHOWN.
3. ONLY LABELLED MONITORING WELLS WERE USED FOR CONTOURING.
4. ALL CONTOURS ARE IN METRES.

# REVISIONS

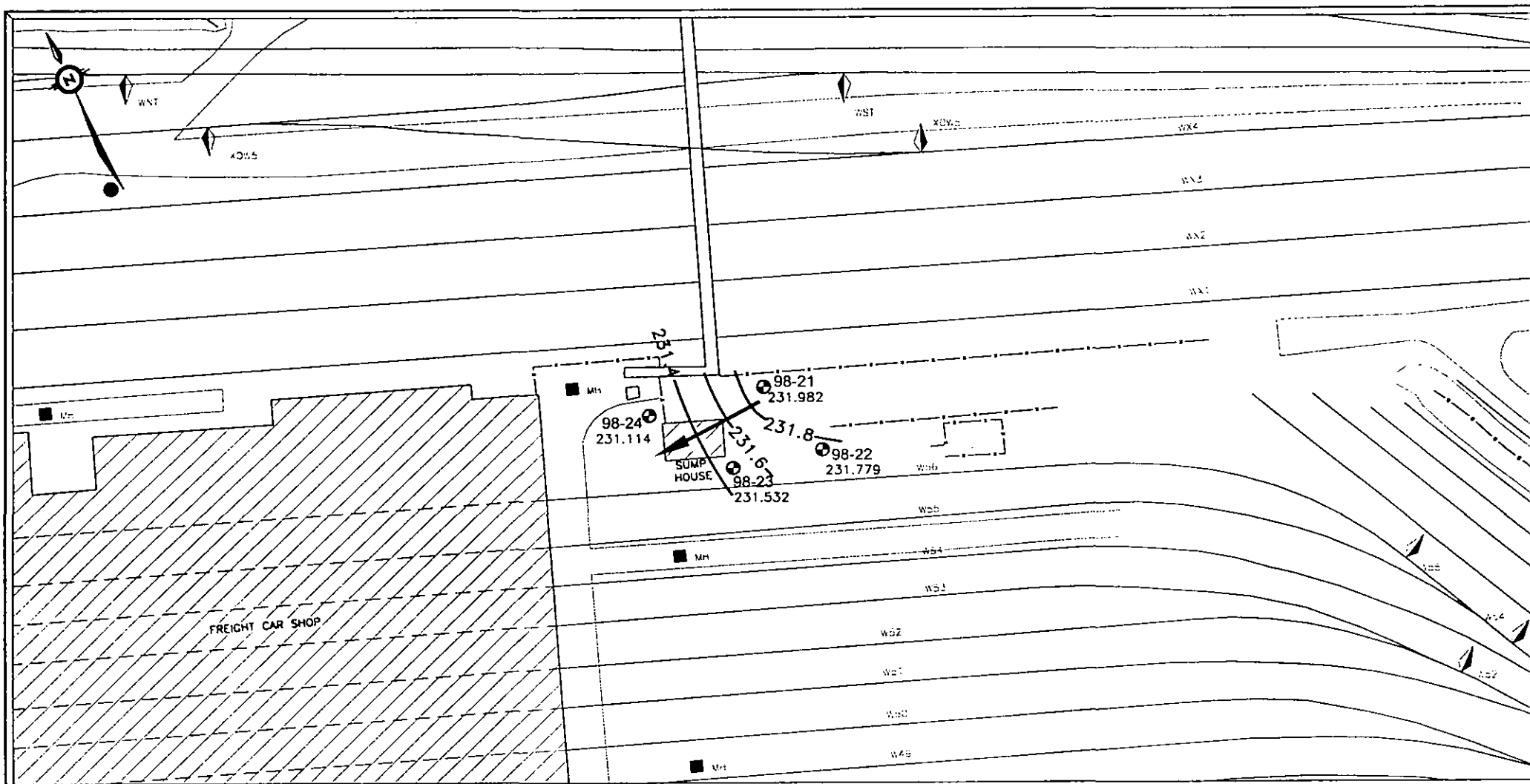
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MORROW ENVIRONMENTAL CONSULTANTS INC.

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INFERRED GROUNDWATER CONTOURS - ABOVE GROUND DIESEL FUEL STORAGE TANK AREA (1999 08 30)

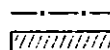


# LEGEND

## BAR SCALE

0m 10 50m

- BOREHOLE LOCATION (MONITORING WELL INSTALLED)
- APPARENT DIRECTION OF GROUNDWATER FLOW
- 231.736 MEASURED GROUNDWATER ELEVATION ON 1999 08 31



- FENCE
- BUILDING
- HAND SWITCH
- POWER SWITCH
- POWER POLES
- OVERHEAD LIGHTS

## NOTES

1. DRAWING IS DERIVED FROM PLAN SUPPLIED BY CP RAIL, DRAWING NUMBER 48-033-06-05-PS.
2. UTILITY LOCATIONS ARE NOT SHOWN.
3. ONLY LABELLED MONITORING WELLS WERE USED FOR CONTOURING.
4. ALL CONTOURS ARE IN METRES.

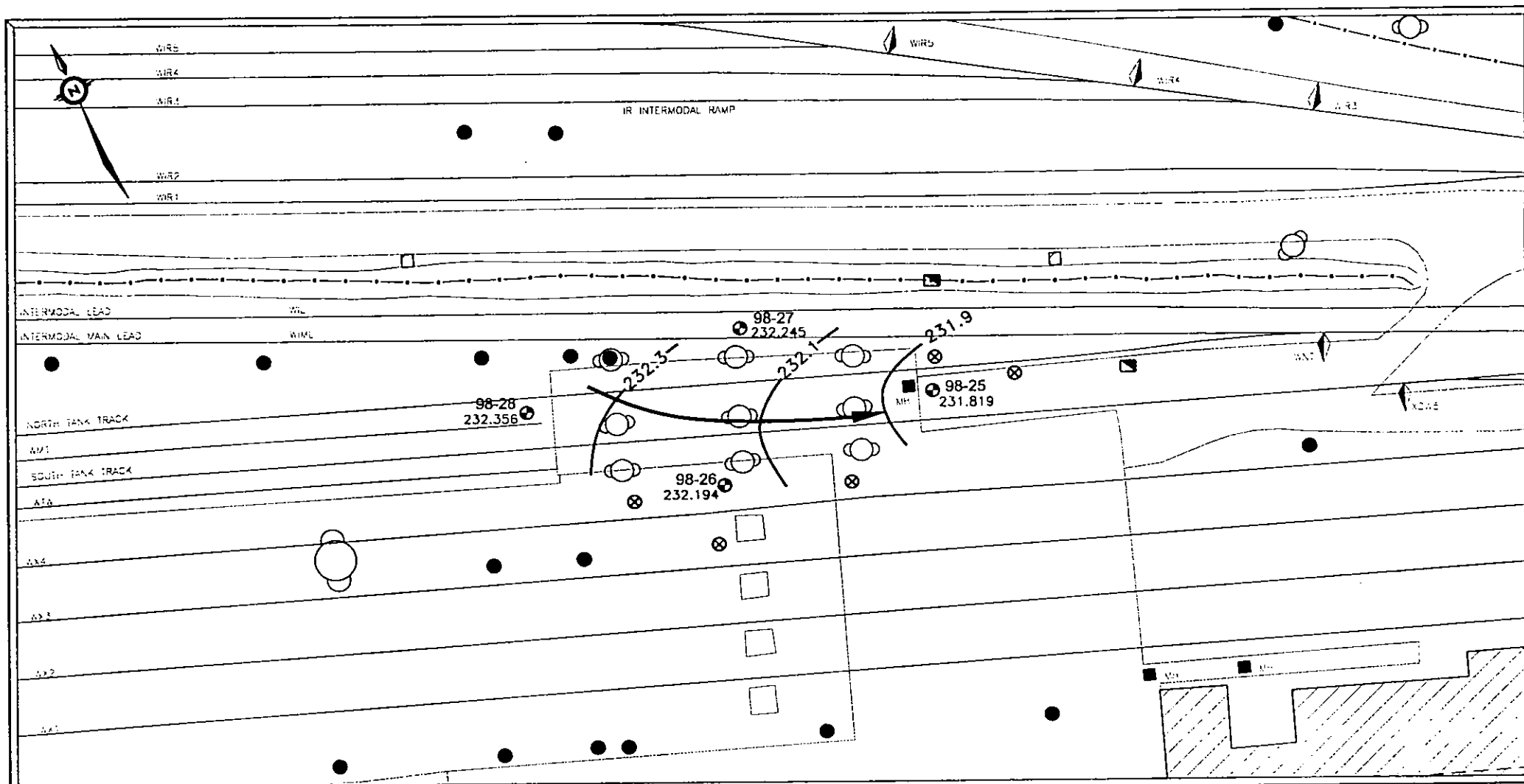
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MORROW ENVIRONMENTAL CONSULTANTS INC.

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| SCALE: AS SHOWN                                                           | DATE: 2000 02 25 | CLIENT: CP RAIL                                                    | DRAWN BY: CDC |
| WED                                                                       | AGM              | CP                                                                 | CHECKED: JDT  |
| CLIENT NAME: CP RAIL                                                      |                  | SITE ADDRESS: WINNIPEG DIESEL SHOPS AND WESTON SHOPS, WINNIPEG, MB |               |
| INFERRED GROUNDWATER CONTOUR - FORMER TANK CAR CLEANING AREA (1999 08 31) |                  |                                                                    |               |
| DRAWING NUMBER: W81408-021                                                |                  |                                                                    |               |



# LEGEND

BAR SCALE

0m 10 50m

- BOREHOLE LOCATION (MONITORING WELL INSTALLED)
- ⊗ BOREHOLE LOCATION (MONITORING WELL NOT INSTALLED)
- TEST PIT LOCATION
- ↖ APPARENT DIRECTION OF GROUNDWATER FLOW

231.738  
ACSL  
1/4"

- MEASURED GROUNDWATER ELEVATION ON 1999 08 31
- FENCE
- BUILDING
- HAND SWITCH
- POWER SWITCH
- POWER POLES
- OVERHEAD LIGHTS

# NOTES

1. DRAWING IS DERIVED FROM PLAN SUPPLIED BY CP RAIL, DRAWING NUMBER 98-033-06-05-PS.
2. UTILITY LOCATIONS ARE NOT SHOWN.
3. ONLY LABELLED MONITORING WELLS WERE USED FOR CONTOURING.
4. ALL CONTOURS ARE IN METRES.

# REVISIONS

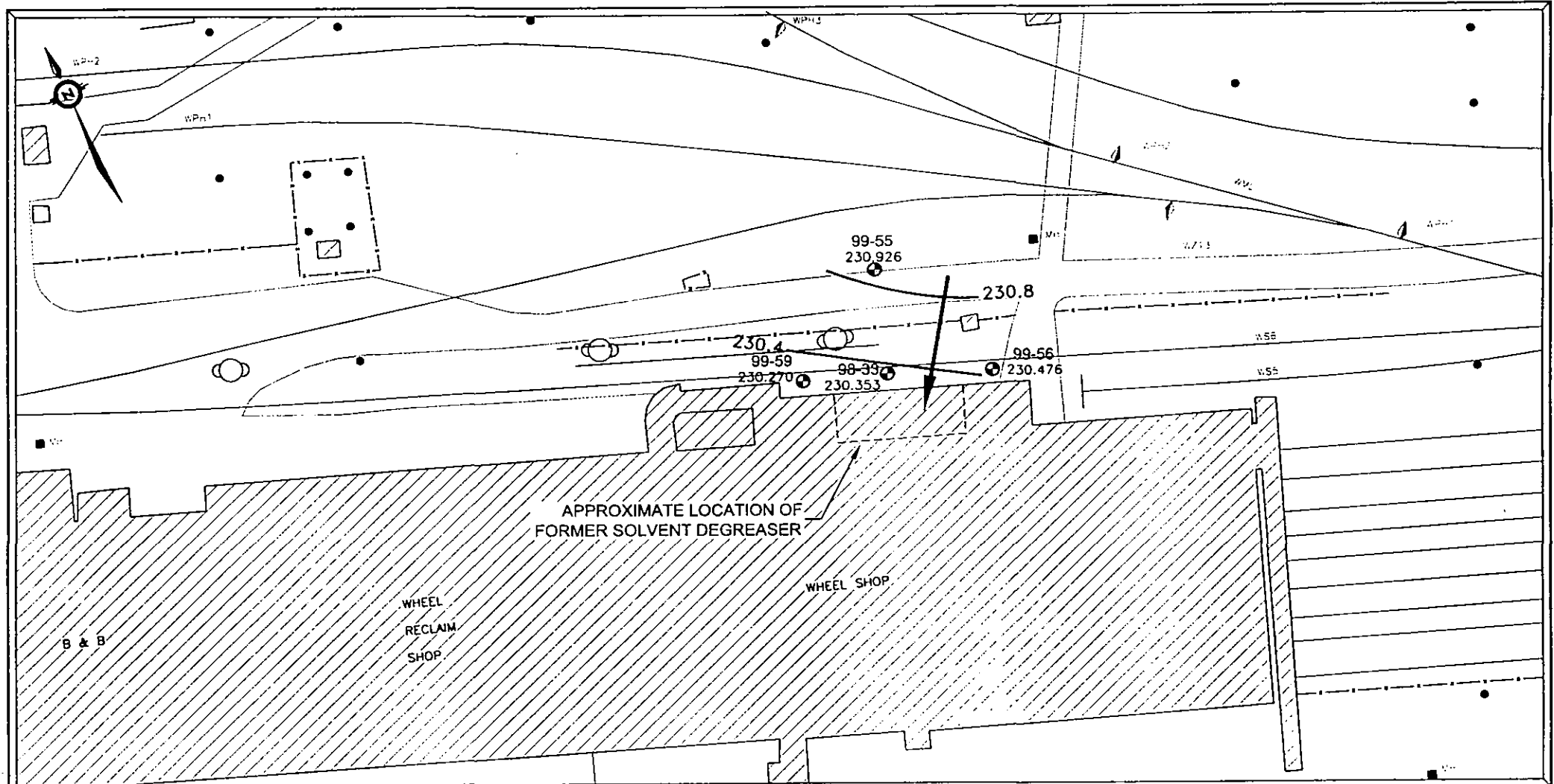
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MORROW ENVIRONMENTAL CONSULTANTS INC.

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| SCALE: AS SHOWN                                                         | DATE: 2000 02 25 | CLIENT: CP RAIL                                                    | DRAWN BY: CDC |
| MECH: AGM                                                               | CHECKED: JDT     | SITE ADDRESS: WINNIPEG DIESEL SHOPS AND WESTON SHOPS, WINNIPEG, MB |               |
| INFERRED GROUNDWATER CONTOURS - FORMER LEAKING TANK CAR AREA 0999 08 30 |                  |                                                                    |               |
| DRAWING NUMBER: W81408-022                                              |                  |                                                                    |               |





# LEGEND

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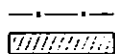
# NOTES

# REVISIONS

● BOREHOLE LOCATION (MONITORING WELL INSTALLED)

— APPARENT DIRECTION OF GROUNDWATER FLOW

231.736 MEASURED GROUNDWATER ELEVATION ON 1999 09 01



FENCE

BUILDING

HAND SWITCH

POWER SWITCH

POWER POLES

OVERHEAD LIGHTS

1. DRAWING IS DERIVED FROM PLAN SUPPLIED BY CP RAIL, DRAWING NUMBER 98-033-06-05-P5.

2. UTILITY LOCATIONS ARE NOT SHOWN.

3. ONLY LABELLED MONITORING WELLS WERE USED FOR CONTOURING.

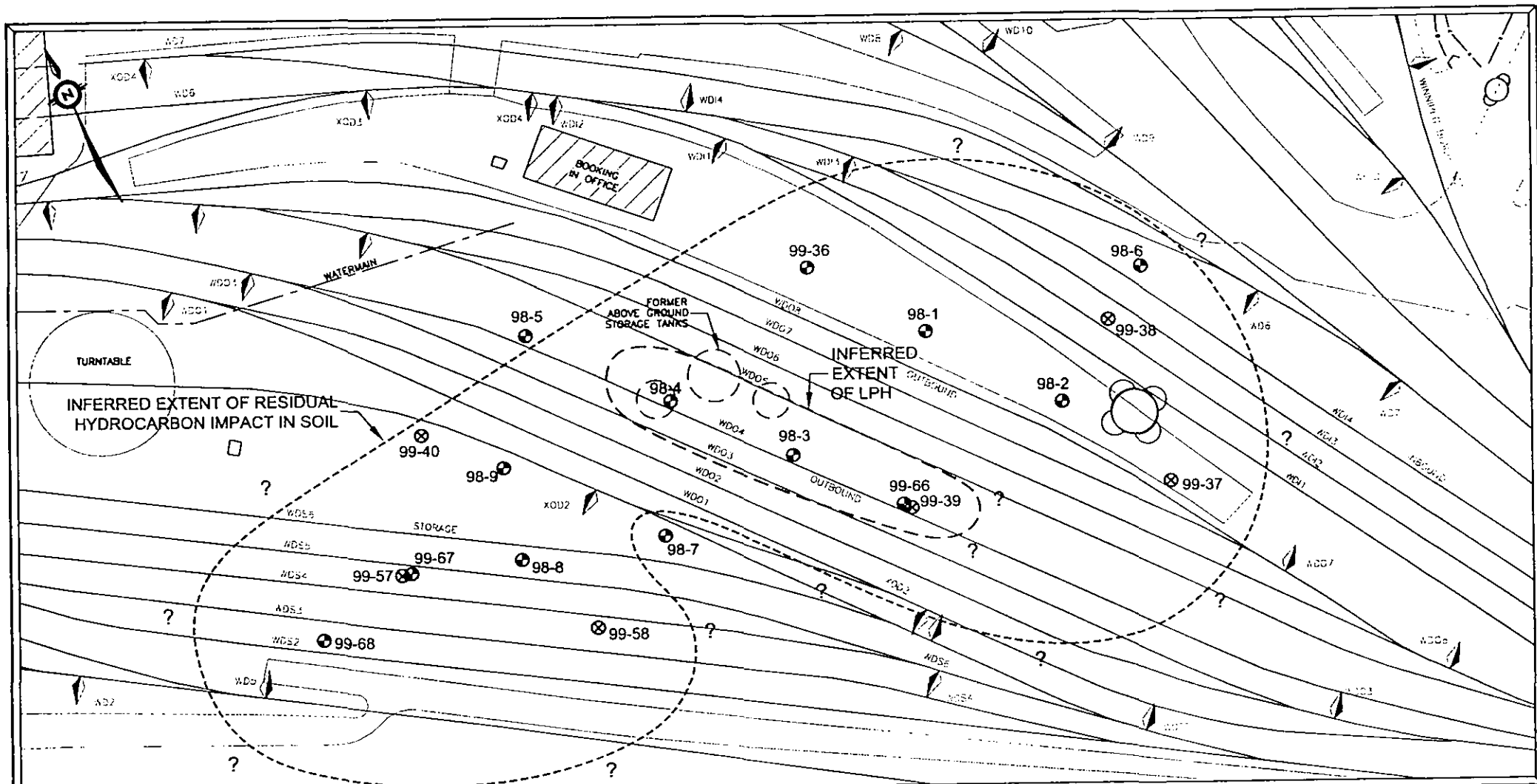
4. ALL CONTOURS ARE IN METRES.

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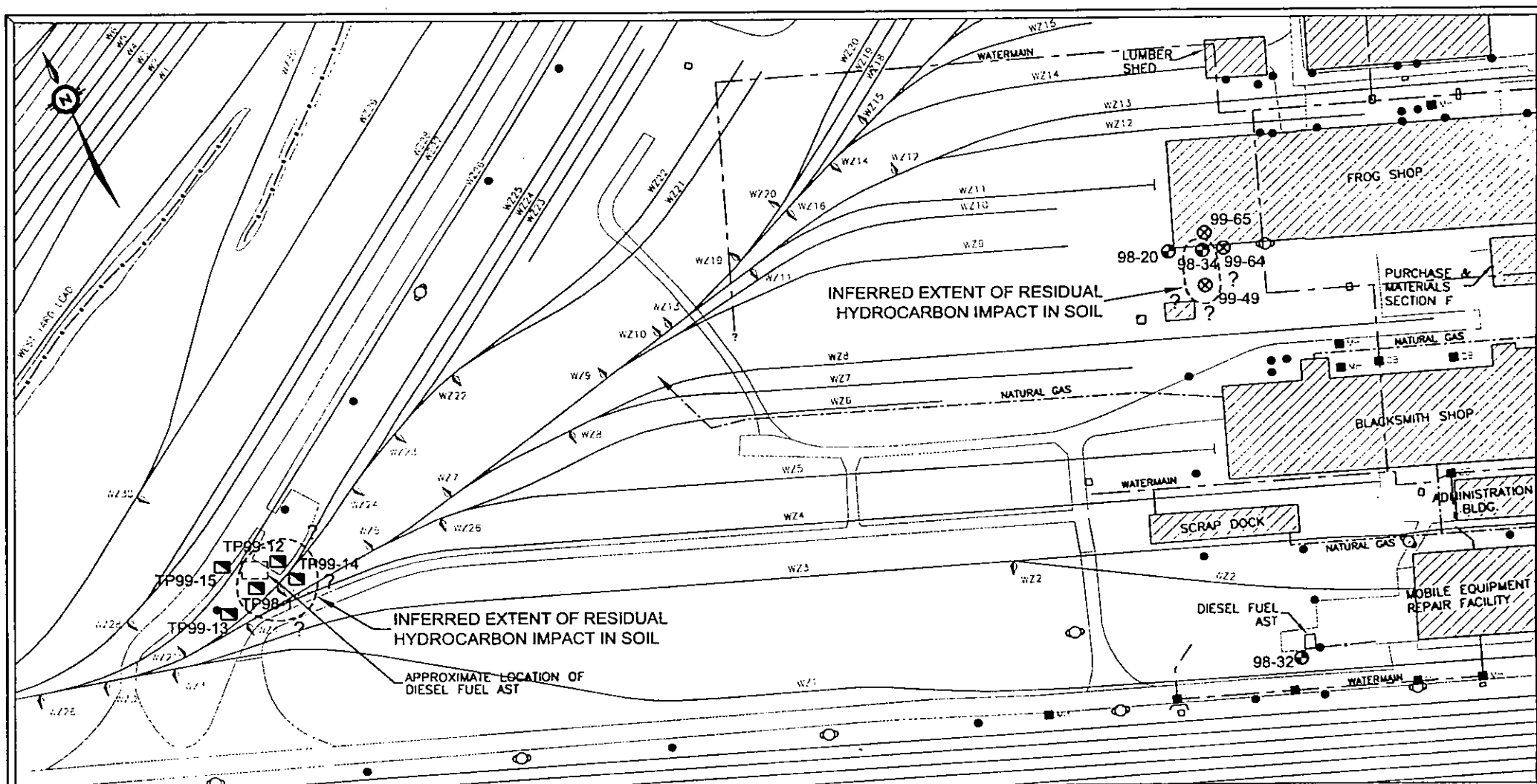
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| SCALE: AS SHOWN                                                    | MECH                                                                     | APPROVED BY: | CLIENT: | DRAWN BY: CDC |
| DATE: 2000 02 25                                                   | AGM                                                                      |              | CP      | CHECKED: JOT  |
| CLIENT NAME:<br>CP RAIL                                            | SITE ADDRESS:<br>WINNIPEG DIESEL SHOPS AND<br>WESTON SHOPS, WINNIPEG, MB |              |         |               |
| <b>INFERRED GROUNDWATER CONTOURS<br/>- WHEEL SHOP (1999 09 01)</b> |                                                                          |              |         |               |
| DRAWING NUMBER: W8140B-024                                         |                                                                          |              |         |               |



| LEGEND                                                                               |                                                   | BAR SCALE       |                                                                    | NOTES                                                                                                                                                                                                                                                          |  | REVISIONS                                                                                                                                                                                                                                                                                                                                                                     |  | MORROW ENVIRONMENTAL CONSULTANTS INC. |                  |                 |                                                                    |                                                                                      |  |  |  |                           |  |  |  |
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| ⊙                                                                                    | BOREHOLE LOCATION (MONITORING WELL INSTALLED)     | — — — — —       | FENCE                                                              | 1. DRAWING IS DERIVED FROM PLAN SUPPLIED BY CP RAIL, DRAWING NUMBER 98-033-06-05-P5.<br>2. UTILITY LOCATIONS AND FORMER TANK LOCATIONS ARE APPROXIMATE AND LIMITED TO INFORMATION PROVIDED BY CP RAIL DRAWINGS. UTILITY LOCATIONS SHOULD BE CONFIRMED ON-SITE. |  | <table border="1"> <tr> <td>SCALE: AS SHOWN</td> <td>DATE: 2000 02 25</td> <td>CLIENT: CP RAIL</td> <td>SITE ADDRESS: WINNIPEG DIESEL SHOPS AND WESTON SHOPS, WINNIPEG, MB</td> </tr> <tr> <td colspan="4">INFERRED EXTENT OF RESIDUAL HYDROCARBON IMPACT - FORMER LOCOMOTIVE FUELLING FACILITY</td> </tr> <tr> <td colspan="4">DRAWING NUMBER W81408-025</td> </tr> </table> |  | SCALE: AS SHOWN                       | DATE: 2000 02 25 | CLIENT: CP RAIL | SITE ADDRESS: WINNIPEG DIESEL SHOPS AND WESTON SHOPS, WINNIPEG, MB | INFERRED EXTENT OF RESIDUAL HYDROCARBON IMPACT - FORMER LOCOMOTIVE FUELLING FACILITY |  |  |  | DRAWING NUMBER W81408-025 |  |  |  |
| SCALE: AS SHOWN                                                                      | DATE: 2000 02 25                                  | CLIENT: CP RAIL | SITE ADDRESS: WINNIPEG DIESEL SHOPS AND WESTON SHOPS, WINNIPEG, MB |                                                                                                                                                                                                                                                                |  |                                                                                                                                                                                                                                                                                                                                                                               |  |                                       |                  |                 |                                                                    |                                                                                      |  |  |  |                           |  |  |  |
| INFERRED EXTENT OF RESIDUAL HYDROCARBON IMPACT - FORMER LOCOMOTIVE FUELLING FACILITY |                                                   |                 |                                                                    |                                                                                                                                                                                                                                                                |  |                                                                                                                                                                                                                                                                                                                                                                               |  |                                       |                  |                 |                                                                    |                                                                                      |  |  |  |                           |  |  |  |
| DRAWING NUMBER W81408-025                                                            |                                                   |                 |                                                                    |                                                                                                                                                                                                                                                                |  |                                                                                                                                                                                                                                                                                                                                                                               |  |                                       |                  |                 |                                                                    |                                                                                      |  |  |  |                           |  |  |  |
| ⊗                                                                                    | BOREHOLE LOCATION (MONITORING WELL NOT INSTALLED) |                 | BUILDING                                                           |                                                                                                                                                                                                                                                                |  |                                                                                                                                                                                                                                                                                                                                                                               |  |                                       |                  |                 |                                                                    |                                                                                      |  |  |  |                           |  |  |  |
|                                                                                      |                                                   | ADS ↓           | HAND SWITCH                                                        |                                                                                                                                                                                                                                                                |  |                                                                                                                                                                                                                                                                                                                                                                               |  |                                       |                  |                 |                                                                    |                                                                                      |  |  |  |                           |  |  |  |
|                                                                                      |                                                   | PA ↓            | POWER SWITCH                                                       |                                                                                                                                                                                                                                                                |  |                                                                                                                                                                                                                                                                                                                                                                               |  |                                       |                  |                 |                                                                    |                                                                                      |  |  |  |                           |  |  |  |
|                                                                                      |                                                   | ●               | POWER POLES                                                        |                                                                                                                                                                                                                                                                |  |                                                                                                                                                                                                                                                                                                                                                                               |  |                                       |                  |                 |                                                                    |                                                                                      |  |  |  |                           |  |  |  |
|                                                                                      |                                                   | ○               | OVERHEAD LIGHTS                                                    |                                                                                                                                                                                                                                                                |  |                                                                                                                                                                                                                                                                                                                                                                               |  |                                       |                  |                 |                                                                    |                                                                                      |  |  |  |                           |  |  |  |







# LEGEND

## BAR SCALE

- BOREHOLE LOCATION (MONITORING WELL INSTALLED)
- BOREHOLE LOCATION (MONITORING WELL NOT INSTALLED)
- TEST PIT LOCATION
- FENCE
- BUILDING
- HAND SWITCH
- POWER SWITCH
- POWER POLES
- OVERHEAD LIGHTS

## NOTES

1. DRAWING IS DERIVED FROM PLAN SUPPLIED BY CP RAIL, DRAWING NUMBER 95-033-06-05-P5.
2. UTILITY LOCATIONS ARE APPROXIMATE AND LIMITED TO INFORMATION PROVIDED BY CP RAIL DRAWINGS. LOCATIONS SHOULD BE CONFIRMED ON-SITE.

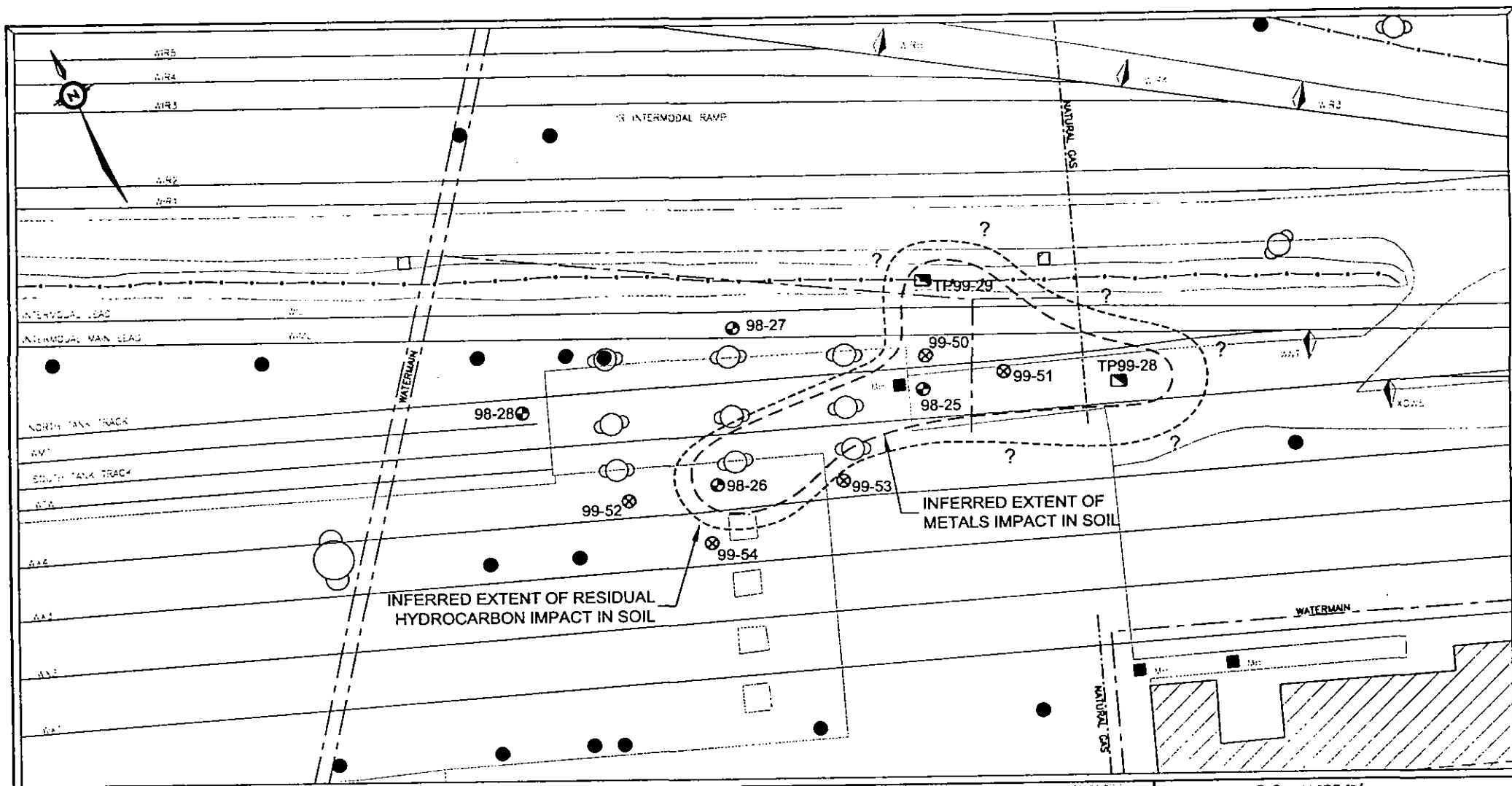
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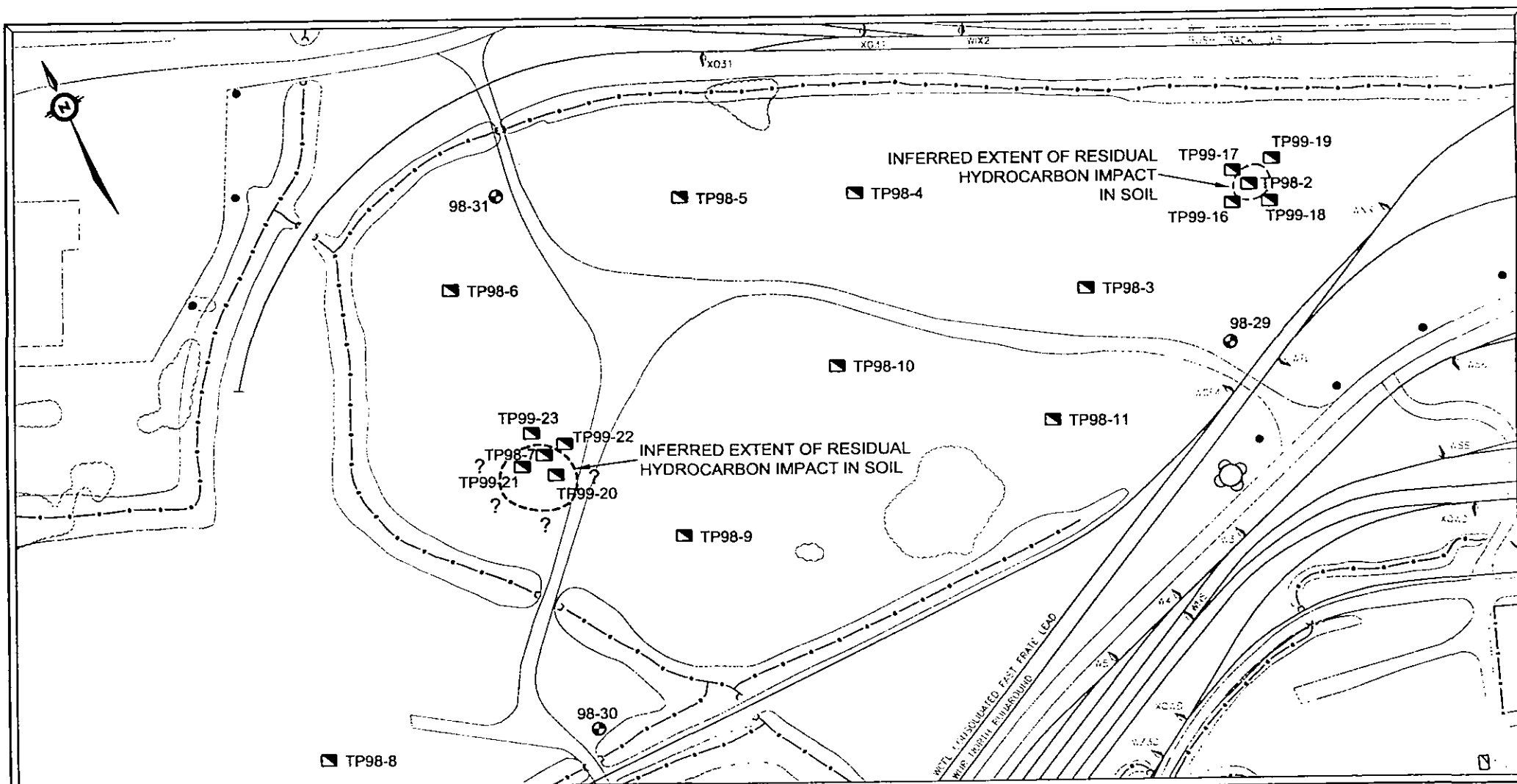


MORROW  
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CONSULTANTS INC.

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| SCALE: AS SHOWN                                                    | DATE: 2000 02 25 | CLIENT NAME: CP RAIL | CLIENT: CP                                                                                    | DRAWN BY: CDC | CHECKED: JDT |
| SITE ADDRESS: WINNIPEG DIESEL SHOPS AND WESTON SHOPS, WINNIPEG, MB |                  |                      | INFERRED EXTENT OF RESIDUAL HYDROCARBON IMPACT - FROG SHOP & MOBILE EQUIPMENT REPAIR FACILITY |               |              |
| DRAWING NUMBER: W81408-028                                         |                  |                      |                                                                                               |               |              |



| LEGEND |                                                      | BAR SCALE                                                                           |                 | NOTES                                                                                                                                                                                                                            |      | REVISIONS   |    | MORROW ENVIRONMENTAL CONSULTANTS INC.                                                                                                                                                                                                                               |  |
|--------|------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------------|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| ⊙      | BOREHOLE LOCATION<br>(MONITORING WELL INSTALLED)     |  | FENCE           | 1. DRAWING IS DERIVED FROM PLAN SUPPLIED BY CP RAIL, DRAWING NUMBER 98-033-06-05-P5.<br><br>2. UTILITY LOCATIONS ARE APPROXIMATE AND LIMITED TO INFORMATION PROVIDED BY CP RAIL DRAWINGS. LOCATIONS SHOULD BE CONFIRMED ON-SITE. |      |             |    |                                                                                                                                                                                                                                                                     |  |
| ⊗      | BOREHOLE LOCATION<br>(MONITORING WELL NOT INSTALLED) |  | BUILDING        |                                                                                                                                                                                                                                  |      |             |    |                                                                                                                                                                                                                                                                     |  |
|        |                                                      |  | HAND SWITCH     |                                                                                                                                                                                                                                  |      |             |    |                                                                                                                                                                                                                                                                     |  |
|        |                                                      |  | POWER SWITCH    |                                                                                                                                                                                                                                  |      |             |    |                                                                                                                                                                                                                                                                     |  |
|        |                                                      |  | POWER POLES     |                                                                                                                                                                                                                                  |      |             |    |                                                                                                                                                                                                                                                                     |  |
| ■      | TEST PIT LOCATION                                    |  | OVERHEAD LIGHTS |                                                                                                                                                                                                                                  |      |             |    |                                                                                                                                                                                                                                                                     |  |
|        |                                                      |                                                                                     |                 | REV.                                                                                                                                                                                                                             | DATE | DESCRIPTION | BY | SCALE: AS SHOWN<br>DATE: 2000 02 25<br>WEEK: AGM<br>CLIENT: CP RAIL<br>SITE ADDRESS: WINNIPEG DIESEL SHOPS AND WESTON SHOPS, WINNIPEG, MB<br>INFERRED EXTENT OF RESIDUAL HYDROCARBON AND METALS IMPACT - FORMER LEAKING TANK CAR AREA<br>DRAWING NUMBER: W8140B-029 |  |



| LEGEND           |                                               | BAR SCALE       |                                                                    | NOTES                                                                                                                                                                                                                          |  | REVISIONS                                                                                                                                                                                      |      | MORROW ENVIRONMENTAL CONSULTANTS INC. |                  |                 |                                                                    |                                                                                                                                    |  |                  |               |              |  |
|------------------|-----------------------------------------------|-----------------|--------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------------------------------|------------------|-----------------|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|--|------------------|---------------|--------------|--|
| ⊙                | BOREHOLE LOCATION (MONITORING WELL INSTALLED) | — — — — —       | FENCE                                                              | 1. DRAWING IS DERIVED FROM PLAN SUPPLIED BY CP RAIL, DRAWING NUMBER 98-033-06-05-P5.<br>2. UTILITY LOCATIONS ARE NOT SHOWN AND ARE LIMITED TO INFORMATION PROVIDED BY CP RAIL DRAWINGS. LOCATIONS SHOULD BE CONFIRMED ON-SITE. |  | <table border="1"> <tr> <td>SCALE: AS SHOWN</td> <td>DATE: 2000 02 25</td> <td>CLIENT: CP RAIL</td> <td>SITE ADDRESS: WINNIPEG DIESEL SHOPS AND WESTON SHOPS, WINNIPEG, MB</td> </tr> </table> |      | SCALE: AS SHOWN                       | DATE: 2000 02 25 | CLIENT: CP RAIL | SITE ADDRESS: WINNIPEG DIESEL SHOPS AND WESTON SHOPS, WINNIPEG, MB | <table border="1"> <tr> <td>APPROVED BY: CDC</td> <td>DRAWN BY: JDT</td> </tr> <tr> <td>CHECKED: JDT</td> <td></td> </tr> </table> |  | APPROVED BY: CDC | DRAWN BY: JDT | CHECKED: JDT |  |
| SCALE: AS SHOWN  | DATE: 2000 02 25                              | CLIENT: CP RAIL | SITE ADDRESS: WINNIPEG DIESEL SHOPS AND WESTON SHOPS, WINNIPEG, MB |                                                                                                                                                                                                                                |  |                                                                                                                                                                                                |      |                                       |                  |                 |                                                                    |                                                                                                                                    |  |                  |               |              |  |
| APPROVED BY: CDC | DRAWN BY: JDT                                 |                 |                                                                    |                                                                                                                                                                                                                                |  |                                                                                                                                                                                                |      |                                       |                  |                 |                                                                    |                                                                                                                                    |  |                  |               |              |  |
| CHECKED: JDT     |                                               |                 |                                                                    |                                                                                                                                                                                                                                |  |                                                                                                                                                                                                |      |                                       |                  |                 |                                                                    |                                                                                                                                    |  |                  |               |              |  |
| ■                | TEST PIT LOCATION                             |                 | BUILDING                                                           | <table border="1"> <tr> <td>REV.</td> <td>DATE</td> <td>DESCRIPTION</td> <td>BY</td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table>              |  | REV.                                                                                                                                                                                           | DATE | DESCRIPTION                           | BY               |                 |                                                                    |                                                                                                                                    |  |                  |               |              |  |
| REV.             | DATE                                          | DESCRIPTION     | BY                                                                 |                                                                                                                                                                                                                                |  |                                                                                                                                                                                                |      |                                       |                  |                 |                                                                    |                                                                                                                                    |  |                  |               |              |  |
|                  |                                               |                 |                                                                    |                                                                                                                                                                                                                                |  |                                                                                                                                                                                                |      |                                       |                  |                 |                                                                    |                                                                                                                                    |  |                  |               |              |  |
|                  |                                               |                 |                                                                    |                                                                                                                                                                                                                                |  |                                                                                                                                                                                                |      |                                       |                  |                 |                                                                    |                                                                                                                                    |  |                  |               |              |  |
| •                | POWER POLES                                   | ADSL ↓          | HAND SWITCH                                                        | INFERRED EXTENT OF RESIDUAL HYDROCARBON IMPACT - SOIL STOCKPILING AREA<br>DRAWING NUMBER: WB1408-030                                                                                                                           |  |                                                                                                                                                                                                |      |                                       |                  |                 |                                                                    |                                                                                                                                    |  |                  |               |              |  |
| ○                | OVERHEAD LIGHTS                               | 7A ↓            | POWER SWITCH                                                       |                                                                                                                                                                                                                                |  |                                                                                                                                                                                                |      |                                       |                  |                 |                                                                    |                                                                                                                                    |  |                  |               |              |  |



## **APPENDIX II**

### **Photographs**



PHOTOGRAPH 1: VIEW OF ACTIVE LOCOMOTIVE FUELLING FACILITY  
LOOKING NORTHEAST.



PHOTOGRAPH 2: VIEW OF ABOVE GROUND DIESEL TANKS LOOKING  
NORTHEAST. THESE TANKS SUPPLY DIESEL TO THE  
LOCOMOTIVE FUELLING FACILITY.



PHOTOGRAPH 3: VIEW OF ABOVE GROUND DIESEL STORAGE TANK  
LOOKING NORTHEAST. THIS TANK IS LOCATED  
WEST OF THE MOBILE EQUIPMENT REPAIR  
FACILITY.



PHOTOGRAPH 4: VIEW OF ABOVE GROUND DIESEL STORAGE TANK  
LOOKING NORTHEAST. THIS TANK SERVICES  
VARIOUS RAIL MACHINERY. TEST PIT 98-1 IS  
LOCATED IN THE BLACK AREA IN THE FOREGROUND.



PHOTOGRAPH 5: VIEW OF SOUTHWEST CORNER OF FROG SHOP  
LOOKING NORTHEAST. THE DRILL RIG IS POSITIONED  
OVER BOREHOLE 98-20.



PHOTOGRAPH 6: VIEW OF FORMER TANK CAR CLEANING AREA  
AND THE BARREL CLEANING FACILITY LOOKING  
NORTHWEST.



PHOTOGRAPH 7: VIEW OF FORMER LEAKING TANK CAR AREA LOOKING WEST.



PHOTOGRAPH 8: DRILLING BOREHOLE 98-35 NEAR THE FORMER VAPOUR DEGREASER IN THE COMPONENT SHOP. NOTE THE METAL PLATES IN THE FOREGROUND WHICH COVER THE PIT WHERE THE DEGREASER WAS FORMERLY LOCATED.

## **APPENDIX III**

### **Site Information**

## **APPENDIX III:**

## **SITE INFORMATION**

### **1. SITE INFORMATION**

#### **Location**

- CP Rail Winnipeg Diesel Shops and Weston Shops (Yard); bounded by McPhillips Street to the east, Selkirk Avenue to the north, Keewatin Street to the west, and the CPR main lines to the south, in Winnipeg, MB

#### **Site Description**

- active rail yard fuelling area, manufacturing and repair facilities
- numerous above ground and underground storage tanks located throughout the site

#### **Surrounding Land Use**

- urban setting
- north: residential
- east: commercial and parkland; in addition, the CP Winnipeg Yard extends toward the east from McPhillips Street
- south: residential and parkland
- west: commercial beyond which is parkland

#### **Groundwater Usage**

- four registered water wells are located within 1,600 m of the Yard. Of the four wells, two are for industrial, one is for air conditioning and one is an observation well. The wells are cased through the overburden to depths of 14.3 m to 28.3 m below grade and completed as open holes in the carbonate bedrock to depths ranging from 37 m to 100 m below grade.
- Potable water for the residents of Winnipeg is supplied via a piped distribution system drawn from Shoal Lake, located approximately 150 km southeast of Winnipeg.

#### **Nearby Underground Structures**

- product distribution piping
- various utility lines (i.e. telephone, natural gas, sewer, water, electrical, etc.) located on the Yard and adjacent to the Yard.

#### **Other Special Environmental Concerns**

- none known

#### **Subsurface Conditions**

- soil type: fill ranging in depth from 0.3 m to 4.0 m below grade. Fill material underlain by clay which is underlain by light brown silt. The clay ranged in thickness from 0.2 m to 1.0 m and the silt varied in depth from 0.8 m to 4.3 m below grade. Beneath the silt was a brown, high plastic clay which extended to the maximum depth of investigation of 6.1 m.
- water table: ranged from 0.6 m to 5.9 m below grade across the site on 1998 12 01/02 and from 0.6 m to 2.6 m below grade on 1999 08 31/09 01.
- apparent direction of groundwater flow was determined in the following areas of the Yard: former locomotive fuelling facility (northwest to northeast), the active locomotive fuelling area (east), the aboveground diesel tank area (east), the former tank car cleaning area (west), the former leaking tank car area (southeast), and the soil stockpiling area (north), and the Wheel Shop (southwest).



1987



 MORROW  
ENVIRONMENTAL  
CONSULTANTS INC.

A DECADE OF SERVICE



1987N

**PHASE II ENVIRONMENTAL  
SITE ASSESSMENT  
Winnipeg Diesel Shops  
& Weston Shops  
Winnipeg, MB**

**Canadian Pacific Railway**

**Volume 2 of 2**



## **APPENDIX IV**

### **Laboratory Reports**

DEC 04 1998

**MORROW ENVIRONMENTAL  
CONSULTANTS INC.  
WINNIPEG**

Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: November 10/98  
Date Reported: November 23/98  
Lab Ref#: G984372  
Lab Quote#: 96-W238-VG  
Client PO#: EA WESTON YD  
Client Ref#: W8140  
Sampled By: JDT

**Certificate of Analysis**

Analysis Performed: Extractable Hydrocarbons(Manitoba Guidelines), C11-C32  
BTEx and Total Volatile Hydrocarbons(Manitoba Criteria)

Methodology: 1) The characterization of HydroCarbon in soil by GC  
analysis, following a solvent extraction.  
U.S. EPA Method No.8011(microextraction)  
2) Analysis of Benzene, Toluene, Ethylbenzene, Xylenes &  
Volatile Hydrocarbons by Static Headspace Capillary GC-P  
ID/FID. External std quantitation with Surrogate stds.  
U.S. EPA Method No. 3810(Modification)

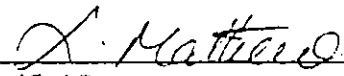
Instrumentation: 1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S  
2) Varian 3400 GC PID/FID, Genesis Headspace Analyzer

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

  
Certified By  
Elaine Grant  
Service Manager

  
Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

## Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Date Reported: November 23/98  
Lab Ref # : G984372  
Lab Quote#: 96-W238-VG  
Client PO#: EA WESTON YD  
Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | SAMPLE ID<br>(spike) | LOQ  | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|------------------------------------------|----------------------|------|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|                                          |                      |      |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Total SemiVolatile Hydrocarbons(C11-C32) | na                   | 10.0 | mg/kg | nd            | 20.0           | yes    | 104                | 70             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Benzene                                  | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 87                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Ethylbenzene                             | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 86                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Toluene                                  | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 87                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Total Volatile Hydrocarbons              | na                   | 10   | mg/kg | nd            | 10             | yes    | 93                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Xylenes(Total)                           | na                   | 0.04 | mg/kg | nd            | 0.08           | yes    | 91                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |

LOQ = Limit of Quantitation = lowest level of the parameter that can be quantified with confidence

\* = Unavailable due to dilution required for analysis

na = Not Applicable

ns = Insufficient Sample Submitted

nd = parameter not detected

TR = trace level less than LOQ

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Report Date: November 23/98  
Lab Ref # : G984372  
Lab Quote #: 96-W238-VG  
Client PO#: EA WESTON YD  
Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter<br>Date Sampled >              | LOQ  | Units | BH98-1-3<br>@981109<br>98/11/09 | BH98-1-3<br>@981109<br>Replicate | BH98-2-9<br>@981109<br>98/11/09 | BH98-3-3<br>@981109<br>98/11/09 | BH98-3-9<br>@981109<br>98/11/09 |
|------------------------------------------|------|-------|---------------------------------|----------------------------------|---------------------------------|---------------------------------|---------------------------------|
| Resemblance                              | na   | na    | ED?                             | ED?                              | PDMO                            | ED?                             | ED?                             |
| Total SemiVolatile Hydrocarbons(C11-C32) | 10.0 | mg/kg | 4540                            | 4590                             | 52600                           | 7830                            | 6010                            |
| Benzene                                  | 0.02 | mg/kg | 0.14                            | 0.11                             | 0.84                            | 0.24                            | 0.16                            |
| Ethylbenzene                             | 0.02 | mg/kg | 4.36                            | 4.14                             | 13.6                            | 6.60                            | 5.79                            |
| Toluene                                  | 0.02 | mg/kg | 0.06                            | 0.04                             | 5.44                            | 0.47                            | 0.43                            |
| Total Volatile Hydrocarbons              | 10   | mg/kg | 537                             | 469                              | 4500                            | 857                             | 784                             |
| Xylenes(Total) --                        | 0.04 | mg/kg | 20.8                            | 19.2                             | 11.3                            | 35.8                            | 24.8                            |

LOQ Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.

ED? Contaminant elutes in the diesel range but does not match reference standard.

na Not Applicable

PDMO Predominantly Diesel with some Motor Oil.

## Report of Analysis

Report Date: November 23/98  
Lab Ref # : G984372  
Lab Quote #: 96-W238-VG  
Client PO#: EA WESTON YD  
Client Ref#: W8140

### Analysis of Soil, expressed on a dry weight basis

[illegible]

|      |                                                                                               |
|------|-----------------------------------------------------------------------------------------------|
| LOQ  | Limit of Quantitation = lowest level of the parameter that can be quantified with confidence. |
| ED?  | Contaminant elutes in the diesel range but does not match reference standard.                 |
| na   | Not Applicable                                                                                |
| nd   | parameter not detected ! = LOQ higher than listed due to dilution ( ) Adjusted LOQ            |
| PDMO | Predominantly Diesel with some Motor Oil.                                                     |



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MORROW ENVIRONMENTAL  
CONSULTANTS INC.  
WINNIPEG

Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: November 10/98  
Date Reported: November 27/98  
Lab Ref#: G984372  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084/WSTN YD  
Client Ref#: W8140  
Sampled By: JDT

### Certificate of Analysis

Analysis Performed: Mineral Oil and Grease(Gravimetric)

Methodology: 1) Analysis of Mineral Oil and Grease gravimetrically in  
soil.  
U.S. EPA Method No. 413.1

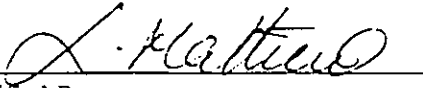
Instrumentation: 1) Sartorius Research Balance, Model R200D

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

  
Certified By  
Elaine Grant  
Service Manager

  
Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

PHILIP ANALYTICAL SERVICES CORPORATION

5715 McALLISTER ROAD, MISSISSAUGA, ONTARIO L4V 1L7, CANADA TEL: (905) 890-8573 FAX: (905) 890-8573 WWW: PASC.COM



# Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Date Reported: November 27/98  
Lab Ref # : G984372  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084/WSTN YD  
Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter            | SAMPLE ID<br>(spike) | LOQ | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|----------------------|----------------------|-----|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|                      |                      |     |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Mineral Oil & Grease | na                   | 100 | mg/kg | nd(b)         | 200            | yes    | 86                 | 78             | 122            | yes    | na           | na     | na             | na             | na     | yes                         |

LOQ = Limit of Quantitation = lowest level of the parameter that can be quantified with confidence

\* = Unavailable due to dilution required for analysis

na = Not Applicable

ns = Insufficient Sample Submitted

nd = parameter not detected

TR = trace level less than LOQ

(b) = Analyte results on REPORT of ANALYSIS have been background corrected for the process blank.

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.

Contact: Alex Man

Report Date: November 27/98

Lab Ref # : G984372

Lab Quote #: 96-W238-VG

Client PO#: EE98084/WSTN YD

Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter<br>Date Sampled > | LOQ | Units | BH98-1-3<br>@981109<br>98/11/09 | BH98-1-3<br>@981109<br>Replicate | BH98-3-3<br>@981109<br>98/11/09 |  |  |
|-----------------------------|-----|-------|---------------------------------|----------------------------------|---------------------------------|--|--|
| Mineral Oil & Grease        | 100 | mg/kg | 2540                            | 2530                             | 1960                            |  |  |

LOQ Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.

Client: Morrow Environmental  
Project Reference: W8140  
Work Order Number: G984372B  
Matrix: Soil

### Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram ( $\mu\text{g/g}$ ) dry weight

Date: 17-Nov-98

| Compound               | LOQ<br>$\mu\text{g/g}$ | BH98-1-3 981109 |
|------------------------|------------------------|-----------------|
| Naphthalene            | 0.05                   | 12.7            |
| 2-Methylnaphthalene    | 0.05                   | 41.2            |
| 1-Methylnaphthalene    | 0.05                   | 26.2            |
| Acenaphthylene         | 0.05                   | nd              |
| Acenaphthene           | 0.05                   | 2.45            |
| Fluorene               | 0.05                   | 4.48            |
| Phenanthrene           | 0.05                   | 8.28            |
| Anthracene             | 0.05                   | nd              |
| Fluoranthene           | 0.05                   | 0.30            |
| Pyrene                 | 0.05                   | 0.42            |
| Benzo(a)anthracene     | 0.05                   | 0.06            |
| Chrysene               | 0.05                   | 0.09            |
| Benzo(b)fluoranthene   | 0.05                   | 0.05            |
| Benzo(k)fluoranthene   | 0.05                   | nd              |
| Benzo(a)pyrene         | 0.05                   | nd              |
| Indeno(1,2,3-cd)pyrene | 0.05                   | nd              |
| Dibenzo(a,h)anthracene | 0.05                   | nd              |
| Benzo(ghi)perylene     | 0.05                   | nd              |

Surrogate Standard Recoveries (Amount Spiked 2.0  $\mu\text{g/L}$ , Control Limits 30 -120%)

|                    |      |
|--------------------|------|
| Acenaphthene-d10   | 100% |
| Benzo(a)pyrene-d12 | 85%  |



Client: Morrow Environmental  
 Project Reference: W8140  
 Work Order Number: G984372B  
 Matrix: Soil

### Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 17-Nov-98

| Compound                      | Method Blank |        |                |        | Spiked Method Blank |                |                |        |
|-------------------------------|--------------|--------|----------------|--------|---------------------|----------------|----------------|--------|
|                               | LOQ<br>µg/g  | Result | Upper<br>Limit | Accept | %<br>Recovery       | Lower<br>Limit | Upper<br>Limit | Accept |
| Naphthalene                   | 0.05         | nd     | 0.05           | yes    | 78                  | 30             | 120            | yes    |
| 2-Methylnaphthalene           | 0.05         | nd     | 0.05           | yes    | 71                  | 30             | 120            | yes    |
| 1-Methylnaphthalene           | 0.05         | nd     | 0.05           | yes    | 73                  | 30             | 120            | yes    |
| Acenaphthylene                | 0.05         | nd     | 0.05           | yes    | 82                  | 30             | 120            | yes    |
| Acenaphthene                  | 0.05         | nd     | 0.05           | yes    | 81                  | 30             | 120            | yes    |
| Fluorene                      | 0.05         | nd     | 0.05           | yes    | 84                  | 30             | 120            | yes    |
| Phenanthrene                  | 0.05         | nd     | 0.05           | yes    | 85                  | 30             | 120            | yes    |
| Anthracene                    | 0.05         | nd     | 0.05           | yes    | 88                  | 30             | 120            | yes    |
| Fluoranthene                  | 0.05         | nd     | 0.05           | yes    | 92                  | 30             | 120            | yes    |
| Pyrene                        | 0.05         | nd     | 0.05           | yes    | 92                  | 30             | 120            | yes    |
| Benzo(a)anthracene            | 0.05         | nd     | 0.05           | yes    | 89                  | 30             | 120            | yes    |
| Chrysene                      | 0.05         | nd     | 0.05           | yes    | 90                  | 30             | 120            | yes    |
| Benzo(b)fluoranthene          | 0.05         | nd     | 0.05           | yes    | 96                  | 30             | 120            | yes    |
| Benzo(k)fluoranthene          | 0.05         | nd     | 0.05           | yes    | 92                  | 30             | 120            | yes    |
| Benzo(a)pyrene                | 0.05         | nd     | 0.05           | yes    | 93                  | 30             | 120            | yes    |
| Indeno(1,2,3-cd)pyrene        | 0.05         | nd     | 0.05           | yes    | 78                  | 30             | 120            | yes    |
| Dibenzo(a,h)anthracene        | 0.05         | nd     | 0.05           | yes    | 83                  | 30             | 120            | yes    |
| Benzo(ghi)perylene            | 0.05         | nd     | 0.05           | yes    | 76                  | 30             | 120            | yes    |
| Surrogate Standard Recoveries |              |        |                |        |                     |                |                |        |
| Acenaphthene-d10              |              | 76%    |                |        | 75                  | 30             | 120            | yes    |
| Benzo(a)pyrene-d12            |              | 86%    |                |        | 87                  | 30             | 120            | yes    |

Client: Morrow Environmental  
Project Reference: W8140  
Work Order Number: G984372B  
Matrix: Soil

**Polynuclear Aromatic Hydrocarbons (PAH's)**

Date: 17-Nov-98

Legend: LOQ = Limit of Quantitation  
nd = Not detected above LOQ

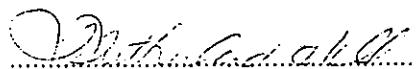
Date received: November 10, 1998  
Date extracted: November 14, 1998  
Date analysed: November 15, 1998

**ANALYTICAL METHOD:**

The soil sample (10 grams wet weight) was mixed with sodium sulfate and extracted with a 1:1 mixture of dichloromethane/acetone. The extract was cleaned up using alumina column chromatography. Analysis was performed by gas chromatography/mass spectrometry using U.S. EPA Method 8270B (modified).

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JOB APPROVED BY:

  
Tasha Sutherland-Hill  
Chemist



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MORROW ENVIRONMENTAL  
CONSULTANTS INC.  
WINNIPEG

Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: November 11/98  
Date Reported: November 23/98  
Lab Ref#: G984387  
Lab Quote#: 96-w238-VG  
Client PO#: EA WestonYrd  
Client Ref#: W8140  
Sampled By: JDT

## Certificate of Analysis

Analysis Performed: Extractable Hydrocarbons(Manitoba Guidelines), C11-C32  
BTEX and Total Volatile Hydrocarbons(Manitoba Criteria)

Methodology: 1) The characterization of HydroCarbon in soil by GC  
analysis, following a solvent extraction.  
U.S. EPA Method No.8011(microextraction)  
2) Analysis of Benzene, Toluene, Ethylbenzene, Xylenes &  
Volatile Hydrocarbons by Static Headspace Capillary GC-P  
ID/FID. External std quantitation with Surrogate stds.  
U.S. EPA Method No. 3810(Modification)

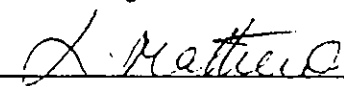
Instrumentation: 1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S  
2) Varian 3400 GC PID/FID, Genesis Headspace Analyzer

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

  
\_\_\_\_\_  
Certified By  
Elaine Grant  
Service Manager

  
\_\_\_\_\_  
Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

Philip Analytical Services Corp  
**Certificate of Quality Control**

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Date Reported: November 23/98  
Lab Ref # : G984387  
Lab Quote#: 96-w238-VG  
Client PO#: EA WestonYrd  
Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | SAMPLE ID<br>(spike) | LOQ  | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|------------------------------------------|----------------------|------|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|                                          |                      |      |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Total SemiVolatile Hydrocarbons(C11-C32) | na                   | 10.0 | mg/kg | nd            | 20.0           | yes    | 104                | 70             | 120            | yes    | na           | na     | na*            | na             | na     | yes                         |
| Benzene                                  | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 87                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Ethylbenzene                             | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 86                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Toluene                                  | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 87                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Total Volatile Hydrocarbons              | na                   | 10   | mg/kg | nd            | 10             | yes    | 93                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Xylenes(Total)                           | na                   | 0.04 | mg/kg | nd            | 0.08           | yes    | 91                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |

LOQ = Limit of Quantitation = lowest level of the parameter that can be quantified with confidence  
 \* = Unavailable due to dilution required for analysis  
 na = Not Applicable  
 ns = Insufficient Sample Submitted  
 nd = parameter not detected  
 TR = trace level less than LOQ

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Report Date: November 23/98  
Lab Ref # : G984387  
Lab Quote #: 96-w238-VG  
Client PO#: EA WestonYrd  
Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | LOQ  | Units | BH98-10-3 | BH98-12-1 | BH98-6-1 | BH98-6-1  | BH98-7-3 |
|------------------------------------------|------|-------|-----------|-----------|----------|-----------|----------|
| Date Sampled >                           |      |       | 98/11/10  | 98/11/10  | 98/11/10 | Replicate | 98/11/10 |
| Resemblance                              | na   | na    | PDMO      | EDMO?     | EDMO?    | EDMO?     | ED?      |
| Total SemiVolatile Hydrocarbons(C11-C32) | 10.0 | mg/kg | 11800     | 1700      | 3560     | 3460      | 1290     |
| Benzene                                  | 0.02 | mg/kg | nd        | nd        | nd       | nd        | nd       |
| Ethylbenzene                             | 0.02 | mg/kg | 2.66      | 0.05      | 0.11     | 0.09      | 0.56     |
| Toluene                                  | 0.02 | mg/kg | 0.26      | 0.03      | 0.02     | 0.02      | 0.03     |
| Total Volatile Hydrocarbons              | 10   | mg/kg | 933       | nd        | 40       | 46        | 144      |
| Xylenes(Total)                           | 0.04 | mg/kg | 17.3      | 0.29      | 0.61     | 0.52      | 1.43     |

LOQ Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.  
ED? Contaminant elutes in the diesel range but does not match reference standard.  
EDMO? Contaminant elutes across the diesel/motor oil range but does not match reference standards.  
na Not Applicable  
nd parameter not detected ! = LOQ higher than listed due to dilution ( ) Adjusted LOQ  
PDMO Predominantly Diesel with some Motor Oil.

## Report of Analysis

Report Date: November 23/98  
Lab Ref # : G984387  
Lab Quote #: 96-w238-VG  
Client PO#: EA WestonYrd  
Client Ref#: W8140

Client Ref#: W8140

|      |                                                                                               |
|------|-----------------------------------------------------------------------------------------------|
| LOQ  | Limit of Quantitation = lowest level of the parameter that can be quantified with confidence. |
| na   | Not Applicable                                                                                |
| nd   | parameter not detected ! = LOQ higher than listed due to dilution ( ) Adjusted LOQ            |
| PDMO | Predominantly Diesel with some Motor Oil.                                                     |

DEC 08 1998

MORROW ENVIRONMENTAL  
CONSULTANTS INC.  
WINNIPEG

Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: November 11/98  
Date Reported: November 20/98  
Lab Ref#: G984387  
Lab Quote#: 96-w238-VG  
Client PO#: EA WestonYrd  
Client Ref#: W8140  
Sampled By: JDT

**Certificate of Analysis**

Analysis Performed: Mineral Oil and Grease(Gravimetric)

Methodology: 1) Analysis of Mineral Oil and Grease gravimetrically in soil.  
U.S. EPA Method No. 413.1

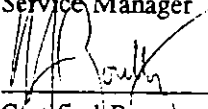
Instrumentation: 1) Sartorius Research Balance, Model R200D

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

  
Certified By  
Elaine Grant  
Service Manager

  
Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

Philip Analytical Services Corp  
**Certificate of Quality Control**

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Date Reported: November 20/98  
Lab Ref # : G984387  
Lab Quote#: 96-w238-VG  
Client PO#: EA WestonYrd  
Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter            | SAMPLE ID<br>(spike) | LOQ | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|----------------------|----------------------|-----|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|                      |                      |     |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Mineral Oil & Grease | na                   | 100 | mg/kg | nd(b)         | 200            | yes    | 86                 | 78             | 122            | yes    | na           | na     | na             | na             | na     | yes                         |

LOQ = Limit of Quantitation = lowest level of the parameter that can be quantified with confidence  
 \* = Unavailable due to dilution required for analysis  
 na = Not Applicable  
 ns = Insufficient Sample Submitted  
 nd = parameter not detected  
 TR = trace level less than LOQ  
 (b) = Analytic results on REPORT of ANALYSIS have been background corrected for the process blank.

## Report of Analysis

Report Date: November 20/98  
Lab Ref # : G984387  
Lab Quote #: 96-w238-VG  
Client PO#: EA WestonYrd  
Client Ref#: W8140

### Analysis of Soil, expressed on a dry weight basis

| Parameter            | LOQ | Units | BH98-10-3 | BH98-6-1 | BH98-6-1  |  |  |
|----------------------|-----|-------|-----------|----------|-----------|--|--|
| Date Sampled >       |     |       | 98/11/10  | 98/11/10 | Replicate |  |  |
| Mineral Oil & Grease | 100 | mg/kg | 7650      | 6650     | 6640      |  |  |

Page 1 of 1

DEC 15 1998

**MORROW ENVIRONMENTAL  
CONSULTANTS INC.  
WINNIPEG**

Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: J. Derek Trinke

Date Received: November 24/98  
Date Reported: December 1/98  
Lab Ref#: G984636  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084/WSTN YD  
Client Ref#: W8140  
Sampled By: JDT

### Certificate of Analysis

Analysis Performed: Extractable Hydrocarbons(Manitoba Guidelines), C11-C32  
BTEX and Total Volatile Hydrocarbons(Manitoba Criteria)

Methodology: 1) The characterization of HydroCarbon in soil by GC  
analysis, following a solvent extraction.  
U.S. EPA Method No.8011(microextraction)  
2) Analysis of Benzene, Toluene, Ethylbenzene, Xylenes &  
Volatile Hydrocarbons by Static Headspace Capillary GC-P  
ID/FID. External std quantitation with Surrogate stds.  
U.S. EPA Method No. 3810(Modification)

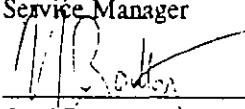
Instrumentation: 1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S  
2) Varian 3400 GC PID/FID, Genesis Headspace Analyzer

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

  
Certified By  
Elaine Grant  
Service Manager

  
Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

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# Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.  
Contact: J. Derek Trinke

Date Reported: December 1/98  
Lab Ref # : G984636  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084/WSTN YD  
Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | SAMPLE ID<br>(spike) | LOQ  | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|------------------------------------------|----------------------|------|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|                                          |                      |      |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Total SemiVolatile Hydrocarbons(C11-C32) | na                   | 10.0 | mg/kg | nd            | 20.0           | yes    | 101                | 70             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Benzene                                  | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 108                | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Ethylbenzene                             | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 104                | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Toluene                                  | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 106                | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Total Volatile Hydrocarbons              | na                   | 10   | mg/kg | nd            | 10             | yes    | 84                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Xylenes(Total)                           | na                   | 0.04 | mg/kg | nd            | 0.08           | yes    | 106                | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |

LOQ = Limit of Quantitation = lowest level of the parameter that can be quantified with confidence  
 \* = Unavailable due to dilution required for analysis  
 na = Not Applicable  
 ns = Insufficient Sample Submitted  
 nd = parameter not detected  
 TR = trace level less than LOQ

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
 Contact: J. Derek Trinke

Report Date: December 1/98  
 Lab Ref # : G984636  
 Lab Quote #: 96-W238-VG  
 Client PO#: EE98084/WSTN YD  
 Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | LOQ  | Units | BH98-13-4<br>981112<br>98/11/12 | BH98-13-4<br>981112<br>Replicate |  |  |  |
|------------------------------------------|------|-------|---------------------------------|----------------------------------|--|--|--|
| Date Sampled >                           |      |       |                                 |                                  |  |  |  |
| Resemblance                              | na   | na    | PDMO                            | PDMO                             |  |  |  |
| Total SemiVolatile Hydrocarbons(C11-C32) | 10.0 | mg/kg | 21100                           | 21100                            |  |  |  |
| Benzene                                  | 0.02 | mg/kg | nd                              | nd                               |  |  |  |
| Ethylbenzene                             | 0.02 | mg/kg | 9.88                            | 10.2                             |  |  |  |
| Toluene                                  | 0.02 | mg/kg | nd                              | nd                               |  |  |  |
| Total Volatile Hydrocarbons              | 10   | mg/kg | 1310                            | 1360                             |  |  |  |
| Xylenes(Total)                           | 0.04 | mg/kg | 17.4                            | 17.7                             |  |  |  |

LOQ Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.  
 na Not Applicable  
 nd parameter not detected ! = LOQ higher than listed due to dilution ( ) Adjusted LOQ  
 PDMO Predominantly Diesel with some Motor Oil.



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MORROW ENVIRONMENTAL  
CONSULTANTS INC.  
WINNIPEG

Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: November 13/98  
Date Reported: November 23/98  
Lab Ref#: G984442  
Lab Quote#: 96-w238-VG  
Client PO#: EA/Weston Yrd  
Client Ref#: W8140  
Sampled By: JDT

### Certificate of Analysis

Analysis Performed: Extractable Hydrocarbons(Manitoba Guidelines), C11-C32  
BTEX and Total Volatile Hydrocarbons(Manitoba Criteria)

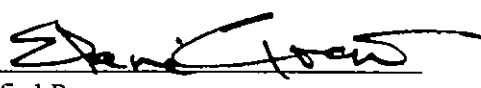
Methodology: 1) The characterization of HydroCarbon in soil by GC  
analysis, following a solvent extraction.  
U.S. EPA Method No.8011(microextraction)  
2) Analysis of Benzene, Toluene, Ethylbenzene, Xylenes &  
Volatile Hydrocarbons by Static Headspace Capillary GC-P  
ID/FID. External std quantitation with Surrogate stds.  
U.S. EPA Method No. 3810(Modification)

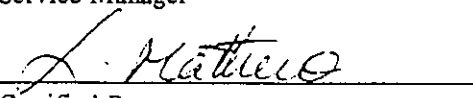
Instrumentation: 1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S  
2) Varian 3400 GC PID/FID, Genesis Headspace Analyzer

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

  
Certified By  
Elaine Grant  
Service Manager

  
Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

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## Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Date Reported: November 23/98  
Lab Ref # : G984442  
Lab Quote#: 96-w238-VG  
Client PO#: EA/Weston Yrd  
Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | SAMPLE ID<br>(spike) | LOQ  | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|------------------------------------------|----------------------|------|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|                                          |                      |      |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Total SemiVolatile Hydrocarbons(C11-C32) | na                   | 10.0 | mg/kg | nd            | 20.0           | yes    | 105                | 70             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Benzene                                  | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 99                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Ethylbenzene                             | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 101                | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Toluene                                  | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 99                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Total Volatile Hydrocarbons              | na                   | 10   | mg/kg | nd            | 10             | yes    | 99                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Xylenes(Total)                           | na                   | 0.04 | mg/kg | nd            | 0.08           | yes    | 99                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |

LOQ = Limit of Quantitation = lowest level of the parameter that can be quantified with confidence  
 \* = Unavailable due to dilution required for analysis  
 na = Not Applicable  
 ns = Insufficient Sample Submitted  
 nd = parameter not detected  
 TR = trace level less than LOQ

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Report Date: November 23/98  
Lab Ref # : G984442  
Lab Quote #: 96-w238-VG  
Client PO#: EA/Weston Yrd  
Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | LOQ  | Units | BH98-14-1 | BH98-14-1 | BH98-16-2 | BH98-17-2 | BH98-19-12 |
|------------------------------------------|------|-------|-----------|-----------|-----------|-----------|------------|
| Date Sampled >                           |      |       | 98/11/12  | Replicate | 98/11/12  | 98/11/12  | 98/11/12   |
| Resemblance                              | na   | na    | EDMO?     | EDMO?     | EDMO?     | EKD?      | EDMO?      |
| Total SemiVolatile Hydrocarbons(C11-C32) | 10.0 | mg/kg | 31000     | 31300     | 2670      | 9770      | 36100      |
| Benzene                                  | 0.02 | mg/kg | 0.05      | 0.05      | nd        | nd        | 0.04       |
| Ethylbenzene                             | 0.02 | mg/kg | 0.78      | 0.75      | nd        | 1.76      | 0.14       |
| Toluene                                  | 0.02 | mg/kg | 0.05      | 0.05      | 0.02      | 0.07      | 0.08       |
| Total Volatile Hydrocarbons              | 10   | mg/kg | 216       | 205       | nd        | 610       | nd         |
| Xylenes(Total)                           | 0.04 | mg/kg | 4.39      | 4.12      | nd        | 9.49      | 0.27       |

LOQ Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.  
EDMO? Contaminant elutes across the diesel/motor oil range but does not match reference standards.  
EKD? Contaminant elutes in the kerosene/diesel range but does not match reference standards.  
na Not Applicable  
nd parameter not detected ! = LOQ higher than listed due to dilution ( ) Adjusted LOQ

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Report Date: November 23/98  
Lab Ref # : G984442  
Lab Quote #: 96-w238-VG  
Client PO#: EA/Weston Yrd  
Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | LOQ  | Units | BH98-19-8<br>98/11/12 | BH98-20-1<br>98/11/12 | TRAVEL<br>BLANK<br>98/11/12 |  |  |
|------------------------------------------|------|-------|-----------------------|-----------------------|-----------------------------|--|--|
| Date Sampled >                           |      |       |                       |                       |                             |  |  |
| Resemblance                              | na   | na    | EDMO?                 | EDMO?                 | -                           |  |  |
| Total SemiVolatile Hydrocarbons(C11-C32) | 10.0 | mg/kg | 26600                 | 62.1                  | -                           |  |  |
| Benzene                                  | 0.02 | mg/kg | 0.03                  | nd                    | nd                          |  |  |
| Ethylbenzene                             | 0.02 | mg/kg | 0.06                  | nd                    | nd                          |  |  |
| Toluene                                  | 0.02 | mg/kg | 0.06                  | nd                    | nd                          |  |  |
| Total Volatile Hydrocarbons              | 10   | mg/kg | nd                    | nd                    | nd                          |  |  |
| Xylenes(Total)                           | 0.04 | mg/kg | 0.20                  | nd                    | nd                          |  |  |

LOQ Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.

- Not Requested

EDMO? Contaminant elutes across the diesel/motor oil range but does not match reference standards.

na Not Applicable

nd parameter not detected ! = LOQ higher than listed due to dilution ( ) Adjusted LOQ



Client: Morrow Environmental Consultants Inc.  
 Project Reference: W8140  
 Work Order Number: G984442B  
 Matrix: Soil

### Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram ( $\mu\text{g/g}$ ) dry weight

Date: 23-Nov-98

| Compound               | LOQ<br>$\mu\text{g/g}$ | BH98-19-12<br>981112<br>DF=250 | BH98-19-12<br>981112<br>Dup.<br>DF=250 |
|------------------------|------------------------|--------------------------------|----------------------------------------|
| Naphthalene            | 12.5                   | 606                            | 364                                    |
| 2-Methylnaphthalene    | 12.5                   | 177                            | 106                                    |
| 1-Methylnaphthalene    | 12.5                   | 97                             | 59                                     |
| Acenaphthylene         | 12.5                   | 39                             | 24                                     |
| Acenaphthene           | 12.5                   | 352                            | 193                                    |
| Fluorene               | 12.5                   | 415                            | 236                                    |
| Phenanthrene           | 12.5                   | 1970                           | 1250                                   |
| Anthracene             | 12.5                   | 685                            | 381                                    |
| Fluoranthene           | 12.5                   | 1830                           | 1060                                   |
| Pyrene                 | 12.5                   | 1510                           | 862                                    |
| Benzo(a)anthracene     | 12.5                   | 664                            | 354                                    |
| Chrysene               | 12.5                   | 590                            | 319                                    |
| Benzo(b)fluoranthene   | 12.5                   | 490                            | 251                                    |
| Benzo(k)fluoranthene   | 12.5                   | 448                            | 228                                    |
| Benzo(a)pyrene         | 12.5                   | 595                            | 317                                    |
| Indeno(1,2,3-cd)pyrene | 12.5                   | 362                            | 194                                    |
| Dibenzo(a,h)anthracene | 12.5                   | 75                             | 35                                     |
| Benzo(ghi)perylene     | 12.5                   | 289                            | 164                                    |

Surrogate Standard Recoveries (Amount Spiked 2.0  $\mu\text{g/L}$ , Control Limits 30 -120%)

|                    |     |     |
|--------------------|-----|-----|
| Acenaphthene-d10   | N/A | N/A |
| Benzo(a)pyrene-d12 | N/A | N/A |

Client: Morrow Environmental Consultants Inc.  
Project Reference: W8140  
Work Order Number: G984442B  
Matrix: Soil

**Polynuclear Aromatic Hydrocarbons (PAH's)**

Units: Micrograms/gram (µg/g) dry weight

Date: 23-Nov-98

| Compound                      | LOQ<br>µg/g | Method Blank |                |        | Spiked Method Blank |                |                |        |
|-------------------------------|-------------|--------------|----------------|--------|---------------------|----------------|----------------|--------|
|                               |             | Result       | Upper<br>Limit | Accept | %<br>Recovery       | Lower<br>Limit | Upper<br>Limit | Accept |
| Naphthalene                   | 0.05        | nd           | 0.05           | yes    | 81                  | 30             | 120            | yes    |
| 2-Methylnaphthalene           | 0.05        | nd           | 0.05           | yes    | 66                  | 30             | 120            | yes    |
| 1-Methylnaphthalene           | 0.05        | nd           | 0.05           | yes    | 69                  | 30             | 120            | yes    |
| Acenaphthylene                | 0.05        | nd           | 0.05           | yes    | 88                  | 30             | 120            | yes    |
| Acenaphthene                  | 0.05        | nd           | 0.05           | yes    | 49                  | 30             | 120            | yes    |
| Fluorene                      | 0.05        | nd           | 0.05           | yes    | 57                  | 30             | 120            | yes    |
| Phenanthrene                  | 0.05        | nd           | 0.05           | yes    | 78                  | 30             | 120            | yes    |
| Anthracene                    | 0.05        | nd           | 0.05           | yes    | 81                  | 30             | 120            | yes    |
| Fluoranthene                  | 0.05        | nd           | 0.05           | yes    | 106                 | 30             | 120            | yes    |
| Pyrene                        | 0.05        | nd           | 0.05           | yes    | 107                 | 30             | 120            | yes    |
| Benzo(a)anthracene            | 0.05        | nd           | 0.05           | yes    | 85                  | 30             | 120            | yes    |
| Chrysene                      | 0.05        | nd           | 0.05           | yes    | 87                  | 30             | 120            | yes    |
| Benzo(b)fluoranthene          | 0.05        | nd           | 0.05           | yes    | 88                  | 30             | 120            | yes    |
| Benzo(k)fluoranthene          | 0.05        | nd           | 0.05           | yes    | 81                  | 30             | 120            | yes    |
| Benzo(a)pyrene                | 0.05        | nd           | 0.05           | yes    | 86                  | 30             | 120            | yes    |
| Indeno(1,2,3-cd)pyrene        | 0.05        | nd           | 0.05           | yes    | 96                  | 30             | 120            | yes    |
| Dibenzo(a,h)anthracene        | 0.05        | nd           | 0.05           | yes    | 96                  | 30             | 120            | yes    |
| Benzo(ghi)perylene            | 0.05        | nd           | 0.05           | yes    | 90                  | 30             | 120            | yes    |
| Surrogate Standard Recoveries |             |              |                |        |                     |                |                |        |
| Acenaphthene-d10              |             | 49%          |                |        | 46                  | 30             | 120            | yes    |
| Benzo(a)pyrene-d12            |             | 83%          |                |        | 80                  | 30             | 120            | yes    |



Client: Morrow Environmental Consultants Inc.

**Polynuclear Aromatic Hydrocarbons (PAH's)**

Date: 23-Nov-98

Project Reference: W8140

Work Order Number: G984442B

Matrix: Soil

Legend: LOQ = Limit of Quantitation  
nd = Not detected above LOQ  
DF = Dilution Factor  
Dup. = Duplicate  
N/A = Surrogate standard recovery could not be determined due to high dilution

Date received: November 13, 1998

Date extracted: November 19, 1998

Date analysed: November 21, 1998

**ANALYTICAL METHOD:**

The soil samples (10 grams wet weight) were mixed with sodium sulfate and extracted with a 1:1 mixture of dichloromethane/acetone. The extracts were cleaned up using alumina column chromatography. Analysis was performed by gas chromatography/mass spectrometry using U.S. EPA Method 8270B (modified).

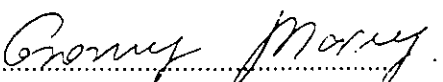
**REPORT DISCUSSION:**

The soil samples were run at a dilution factor of 250 due to elevated levels of target and nontarget compounds present which would exceed the calibration range of the instrument and cause contamination of the equipment if run undiluted. The amounts reported have been corrected for the dilution factor that was used.

The results for duplicate analyses of sample BH98-19-12 differed more than that attributable to the precision of the analytical method. These results are likely due to heterogeneity in the soil matrix.

*NOTE: All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analysis done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangement.*

**JOB APPROVED BY:**

  
Grazyna Blazejewska, M.Sc., C.Chem.  
Chemist, Mass Spectrometry Services



Date: Nov.18, 1998

Client : Morrow Environmental Consultants Inc.  
1420 Clarence Ave, Unit E  
Winnipeg MB R3T 1T6  
Contact : Alex Man  
Client project : W8140  
PASC job # : G984442

### Certificate of Analysis

Analysis Performed: Polychlorinated Biphenyls (PCB's)

Methodology: Determination of total PCB's in soil by solvent extraction,  
followed by florisil cleanup and analysis by capillary GC/ECD  
with external standard quantitation.  
U.S. EPA Method No. 8082

Instrumentation: Hewlett-Packard 5890 II with autosampler, ECD, and Chemstation

Sample Description: Soil

Results: Refer to Report of Analysis attached.

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done unless otherwise agreed upon by contractual arrangement. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

  
\_\_\_\_\_  
Certified By  
Medhat Riskallah, Ph.D., C.Chem.  
Manager, Gas Chromatography Section



Client : Morrow Environmental Consultants Inc.  
1420 Clarence Ave, Unit E  
Winnipeg MB R3T 1T6  
Contact : Alex Man  
Client project : W8140  
PASC job # : G984442  
Matrix : Soil

Date: Nov.18, 1998

### Report of Analysis

|   |                      | Total PCB's<br>ug/g | DCBP<br>% Recovery |
|---|----------------------|---------------------|--------------------|
|   | L.O.Q.               | 0.05                |                    |
| 1 | Reagent Blank        | ND                  | 91%                |
| 2 | Spiked Reagent Blank | 87%                 | 91%                |
| 3 | BH98-19-12           | ND                  | 120%               |
| 4 | Repeat               | ND                  | 120%               |

L.O.Q. = Limit of Quantitation

N.D = Not Detected

ug/g= micrograms per gram

DCBP= Decachlorobiphenyl (surrogate standard)



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Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: November 14/98  
Date Reported: November 23/98  
Lab Ref#: G984466  
Lab Quote#: 96-W238-VG  
Client PO#: EA Weston Yard  
Client Ref#: W8140  
Sampled By: JDT

### Certificate of Analysis

Analysis Performed: Extractable Hydrocarbons(Manitoba Guidelines), C11-C32  
BTEX and Total Volatile Hydrocarbons(Manitoba Criteria)  
Total Purgeable Hydrocarbons

Methodology:

- 1) The characterization of HydroCarbon in soil by GC analysis, following a solvent extraction.  
U.S. EPA Method No.8011(microextraction)
- 2) Analysis of Benzene, Toluene, Ethylbenzene, Xylenes & Volatile Hydrocarbons by Static Headspace Capillary GC-PID/FID. External std quantitation with Surrogate stds.  
U.S. EPA Method No. 3810(Modification)
- 3) Purge & Trap capillary GC/MS analysis of Soil samples for Total Purgeables.  
U.S. EPA Method No. 5030

Instrumentation:

- 1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S
- 2) Varian 3400 GC PID/FID, Genesis Headspace Analyzer
- 3) Purge & Trap-GC/MS

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

PHILIP ANALYTICAL SERVICES CORPORATION

5735 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575 Wire: 1-800-263-9910





Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: November 14/98  
Date Reported: November 23/98  
Lab Ref#: G984466  
Lab Quote#: 96-W238-VG  
Client PO#: EA Weston Yard  
Client Ref#: W8140  
Sampled By: JDT

### Certificate of Analysis

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

  
Certified By  
Elaine Grant  
Service Manager

  
Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

# Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Date Reported: November 23/98  
Lab Ref # : G984466  
Lab Quote#: 96-W238-VG  
Client PO#: EA Weston Yard  
Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | SAMPLE ID<br>(spike) | LOQ  | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|------------------------------------------|----------------------|------|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|                                          |                      |      |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Total SemiVolatile Hydrocarbons(C11-C32) | na                   | 10.0 | mg/kg | nd            | 20.0           | yes    | 103                | 70             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Benzene                                  | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 94                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Ethylbenzene                             | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 98                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Toluene                                  | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 94                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Total Volatile Hydrocarbons              | na                   | 10   | mg/kg | nd            | 10             | yes    | 98                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Xylenes(Total)                           | na                   | 0.04 | mg/kg | nd            | 0.08           | yes    | 95                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Total Purgable Hydrocarbons              | na                   | 10   | ug/g  | nd            | 20             | yes    | na                 | na             | na             | na     | na           | na     | na             | na             | na     | yes                         |

LOQ = Limit of Quantitation = lowest level of the parameter that can be quantified with confidence  
 \* = Unavailable due to dilution required for analysis  
 na = Not Applicable  
 ns = Insufficient Sample Submitted  
 nd = parameter not detected  
 TR = trace level less than LOQ

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Report Date: November 23/98  
Lab Ref # : G984466  
Lab Quote #: 96-W238-VG  
Client PO#: EA Weston Yard  
Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter<br>Date Sampled >              | LOQ  | Units | BH98-22-1- | BH98-22-4- | BH98-24-3- | BH98-25-2- | BH98-26-1- |
|------------------------------------------|------|-------|------------|------------|------------|------------|------------|
|                                          |      |       | 981113     | 981113     | 981113     | 981113     | 981113     |
|                                          |      |       | 98/11/13   | 98/11/13   | 98/11/13   | 98/11/13   | 98/11/13   |
| Resemblance                              | na   | na    | na         | na         | EMO?       | EMO?       | PMOK       |
| Total SemiVolatile Hydrocarbons(C11-C32) | 10.0 | mg/kg | nd         | nd         | 1210       | 17400      | 35900      |
| Benzene                                  | 0.02 | mg/kg | nd         | nd         | nd         | -          | -          |
| Ethylbenzene                             | 0.02 | mg/kg | nd         | nd         | nd         | -          | -          |
| Toluene                                  | 0.02 | mg/kg | nd         | nd         | nd         | -          | -          |
| Total Volatile Hydrocarbons              | 10   | mg/kg | nd         | nd         | nd         | -          | -          |
| Xylenes(Total)                           | 0.04 | mg/kg | 0.11       | nd         | nd         | -          | -          |
| Total Purgeable Hydrocarbons             | 10   | ug/g  | -          | -          | -          | nd         | 77         |

LOQ Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.

- Not Requested

EMO? Contaminant elutes in the motor oil range but does not match reference standard.

na Not Applicable

nd parameter not detected ! = LOQ higher than listed due to dilution ( ) Adjusted LOQ

PMOK Predominantly Motor Oil with some Kerosene.

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
 Contact: Alex Man

Report Date: November 23/98  
 Lab Ref # : G984466  
 Lab Quote #: 96-W238-VG  
 Client PO#: EA Weston Yard  
 Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | LOQ  | Units | BH98-26-1-<br>981113<br>Replicate | BH98-28-3-<br>981113<br>98/11/13 | BH98-28-3-<br>981113<br>Replicate |  |  |
|------------------------------------------|------|-------|-----------------------------------|----------------------------------|-----------------------------------|--|--|
| Resemblance                              | na   | na    | -                                 | na                               | na                                |  |  |
| Total SemiVolatile Hydrocarbons(C11-C32) | 10.0 | mg/kg | -                                 | nd                               | nd                                |  |  |
| Benzene                                  | 0.02 | mg/kg | -                                 | nd                               | nd                                |  |  |
| Ethylbenzene                             | 0.02 | mg/kg | -                                 | nd                               | nd                                |  |  |
| Toluene                                  | 0.02 | mg/kg | -                                 | nd                               | nd                                |  |  |
| Total Volatile Hydrocarbons              | 10   | mg/kg | -                                 | nd                               | nd                                |  |  |
| Xylenes(Total)                           | 0.04 | mg/kg | -                                 | nd                               | nd                                |  |  |
| Total Purgeable Hydrocarbons             | 10   | ug/g  | 36                                | -                                | -                                 |  |  |

LOQ Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.

- Not Requested

na Not Applicable

nd parameter not detected ! = LOQ higher than listed due to dilution ( ) Adjusted LOQ



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Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: November 14/98  
Date Reported: November 23/98  
Lab Ref#: G984466  
Lab Quote#: 96-W238-VG  
Client PO#: EA Weston Yard  
Client Ref#: W8140  
Sampled By: JDT

### Certificate of Analysis

Analysis Performed: Mineral Oil and Grease(Gravimetric)

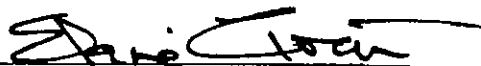
Methodology: 1) Analysis of Mineral Oil and Grease gravimetrically in soil.  
U.S. EPA Method No. 413.1

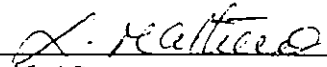
Instrumentation: 1) Sartorius Research Balance, Model R200D

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

  
Certified By  
Elaine Grant  
Service Manager

  
Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

PHILIP ANALYTICAL SERVICES CORPORATION

5755 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8566 Fax: (905) 890-8575 WATS: 1-800-263-9900

Page 1



# Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Date Reported: November 23/98  
Lab Ref # : G984456  
Lab Quote#: 96-W238-VG  
Client PO#: EA Weston Yard  
Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter            | SAMPLE ID<br>(spike) | LOQ | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|----------------------|----------------------|-----|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|                      |                      |     |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Mineral Oil & Grease | na                   | 100 | mg/kg | nd(b)         | 200            | yes    | 86                 | 78             | 122            | yes    | na           | na     | na             | na             | na     | yes                         |

LOQ = Limit of Quantitation = lowest level of the parameter that can be quantified with confidence  
 \* = Unavailable due to dilution required for analysis  
 na = Not Applicable  
 ns = Insufficient Sample Submitted  
 nd = parameter not detected  
 TR = trace level less than LOQ  
 (b) = Analyte results on REPORT of ANALYSIS have been background corrected for the process blank.

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Report Date: November 23/98  
Lab Ref # : G984466  
Lab Quote #: 96-W238-VG  
Client PO#: EA Weston Yard  
Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter            | Date Sampled > | LOQ | Units | BH98-24-3-<br>981113<br>98/11/13 | BH98-24-3-<br>981113<br>Replicate |  |  |  |
|----------------------|----------------|-----|-------|----------------------------------|-----------------------------------|--|--|--|
| Mineral Oil & Grease |                | 100 | mg/kg | 820                              | 820                               |  |  |  |

LOQ Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.



Date: Dec. 3, 1998

Client : Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg MB R3T 1T6  
Contact : Alex Man  
Client project : W8140  
PASC job # : G984466

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### Certificate of Analysis

Analysis Performed: Polychlorinated Biphenyls (PCB's)

Methodology: Determination of total PCB's in soil by solvent extraction,  
followed by florisil cleanup and analysis by capillary GC/ECD  
with external standard quantitation.  
U.S. EPA Method No. 8082

Instrumentation: Hewlett-Packard 5890 II with autosampler, ECD, and Chemstation

Sample Description: Soil

Results: Refer to Report of Analysis attached.

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

*M. Riskallah*

Certified By  
Medhat Riskallah, Ph.D., C.Chem.  
Manager, Gas Chromatography Section



Date: Dec. 3, 1998

Client : Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg MB R3T 1T6  
Contact : Alex Man  
Client project : W8140  
PASC job # : G984466  
Matrix : Soil

### Report of Analysis

|   |                         | Total PCB's<br>ug/g | DCBP<br>% Recovery |
|---|-------------------------|---------------------|--------------------|
|   | L.O.Q.                  | 0.05                |                    |
| 1 | Reagent Blank           | ND                  | 119%               |
| 2 | Spiked Reagent Blank    | 110%                | 87%                |
| 3 | BH98-26-1-981113        | 3.73                | ND                 |
| 4 | BH98-26-1-981113 Repeat | 3.89                | ND                 |
| 5 | BH98-22-1-981113        | ND                  | 78%                |

Note: PCB detected in sample BH98-26-1-981113 is a mixture of Aroclor 1260 & 1254.

L.O.Q. = Limit of Quantitation

N.D. = Not Detected

ug/g= micrograms per gram

DCBP= Decachlorobiphenyl (surrogate standard)

Client: Morrow Environmental Consultants Inc.  
Project Reference: W8140  
Work Order Number: G984466B  
Matrix: Soil

**Polynuclear Aromatic Hydrocarbons (PAH's)**

Units: Micrograms/gram ( $\mu\text{g/g}$ ) dry weight

Date: 23-Nov-98

| Compound               | LOQ<br>$\mu\text{g/g}$ | BH98-24-3<br>981113 | LOQ<br>$\mu\text{g/g}$ | BH98-25-2<br>981113<br>DF=10 |
|------------------------|------------------------|---------------------|------------------------|------------------------------|
| Naphthalene            | 0.05                   | nd                  | 0.5                    | nd                           |
| 2-Methylnaphthalene    | 0.05                   | nd                  | 0.5                    | 1.1                          |
| 1-Methylnaphthalene    | 0.05                   | nd                  | 0.5                    | 1.3                          |
| Acenaphthylene         | 0.05                   | nd                  | 0.5                    | nd                           |
| Acenaphthene           | 0.05                   | nd                  | 0.5                    | nd                           |
| Fluorene               | 0.05                   | 0.06                | 0.5                    | 0.5                          |
| Phenanthrene           | 0.05                   | 0.28                | 0.5                    | 2.0                          |
| Anthracene             | 0.05                   | 0.07                | 0.5                    | nd                           |
| Fluoranthene           | 0.05                   | 0.15                | 0.5                    | 0.9                          |
| Pyrene                 | 0.05                   | 0.11                | 0.5                    | 0.9                          |
| Benzo(a)anthracene     | 0.25                   | nd                  | 2.5                    | nd                           |
| Chrysene               | 0.25                   | nd                  | 2.5                    | nd                           |
| Benzo(b)fluoranthene   | 0.25                   | nd                  | 2.5                    | nd                           |
| Benzo(k)fluoranthene   | 0.25                   | nd                  | 2.5                    | nd                           |
| Benzo(a)pyrene         | 0.25                   | nd                  | 2.5                    | nd                           |
| Indeno(1,2,3-cd)pyrene | 0.25                   | nd                  | 2.5                    | nd                           |
| Dibenzo(a,h)anthracene | 0.25                   | nd                  | 2.5                    | nd                           |
| Benzo(ghi)perylene     | 0.25                   | nd                  | 2.5                    | nd                           |

Surrogate Standard Recoveries (Amount Spiked 2.0  $\mu\text{g/L}$ , Control Limits 30 -120%)

|                    |     |     |
|--------------------|-----|-----|
| Acenaphthene-d10   | 38% | 89% |
| Benzo(a)pyrene-d12 | 84% | 94% |



Client: Morrow Environmental Consultants Inc.  
 Project Reference: W8140  
 Work Order Number: G984466B  
 Matrix: Soil

### Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 23-Nov-98

| Compound               | Method Blank |        |                |        | Spiked Method Blank |                |                |        |
|------------------------|--------------|--------|----------------|--------|---------------------|----------------|----------------|--------|
|                        | LOQ<br>µg/g  | Result | Upper<br>Limit | Accept | %<br>Recovery       | Lower<br>Limit | Upper<br>Limit | Accept |
| Naphthalene            | 0.05         | nd     | 0.05           | yes    | 70                  | 30             | 120            | yes    |
| 2-Methylnaphthalene    | 0.05         | nd     | 0.05           | yes    | 57                  | 30             | 120            | yes    |
| 1-Methylnaphthalene    | 0.05         | nd     | 0.05           | yes    | 58                  | 30             | 120            | yes    |
| Acenaphthylene         | 0.05         | nd     | 0.05           | yes    | 70                  | 30             | 120            | yes    |
| Acenaphthene           | 0.05         | nd     | 0.05           | yes    | 52                  | 30             | 120            | yes    |
| Fluorene               | 0.05         | nd     | 0.05           | yes    | 59                  | 30             | 120            | yes    |
| Phenanthrene           | 0.05         | nd     | 0.05           | yes    | 80                  | 30             | 120            | yes    |
| Anthracene             | 0.05         | nd     | 0.05           | yes    | 86                  | 30             | 120            | yes    |
| Fluoranthene           | 0.05         | nd     | 0.05           | yes    | 110                 | 30             | 120            | yes    |
| Pyrene                 | 0.05         | nd     | 0.05           | yes    | 111                 | 30             | 120            | yes    |
| Benzo(a)anthracene     | 0.05         | nd     | 0.05           | yes    | 91                  | 30             | 120            | yes    |
| Chrysene               | 0.05         | nd     | 0.05           | yes    | 92                  | 30             | 120            | yes    |
| Benzo(b)fluoranthene   | 0.05         | nd     | 0.05           | yes    | 97                  | 30             | 120            | yes    |
| Benzo(k)fluoranthene   | 0.05         | nd     | 0.05           | yes    | 86                  | 30             | 120            | yes    |
| Benzo(a)pyrene         | 0.05         | nd     | 0.05           | yes    | 93                  | 30             | 120            | yes    |
| Indeno(1,2,3-cd)pyrene | 0.05         | nd     | 0.05           | yes    | 110                 | 30             | 120            | yes    |
| Dibenzo(a,h)anthracene | 0.05         | nd     | 0.05           | yes    | 109                 | 30             | 120            | yes    |
| Benzo(ghi)perylene     | 0.05         | nd     | 0.05           | yes    | 101                 | 30             | 120            | yes    |

#### Surrogate Standard Recoveries

|                    |     |    |    |     |     |
|--------------------|-----|----|----|-----|-----|
| Acenaphthene-d10   | 51% | 49 | 30 | 120 | yes |
| Benzo(a)pyrene-d12 | 86% | 87 | 30 | 120 | yes |



Client: Morrow Environmental Consultants Inc.      **Polynuclear Aromatic Hydrocarbons (PAH's)**  
Project Reference: W8140  
Work Order Number: G984466B  
Matrix: Soil

Date: 23-Nov-98

Legend: LOQ = Limit of Quantitation  
nd = Not detected above LOQ  
DF. = Dilution Factor

Date received: November 14, 1998  
Date extracted: November 18, 1998  
Date analysed: November 20-21, 1998

#### ANALYTICAL METHOD:

The soil samples (10 grams wet weight) were mixed with sodium sulfate and extracted with a 1:1 mixture of dichloromethane/acetone. The extracts were cleaned up using alumina column chromatography. Analysis was performed by gas chromatography/mass spectrometry using U.S. EPA Method 8270B (modified).

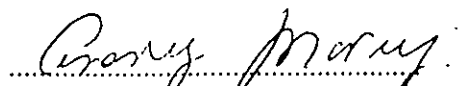
#### REPORT DISCUSSION:

The soil sample BH98-25-2 was run at a dilution factor of 10 due to elevated levels of nontarget compounds present which would cause contamination of the equipment if run undiluted. The amounts reported have been corrected for the dilution factor that was used.

The additional increase of LOQ's for late eluting compounds was prompted by the high hydrocarbon background.

*NOTE: All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analysis done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangement.*

JOB APPROVED BY:

  
Grazyna Blazejewska, M.Sc., C.Chem.  
Chemist, Mass Spectrometry Services



RECEIVED  
DEC 21 1998

MORROW ENVIRONMENTAL  
CONSULTANTS INC.  
WINNIPEG

December 18, 1998

Mr. Derek Trinke  
Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Avenue  
Winnipeg, Manitoba  
R3T 1T6

Re: Project No. W8140 - Philip Report for Volatile Organic Compounds No. G984466V

A typographical error was discovered on the original report for the recovery of m/p-xylene in the Spiked Method Blank. The recovery was stated as 14% whereas the correct value was 104%. Although every report is independently cross-checked prior to release of the final report, in this case the typographical error was not corrected.

A revised final report is enclosed. My apologies for any inconvenience this may have caused.

Sincerely,

Ron Corkum  
Manager, Mass Spectrometry Services

Client: Morrow Environmental Consultants Inc.  
Project Reference: W8140  
Work Order: G984466V  
Matrix: Soil

**VOLATILE ORGANIC COMPOUNDS**  
(Revised Final Report)

Date: 18-Dec-98

Units: micrograms/gram (µg/g) dry weight

| Compound                               | LOQ<br>µg/g | BH98-25-2<br>981113 |
|----------------------------------------|-------------|---------------------|
| Chloromethane                          | 0.005       | nd                  |
| Vinyl chloride                         | 0.003       | nd                  |
| Bromomethane                           | 0.005       | nd                  |
| Chloroethane                           | 0.005       | nd                  |
| Trichlorofluoromethane                 | 0.005       | nd                  |
| Acetone                                | 0.050       | 0.212               |
| 1,1-Dichloroethene                     | 0.002       | nd                  |
| Dichloromethane (Methylene Chloride)   | 0.010       | nd                  |
| trans-1,2-Dichloroethene               | 0.002       | nd                  |
| Methyl-t-Butyl Ether                   | 0.002       | nd                  |
| 1,1-Dichloroethane                     | 0.002       | nd                  |
| Methyl Ethyl Ketone (MEK)              | 0.025       | 0.037               |
| cis-1,2-Dichloroethene                 | 0.002       | nd                  |
| Chloroform                             | 0.002       | nd                  |
| 1,2-Dichloroethane                     | 0.002       | nd                  |
| 1,1,1-Trichloroethane                  | 0.002       | nd                  |
| Carbon Tetrachloride                   | 0.002       | nd                  |
| Benzene                                | 0.002       | nd                  |
| 1,2-Dichloropropane                    | 0.002       | nd                  |
| Trichloroethene                        | 0.002       | nd                  |
| Bromodichloromethane                   | 0.002       | nd                  |
| cis-1,3-Dichloropropene                | 0.002       | nd                  |
| Methyl Isobutyl Ketone (MIBK)          | 0.025       | nd                  |
| trans-1,3-Dichloropropene              | 0.002       | nd                  |
| 1,1,2-Trichloroethane                  | 0.002       | nd                  |
| Toluene                                | 0.002       | 0.002               |
| 2-Hexanone                             | 0.025       | nd                  |
| Dibromochloromethane                   | 0.002       | nd                  |
| 1,2-Dibromoethane (Ethylene dibromide) | 0.002       | nd                  |
| Tetrachloroethene (Perchloroethylene)  | 0.002       | nd                  |
| 1,1,1,2-Tetrachloroethane              | 0.002       | nd                  |
| Chlorobenzene                          | 0.002       | nd                  |
| Ethylbenzene                           | 0.002       | nd                  |
| m-Xylene & p-Xylene                    | 0.002       | 0.003               |
| Bromoform                              | 0.002       | nd                  |
| Styrene                                | 0.002       | nd                  |
| 1,1,2,2-Tetrachloroethane              | 0.002       | nd                  |
| o-Xylene                               | 0.002       | 0.004               |
| 1,3-Dichlorobenzene                    | 0.002       | nd                  |
| 1,4-Dichlorobenzene                    | 0.002       | nd                  |
| 1,2-Dichlorobenzene                    | 0.002       | nd                  |

Surrogate Standard Recoveries: Control Limits: 70-130%

|                      |      |
|----------------------|------|
| Dibromofluoromethane | 100% |
| Toluene-d8           | 113% |
| 4-Bromofluorobenzene | 75%  |

Client: Morrow Environmental Consultants Inc.  
Project Reference: W8140  
Work Order: G984466V  
Matrix: Soil

**VOLATILE ORGANIC COMPOUNDS**

(Revised Final Report)

Date: 18-Dec-98

Units: micrograms/gram (µg/g) dry weight

**Method Blank**

**Spiked Method Blank**

| Compound                               | LOQ<br>µg/g | Result | Upper<br>Limit | Accept | %<br>Recovery | Lower<br>Limit | Upper<br>Limit | Accept |
|----------------------------------------|-------------|--------|----------------|--------|---------------|----------------|----------------|--------|
| Chloromethane                          | 0.005       | nd     | 0.005          | yes    | 97            | 70             | 130            | yes    |
| Vinyl chloride                         | 0.003       | nd     | 0.003          | yes    | 92            | 70             | 130            | yes    |
| Bromomethane                           | 0.005       | nd     | 0.005          | yes    | 97            | 70             | 130            | yes    |
| Chloroethane                           | 0.005       | nd     | 0.005          | yes    | 105           | 70             | 130            | yes    |
| Trichlorofluoromethane                 | 0.005       | nd     | 0.005          | yes    | 99            | 70             | 130            | yes    |
| Acetone                                | 0.050       | nd     | 0.050          | yes    | 100           | 60             | 140            | yes    |
| 1,1-Dichloroethene                     | 0.002       | nd     | 0.002          | yes    | 99            | 70             | 130            | yes    |
| Dichloromethane (Methylene Chloride)   | 0.010       | nd     | 0.010          | yes    | 101           | 70             | 130            | yes    |
| trans-1,2-Dichloroethene               | 0.002       | nd     | 0.002          | yes    | 100           | 70             | 130            | yes    |
| Methyl-t-Butyl Ether                   | 0.002       | nd     | 0.002          | yes    | 102           | 70             | 130            | yes    |
| 1,1-Dichloroethane                     | 0.002       | nd     | 0.002          | yes    | 99            | 70             | 130            | yes    |
| Methyl Ethyl Ketone (MEK)              | 0.025       | nd     | 0.025          | yes    | 105           | 60             | 140            | yes    |
| cis-1,2-Dichloroethene                 | 0.002       | nd     | 0.002          | yes    | 102           | 70             | 130            | yes    |
| Chloroform                             | 0.002       | nd     | 0.002          | yes    | 99            | 70             | 130            | yes    |
| 1,2-Dichloroethane                     | 0.002       | nd     | 0.002          | yes    | 103           | 70             | 130            | yes    |
| 1,1,1-Trichloroethane                  | 0.002       | nd     | 0.002          | yes    | 100           | 70             | 130            | yes    |
| Carbon Tetrachloride                   | 0.002       | nd     | 0.002          | yes    | 99            | 70             | 130            | yes    |
| Benzene                                | 0.002       | nd     | 0.002          | yes    | 101           | 70             | 130            | yes    |
| 1,2-Dichloropropane                    | 0.002       | nd     | 0.002          | yes    | 104           | 70             | 130            | yes    |
| Trichloroethene                        | 0.002       | nd     | 0.002          | yes    | 102           | 70             | 130            | yes    |
| Bromodichloromethane                   | 0.002       | nd     | 0.002          | yes    | 98            | 70             | 130            | yes    |
| cis-1,3-Dichloropropene                | 0.002       | nd     | 0.002          | yes    | 103           | 70             | 130            | yes    |
| Methyl Isobutyl Ketone (MIBK)          | 0.025       | nd     | 0.025          | yes    | 106           | 60             | 140            | yes    |
| trans-1,3-Dichloropropene              | 0.002       | nd     | 0.002          | yes    | 101           | 70             | 130            | yes    |
| 1,1,2-Trichloroethane                  | 0.002       | nd     | 0.002          | yes    | 98            | 70             | 130            | yes    |
| Toluene                                | 0.002       | nd     | 0.002          | yes    | 100           | 70             | 130            | yes    |
| 2-Hexanone                             | 0.025       | nd     | 0.025          | yes    | 102           | 60             | 140            | yes    |
| Dibromochloromethane                   | 0.002       | nd     | 0.002          | yes    | 100           | 70             | 130            | yes    |
| 1,2-Dibromoethane (Ethylene dibromide) | 0.002       | nd     | 0.002          | yes    | 102           | 70             | 130            | yes    |
| Tetrachloroethene (Perchloroethylene)  | 0.002       | nd     | 0.002          | yes    | 96            | 70             | 130            | yes    |
| 1,1,1,2-Tetrachloroethane              | 0.002       | nd     | 0.002          | yes    | 98            | 70             | 130            | yes    |
| Chlorobenzene                          | 0.002       | nd     | 0.002          | yes    | 101           | 70             | 130            | yes    |
| Ethylbenzene                           | 0.002       | nd     | 0.002          | yes    | 97            | 70             | 130            | yes    |
| m-Xylene & p-Xylene                    | 0.002       | nd     | 0.002          | yes    | 98            | 70             | 130            | yes    |
| Bromoform                              | 0.002       | nd     | 0.002          | yes    | 101           | 70             | 130            | yes    |
| Styrene                                | 0.002       | nd     | 0.002          | yes    | 97            | 70             | 130            | yes    |
| 1,1,2,2-Tetrachloroethane              | 0.002       | nd     | 0.002          | yes    | 103           | 70             | 130            | yes    |
| o-Xylene                               | 0.002       | nd     | 0.002          | yes    | 96            | 70             | 130            | yes    |
| 1,3-Dichlorobenzene                    | 0.002       | nd     | 0.002          | yes    | 95            | 70             | 130            | yes    |
| 1,4-Dichlorobenzene                    | 0.002       | nd     | 0.002          | yes    | 96            | 70             | 130            | yes    |
| 1,2-Dichlorobenzene                    | 0.002       | nd     | 0.002          | yes    | 95            | 70             | 130            | yes    |

**Surrogate Standard Recoveries:**

|                      |      |     |     |    |     |     |
|----------------------|------|-----|-----|----|-----|-----|
| Dibromofluoromethane | 99%  | yes | 101 | 70 | 130 | yes |
| Toluene-d8           | 103% | yes | 98  | 70 | 130 | yes |
| 4-Bromofluorobenzene | 89%  | yes | 99  | 70 | 130 | yes |

Client: Morrow Environmental Consultants Inc.  
Project Reference: W8140  
Work Order: G984466V  
Matrix: Soil

**VOLATILE ORGANIC COMPOUNDS**  
(Revised Final Report)

Date: 18-Dec-98

Units: micrograms/gram (µg/g) dry weight

| Compound                               | LOQ<br>µg/g | BH98-26-1<br>981113<br>DF=4 | BH98-26-1<br>981113<br>DF=4<br>Dup. |
|----------------------------------------|-------------|-----------------------------|-------------------------------------|
| Chloromethane                          | 1.0         | nd                          | nd                                  |
| Vinyl chloride                         | 0.5         | nd                          | nd                                  |
| Bromomethane                           | 1.0         | nd                          | nd                                  |
| Chloroethane                           | 1.0         | nd                          | nd                                  |
| Trichlorofluoromethane                 | 0.2         | nd                          | nd                                  |
| Acetone                                | 10.0        | nd                          | nd                                  |
| 1,1-Dichloroethene                     | 0.1         | nd                          | nd                                  |
| Dichloromethane (Methylene Chloride)   | 0.5         | nd                          | nd                                  |
| trans-1,2-Dichloroethene               | 0.1         | nd                          | nd                                  |
| Methyl-t-Butyl Ether                   | 0.1         | nd                          | nd                                  |
| 1,1-Dichloroethane                     | 0.1         | nd                          | nd                                  |
| Methyl Ethyl Ketone (MEK)              | 5.0         | nd                          | nd                                  |
| cis-1,2-Dichloroethene                 | 0.1         | nd                          | nd                                  |
| Chloroform                             | 0.1         | nd                          | nd                                  |
| 1,2-Dichloroethane                     | 0.1         | nd                          | nd                                  |
| 1,1,1-Trichloroethane                  | 0.1         | nd                          | nd                                  |
| Carbon Tetrachloride                   | 0.1         | nd                          | nd                                  |
| Benzene                                | 0.05        | nd                          | nd                                  |
| 1,2-Dichloropropane                    | 0.1         | nd                          | nd                                  |
| Trichloroethene                        | 0.1         | nd                          | nd                                  |
| Bromodichloromethane                   | 0.1         | nd                          | nd                                  |
| cis-1,3-Dichloropropene                | 0.1         | nd                          | nd                                  |
| Methyl Isobutyl Ketone (MIBK)          | 5.0         | nd                          | nd                                  |
| trans-1,3-Dichloropropene              | 0.1         | nd                          | nd                                  |
| 1,1,2-Trichloroethane                  | 0.1         | nd                          | nd                                  |
| Toluene                                | 0.1         | nd                          | nd                                  |
| 2-Hexanone                             | 5.0         | nd                          | nd                                  |
| Dibromochloromethane                   | 0.1         | nd                          | nd                                  |
| 1,2-Dibromoethane (Ethylene dibromide) | 0.1         | nd                          | nd                                  |
| Tetrachloroethene (Perchloroethylene)  | 0.1         | nd                          | nd                                  |
| 1,1,1,2-Tetrachloroethane              | 0.1         | nd                          | nd                                  |
| Chlorobenzene                          | 0.1         | nd                          | nd                                  |
| Ethylbenzene                           | 0.1         | nd                          | nd                                  |
| m-Xylene & p-Xylene                    | 0.1         | nd                          | nd                                  |
| Bromoform                              | 0.1         | nd                          | nd                                  |
| Styrene                                | 0.1         | nd                          | nd                                  |
| 1,1,2,2-Tetrachloroethane              | 0.1         | nd                          | nd                                  |
| o-Xylene                               | 0.1         | nd                          | nd                                  |
| 1,3-Dichlorobenzene                    | 0.1         | nd                          | nd                                  |
| 1,4-Dichlorobenzene                    | 0.1         | nd                          | nd                                  |
| 1,2-Dichlorobenzene                    | 0.1         | nd                          | nd                                  |

Surrogate Standard Recoveries: Control Limits: 70-130%

|                      |      |      |
|----------------------|------|------|
| Dibromofluoromethane | 107% | 104% |
| Toluene-d8           | 91%  | 92%  |
| 4-Bromofluorobenzene | 106% | 108% |

Philip Analytical Services Corporation

Client: Morrow Environmental Consultants Inc.  
Project Reference: W8140  
Work Order: G984466V  
Matrix: Soil

**VOLATILE ORGANIC COMPOUNDS**  
(Revised Final Report)  
Units: micrograms/gram (µg/g) dry weight

Date: 18-Dec-98

| Compound                               | LOQ<br>µg/g             | Method Blank |                |        | Spiked Method Blank |                |                |        |
|----------------------------------------|-------------------------|--------------|----------------|--------|---------------------|----------------|----------------|--------|
|                                        |                         | Result       | Upper<br>Limit | Accept | %<br>Recovery       | Lower<br>Limit | Upper<br>Limit | Accept |
| Chloromethane                          | 1.0                     | nd           | 1.0            | yes    | 108                 | 70             | 130            | yes    |
| Vinyl chloride                         | 0.5                     | nd           | 0.5            | yes    | 109                 | 70             | 130            | yes    |
| Bromomethane                           | 1.0                     | nd           | 1.0            | yes    | 112                 | 70             | 130            | yes    |
| Chloroethane                           | 1.0                     | nd           | 1.0            | yes    | 93                  | 70             | 130            | yes    |
| Trichlorofluoromethane                 | 0.2                     | nd           | 0.2            | yes    | 106                 | 70             | 130            | yes    |
| Acetone                                | 10.0                    | nd           | 10.0           | yes    | 100                 | 60             | 140            | yes    |
| 1,1-Dichloroethene                     | 0.1                     | nd           | 0.1            | yes    | 106                 | 70             | 130            | yes    |
| Dichloromethane (Methylene Chloride)   | 0.5                     | nd           | 0.5            | yes    | 104                 | 70             | 130            | yes    |
| trans-1,2-Dichloroethene               | 0.1                     | nd           | 0.1            | yes    | 105                 | 70             | 130            | yes    |
| Methyl-t-Butyl Ether                   | 0.1                     | nd           | 0.1            | yes    | 99                  | 70             | 130            | yes    |
| 1,1-Dichloroethane                     | 0.1                     | nd           | 0.1            | yes    | 105                 | 70             | 130            | yes    |
| Methyl Ethyl Ketone (MEK)              | 5.0                     | nd           | 5.0            | yes    | 106                 | 60             | 140            | yes    |
| cis-1,2-Dichloroethene                 | 0.1                     | nd           | 0.1            | yes    | 103                 | 70             | 130            | yes    |
| Chloroform                             | 0.1                     | nd           | 0.1            | yes    | 106                 | 70             | 130            | yes    |
| 1,2-Dichloroethane                     | 0.1                     | nd           | 0.1            | yes    | 103                 | 70             | 130            | yes    |
| 1,1,1-Trichloroethane                  | 0.1                     | nd           | 0.1            | yes    | 104                 | 70             | 130            | yes    |
| Carbon Tetrachloride                   | 0.1                     | nd           | 0.1            | yes    | 105                 | 70             | 130            | yes    |
| Benzene                                | 0.05                    | nd           | 0.05           | yes    | 103                 | 70             | 130            | yes    |
| 1,2-Dichloropropane                    | 0.1                     | nd           | 0.1            | yes    | 105                 | 70             | 130            | yes    |
| Trichloroethene                        | 0.1                     | nd           | 0.1            | yes    | 105                 | 70             | 130            | yes    |
| Bromodichloromethane                   | 0.1                     | nd           | 0.1            | yes    | 100                 | 70             | 130            | yes    |
| cis-1,3-Dichloropropene                | 0.1                     | nd           | 0.1            | yes    | 105                 | 70             | 130            | yes    |
| Methyl Isobutyl Ketone (MIBK)          | 5.0                     | nd           | 5.0            | yes    | 103                 | 60             | 140            | yes    |
| trans-1,3-Dichloropropene              | 0.1                     | nd           | 0.1            | yes    | 102                 | 70             | 130            | yes    |
| 1,1,2-Trichloroethane                  | 0.1                     | nd           | 0.1            | yes    | 104                 | 70             | 130            | yes    |
| Toluene                                | 0.1                     | nd           | 0.1            | yes    | 108                 | 70             | 130            | yes    |
| 2-Hexanone                             | 5.0                     | nd           | 5.0            | yes    | 106                 | 60             | 140            | yes    |
| Dibromochloromethane                   | 0.1                     | nd           | 0.1            | yes    | 106                 | 70             | 130            | yes    |
| 1,2-Dibromoethane (Ethylene dibromide) | 0.1                     | nd           | 0.1            | yes    | 104                 | 70             | 130            | yes    |
| Tetrachloroethene (Perchloroethylene)  | 0.1                     | nd           | 0.1            | yes    | 104                 | 70             | 130            | yes    |
| 1,1,1,2-Tetrachloroethane              | 0.1                     | nd           | 0.1            | yes    | 104                 | 70             | 130            | yes    |
| Chlorobenzene                          | 0.1                     | nd           | 0.1            | yes    | 108                 | 70             | 130            | yes    |
| Ethylbenzene                           | 0.1                     | nd           | 0.1            | yes    | 103                 | 70             | 130            | yes    |
| m-Xylene & p-Xylene                    | 0.1                     | nd           | 0.1            | yes    | 104                 | 70             | 130            | yes    |
| Bromoform                              | 0.1                     | nd           | 0.1            | yes    | 108                 | 70             | 130            | yes    |
| Styrene                                | 0.1                     | nd           | 0.1            | yes    | 107                 | 70             | 130            | yes    |
| 1,1,2,2-Tetrachloroethane              | 0.1                     | nd           | 0.1            | yes    | 106                 | 70             | 130            | yes    |
| o-Xylene                               | 0.1                     | nd           | 0.1            | yes    | 110                 | 70             | 130            | yes    |
| 1,3-Dichlorobenzene                    | 0.1                     | nd           | 0.1            | yes    | 108                 | 70             | 130            | yes    |
| 1,4-Dichlorobenzene                    | 0.1                     | nd           | 0.1            | yes    | 116                 | 70             | 130            | yes    |
| 1,2-Dichlorobenzene                    | 0.1                     | nd           | 0.1            | yes    | 112                 | 70             | 130            | yes    |
| Surrogate Standard Recoveries:         | Control Limits: 70-130% |              |                |        |                     |                |                |        |
| Dibromofluoromethane                   |                         | 101%         |                |        | 101                 | 70             | 130            | yes    |
| Toluene-d8                             |                         | 97%          |                |        | 101                 | 70             | 130            | yes    |
| 4-Bromofluorobenzene                   |                         | 100%         |                |        | 101                 | 70             | 130            | yes    |

Client: Morrow Environmental Consultants Inc.  
Project Reference: W8140  
Work Order: G984466V  
Matrix: Soil

**VOLATILE ORGANIC COMPOUNDS**  
(Revised Final Report)

Date: 18-Dec-9

Legend: LOQ = Limit of Quantitation  
nd = Not Detected Above LOQ  
Dup. = Duplicate  
DF = Dilution Factor

Date of sample receipt: November 14, 1998  
Date of sample analysis: November 21-22, 1998

Analytical Method:

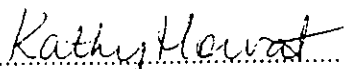
Soil sample BH98-25-2-981113 was analysed by low level purge & trap (US EPA Method 5035) gas chromatography/ mass spectrometry using US EPA Method 8260B (modified). The jar from which this sample was taken was only half full. A significant level of volatile organic compounds might have been lost from the jar prior to sample preparation.

Due to a level of petroleum hydrocarbon compounds beyond the appropriate range, sample BH98-26-1-981113 could not be analysed by the low level direct purge method. This sample was analysed by medium level purge & trap (US EPA Method 5035) gas chromatography/mass spectrometry using US EPA Method 8260B (modified).

NOTE: This report was revised to include a correction for the recovery of m-xylene & p-xylene in the spiked method blank.

*NOTE: All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analysis done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangement.*

Job Approved By:

  
Kathy Horvat, B.Sc.  
Chemist

Client: Morrow Environmental Consultants Ltd.

**ACID EXTRACTABLES**

Date: 3-Dec-98

Project Reference: W8140

Work Order Number: G984466A

Matrix: Soil

| Compound                                                 | LOQ<br>µg/g | BH98-22-1<br>981113 | LOQ<br>µg/g | BH98-26-1<br>981113<br>DF=12.5 | BH98-26-1<br>981113<br>Dup.<br>DF=12.5 |
|----------------------------------------------------------|-------------|---------------------|-------------|--------------------------------|----------------------------------------|
| Phenol                                                   | 0.1         | nd                  | 1.3         | nd                             | nd                                     |
| 2-Chlorophenol                                           | 0.1         | nd                  | 1.3         | nd                             | nd                                     |
| o-Cresol                                                 | 0.1         | nd                  | 1.3         | nd                             | nd                                     |
| m-Cresol & p-Cresol                                      | 0.1         | 0.1                 | 1.3         | nd                             | nd                                     |
| 2-Nitrophenol                                            | 0.1         | nd                  | 1.3         | nd                             | nd                                     |
| 2,4-Dimethylphenol                                       | 0.1         | nd                  | 1.3         | nd                             | nd                                     |
| 2,4-dichlorophenol                                       | 0.1         | nd                  | 1.3         | nd                             | nd                                     |
| 4-Chloro-3-Methylphenol                                  | 0.1         | nd                  | 1.3         | nd                             | nd                                     |
| 2,4,6-Trichlorophenol                                    | 0.1         | nd                  | 1.3         | nd                             | nd                                     |
| 2,4,5-Trichlorophenol                                    | 0.1         | nd                  | 1.3         | nd                             | nd                                     |
| 2,4-Dinitrophenol                                        | 0.2         | nd                  | 2.5         | nd                             | nd                                     |
| 4-Nitrophenol                                            | 0.5         | nd                  | 6.3         | nd                             | nd                                     |
| 2,3,5,6-Tetrachlorophenol                                | 0.1         | nd                  | 1.3         | nd                             | nd                                     |
| 2,3,4,5-Tetrachlorophenol &<br>2,3,4,6-Tetrachlorophenol | 0.1         | nd                  | 1.3         | nd                             | nd                                     |
| 2-Methyl-4,6-Dinitrophenol                               | 0.5         | nd                  | 6.3         | nd                             | nd                                     |
| Pentachlorophenol                                        | 0.2         | nd                  | 2.5         | nd                             | nd                                     |

Surrogate Standard Recoveries:

Control Limits: 30-120%

|                      |     |     |     |
|----------------------|-----|-----|-----|
| 2-Fluorophenol       | 44% | 51% | 49% |
| Phenol-d5            | 47% | 59% | 56% |
| 2,4,6-Tribromophenol | 76% | 71% | 72% |

Client: Morrow Environmental Consultants Ltd.  
Project Reference: W8140  
Work Order Number: G984466A  
Matrix: Soil

**ACID EXTRACTABLES**

Date: 3-Dec-98

| Compound                    | LOQ<br>µg/g | Result | Method Blank   |        | %<br>Recovery | Spiked Method Blank |                | Accept |
|-----------------------------|-------------|--------|----------------|--------|---------------|---------------------|----------------|--------|
|                             |             |        | Upper<br>Limit | Accept |               | Lower<br>Limit      | Upper<br>Limit |        |
| Phenol                      | 0.1         | nd     | 0.1            | yes    | 70            | 30                  | 120            | yes    |
| 2-Chlorophenol              | 0.1         | nd     | 0.1            | yes    | 67            | 30                  | 120            | yes    |
| o-Cresol                    | 0.1         | nd     | 0.1            | yes    | 70            | 30                  | 120            | yes    |
| m-Cresol & p-Cresol         | 0.1         | nd     | 0.1            | yes    | 66            | 30                  | 120            | yes    |
| 2-Nitrophenol               | 0.1         | nd     | 0.1            | yes    | 65            | 30                  | 120            | yes    |
| 2,4-Dimethylphenol          | 0.1         | nd     | 0.1            | yes    | 52            | 30                  | 120            | yes    |
| 2,4-dichlorophenol          | 0.1         | nd     | 0.1            | yes    | 68            | 30                  | 120            | yes    |
| 4-Chloro-3-Methylphenol     | 0.1         | nd     | 0.1            | yes    | 71            | 30                  | 120            | yes    |
| 2,4,6-Trichlorophenol       | 0.1         | nd     | 0.1            | yes    | 70            | 30                  | 120            | yes    |
| 2,4,5-Trichlorophenol       | 0.1         | nd     | 0.1            | yes    | 73            | 30                  | 120            | yes    |
| 2,4-Dinitrophenol           | 0.2         | nd     | 0.2            | yes    | 53            | 30                  | 120            | yes    |
| 4-Nitrophenol               | 0.5         | nd     | 0.5            | yes    | 62            | 30                  | 120            | yes    |
| 2,3,5,6-Tetrachlorophenol   | 0.1         | nd     | 0.1            | yes    | 77            | 30                  | 120            | yes    |
| 2,3,4,5-Tetrachlorophenol & |             |        |                |        |               |                     |                |        |
| 2,3,4,6-Tetrachlorophenol   | 0.1         | nd     | 0.1            | yes    | 74            | 30                  | 120            | yes    |
| 2-Methyl-4,6-Dinitrophenol  | 0.5         | nd     | 0.5            | yes    | 65            | 30                  | 120            | yes    |
| Pentachlorophenol           | 0.2         | nd     | 0.2            | yes    | 70            | 30                  | 120            | yes    |

Surrogate Standard Recoveries:

|                      |     |         |     |    |    |     |     |
|----------------------|-----|---------|-----|----|----|-----|-----|
| 2-Fluorophenol       | 64% | 30-120% | yes | 68 | 30 | 120 | yes |
| Phenol-d5            | 66% | 30-120% | yes | 67 | 30 | 120 | yes |
| 2,4,6-Tribromophenol | 61% | 30-120% | yes | 74 | 30 | 120 | yes |



Client: Morrow Environmental Consultants Ltd.  
 Project Reference: W8140  
 Work Order Number: G984466A  
 Matrix: Soil

**ACID EXTRACTABLES**

Date: 3-Dec-98

Legend: LOQ = Limit of Quantitation  
 Units = Micrograms per gram ( $\mu\text{g/g}$ ) dry weight  
 nd = Not detected above LOQ  
 Dup. = Duplicate  
 DF = Dilution Factor

Date received: November 14, 1998  
 Date extracted: December 1, 1998  
 Date analysed: December 3, 1998

## Analytical Method:

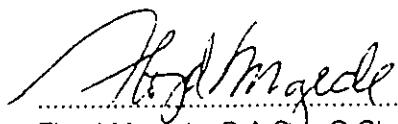
The soil samples (10 grams wet weight) were mixed with sodium sulfate and extracted with a 1:1 mixture of acetone:dichloromethane. Analysis was performed by gas chromatography/mass spectrometry using US EPA Method 8270B (modified).

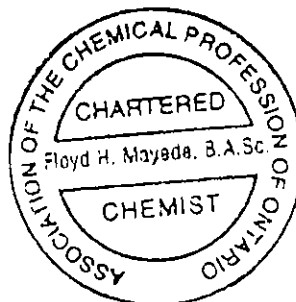
## Report Discussion:

The duplicate portions of sample BH98-26-1-981113 were run at a dilution factor due to elevated levels of nontarget compounds present. Excessive levels of nontarget compounds may interfere with the proper quantitation of the sample and may also cause contamination of the analytical equipment if run undiluted. The quantitation limits for these samples are higher than the LOQ's for undiluted samples as indicated above.

*NOTE: All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analysis done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangement.*

Job Approved By:

  
 \_\_\_\_\_  
 Floyd Mayeda, B.A.Sc., C.Chem.  
 Chemist



DEC 15 1998

MORROW ENVIRONMENTAL  
CONSULTANTS INC.  
WINNIPEG

Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6  
  
Fax: 204-477-9194  
  
Attn: Alex Man

Date Received: November 14/98  
Date Reported: November 25/98  
Lab Ref#: G984466  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084/WSTN YD  
Client Ref#: W8140  
Sampled By: JDT

### Certificate of Analysis

Analysis Performed: Arsenic, Hydride Generation AA  
Antimony, Hydride Generation, Digestion Required  
Selenium, Hydride Generation  
Anions, IC(F, Cl, Br, NO<sub>2</sub>, NO<sub>3</sub>, o-PO<sub>4</sub> & SO<sub>4</sub>), Extraction Req'd  
17 Element ICP Scan  
pH, Hydrogen Ion Activity, Extraction Required  
Acetic Acid Extraction(For Inorganics)

Methodology:

- 1) Analysis of arsenic in soil by Hydride Generation  
Atomic Absorption.  
U.S. EPA Method No. 7061(Modifications)
- 2) Analysis of antimony in soil by hydride generation.  
U.S. EPA Method No. 7042
- 3) Analysis of selenium in soil by hydride generation.  
U.S. EPA Method No. 7741(Modification)
- 4) Analysis of anions in soil by Ion Chromatography.  
U.S. EPA Method No. 300.0  
Standard Methods(1985) No. 429.0
- 5) Analysis of trace metals in soil by Inductively Coupled  
Plasma Spectrophotometry.  
U.S. EPA Method No. 6010  
(Ministry of Environment ELSCAN)

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.



Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: November 14/98  
Date Reported: November 25/98  
Lab Ref#: G984466  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084/WSTN YD  
Client Ref#: W8140  
Sampled By: JDT

### Certificate of Analysis

Methodology: (Cont'd)

- 6) Analysis of pH in soil by electrode.  
U.S. EPA Method No. 9045
- 7) Acetic Acid leach of solids.  
Environmental Protection Act, Reg. 347  
(Ref-Canadian General Stds 164-GP-1MP)

Instrumentation:

- 1, 2, 3) Thermo Jarrell Ash Smith-Hieftje 22 AA/Varian VGA 76
- 4) Dionex Ion Chromatograph, Series 4500i
- 5) Thermo Jarrell Ash ICAP 61E Plasma Spectrophotometer
- 6) Orion Research Expandable Ion Analyzer EA940
- 7) Rotorack at 10 RPM/Filtration Apparatus

Sample Description:

Soil

QA/QC:

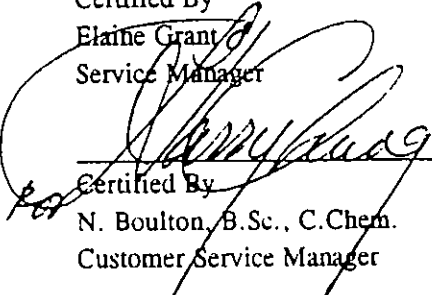
Refer to CERTIFICATE OF QUALITY CONTROL report.

Results:

Refer to REPORT of ANALYSIS attached.

  
Certified By

Elaine Grant  
Service Manager

  
Certified By

N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

PHILIP ANALYTICAL SERVICES CORPORATION

5745 McAdam Road, Mississauga, Ontario L4Z 1N9 Tel: (905) 890-8850 Fax: (905) 890-8575 (WATS: 1-800-263-9007)

# Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Date Reported: November 25/98  
Lab Ref # : G984466  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084/WSTN YD  
Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter            | SAMPLE ID<br>(spike) | LOQ  | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|----------------------|----------------------|------|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|                      |                      |      |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Arsenic              | na                   | 0.5  | mg/kg | nd(b)         | 2.0            | yes    | 102                | 60             | 140            | yes    | na           | na     | na             | na             | na     | yes                         |
| Antimony             | na                   | 0.5  | mg/kg | nd(b)         | 1.0            | yes    | 133                | 60             | 140            | yes    | na           | na     | na             | na             | na     | yes                         |
| Selenium             | na                   | 0.2  | mg/kg | nd(b)         | 0.8            | yes    | 120                | 60             | 140            | yes    | na           | na     | na             | na             | na     | yes                         |
| Bromide              | na                   | 0.5  | mg/kg | nd(b)         | 1.0            | yes    | 98                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Chloride             | na                   | 0.5  | mg/kg | nd(b)         | 1.0            | yes    | 99                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Fluoride             | na                   | 0.2  | mg/kg | nd(b)         | 0.4            | yes    | 102                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Nitrate(as N)        | na                   | 0.3  | mg/kg | nd(b)         | 0.6            | yes    | 100                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Nitrite(as N)        | na                   | 0.3  | mg/kg | nd(b)         | 0.6            | yes    | 100                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Orthophosphate(as P) | na                   | 0.2  | mg/kg | nd(b)         | 0.4            | yes    | 97                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Sulphate             | na                   | 0.5  | mg/kg | nd(b)         | 1.0            | yes    | 97                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Aluminum             | na                   | 20.0 | mg/kg | nd(b)         | 40.0           | yes    | 94                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Barium               | na                   | 5.0  | mg/kg | nd(b)         | 10.0           | yes    | 99                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Beryllium            | na                   | 0.2  | mg/kg | nd(b)         | 0.4            | yes    | 89                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Cadmium              | na                   | 0.3  | mg/kg | nd(b)         | 0.6            | yes    | 103                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Chromium             | na                   | 1.0  | mg/kg | nd(b)         | 2.0            | yes    | 103                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Cobalt               | na                   | 2.0  | mg/kg | nd(b)         | 4.0            | yes    | 102                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Copper               | na                   | 1.0  | mg/kg | nd(b)         | 4.0            | yes    | 102                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Iron                 | na                   | 50.0 | mg/kg | nd(b)         | 100.0          | yes    | 102                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Lead                 | na                   | 5.0  | mg/kg | nd(b)         | 10.0           | yes    | 99                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Manganese            | na                   | 1.0  | mg/kg | nd(b)         | 2.0            | yes    | 100                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |

LOQ = Limit of Quantitation = lowest level of the parameter that can be quantified with confidence

\* = Unavailable due to dilution required for analysis

na = Not Applicable

ns = Insufficient Sample Submitted

nd = parameter not detected

TR = trace level less than LOQ

(b) = Analyte results on REPORT of ANALYSIS have been background corrected for the process blank.

# Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Date Reported: November 25/98  
Lab Ref # : G984466  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084/WSTN YD  
Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter  | SAMPLE ID<br>(spike) | LOQ  | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|------------|----------------------|------|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|            |                      |      |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Molybdenum | na                   | 3.0  | mg/kg | nd(b)         | 6.0            | yes    | 100                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Nickel     | na                   | 2.0  | mg/kg | nd(b)         | 4.0            | yes    | 102                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Phosphorus | na                   | 20.0 | mg/kg | nd(b)         | 40.0           | yes    | 102                | 70             | 130            | yes    | na           | na     | na             | na             | na     | yes                         |
| Silver     | na                   | 0.3  | mg/kg | nd(b)         | 0.6            | yes    | 91                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Titanium   | na                   | 1.0  | mg/kg | nd(b)         | 2.0            | yes    | 100                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Vanadium   | na                   | 1.0  | mg/kg | nd(b)         | 2.0            | yes    | 101                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Zinc       | na                   | 5.0  | mg/kg | nd(b)         | 10.0           | yes    | 99                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| pH         | na                   | 0.01 | Units | na            | na             | na     | 105                | 95             | 105            | yes    | na           | na     | na             | na             | na     | yes                         |
| pH         | na                   | 0.01 | Units | na            | na             | na     | 105                | 95             | 105            | yes    | na           | na     | na             | na             | na     | yes                         |

LOQ = Limit of Quantitation = lowest level of the parameter that can be quantified with confidence

\* = Unavailable due to dilution required for analysis

na = Not Applicable

ns = Insufficient Sample Submitted

nd = parameter not detected

TR = trace level less than LOQ

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Report Date: November 25/98  
Lab Ref # : G984466  
Lab Quote #: 96-W238-VG  
Client PO#: EE98084/WSTN YD  
Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter            | LOQ  | Units | BH98-24-3-<br>981113<br>98/11/13 | BH98-25-2-<br>981113<br>98/11/13 | BH98-26-1-<br>981113<br>98/11/13 | BH98-26-1-<br>981113<br>Replicate | PH-ASH-<br>981113<br>98/11/13 |
|----------------------|------|-------|----------------------------------|----------------------------------|----------------------------------|-----------------------------------|-------------------------------|
| Date Sampled >       |      |       |                                  |                                  |                                  |                                   |                               |
| Antimony             | 0.5  | mg/kg | nd                               | 26.9                             | 20.0                             | 20.0                              | -                             |
| Arsenic              | 0.5  | mg/kg | nd                               | 10.0                             | 5.6                              | 5.1                               | -                             |
| Selenium             | 0.2  | mg/kg | nd                               | 0.7                              | 0.4                              | 0.4                               | -                             |
| Bromide              | 0.5  | mg/kg | -                                | -                                | -                                | -                                 | nd                            |
| Chloride             | 0.5  | mg/kg | -                                | -                                | -                                | -                                 | 19.4                          |
| Fluoride             | 0.2  | mg/kg | -                                | -                                | -                                | -                                 | nd                            |
| Nitrate(as N)        | 0.3  | mg/kg | -                                | -                                | -                                | -                                 | 2.3                           |
| Nitrite(as N)        | 0.3  | mg/kg | -                                | -                                | -                                | -                                 | 0.3                           |
| Orthophosphate(as P) | 0.2  | mg/kg | -                                | -                                | -                                | -                                 | nd                            |
| Sulphate             | 0.5  | mg/kg | -                                | -                                | -                                | -                                 | 19800                         |
| Aluminum             | 20.0 | mg/kg | 3080                             | 15500                            | 7090                             | 7280                              | -                             |
| Barium               | 5.0  | mg/kg | 24.7                             | 236                              | 700                              | 716                               | -                             |
| Beryllium            | 0.2  | mg/kg | nd                               | 0.7                              | 0.3                              | 0.3                               | -                             |
| Cadmium              | 0.3  | mg/kg | nd                               | 1.4                              | 0.8                              | 1.2                               | -                             |
| Chromium             | 1.0  | mg/kg | 9.7                              | 36.7                             | 24.6                             | 27.6                              | -                             |
| Cobalt               | 2.0  | mg/kg | nd                               | 8.4                              | 4.3                              | 5.8                               | -                             |
| Copper               | 1.0  | mg/kg | 7.3                              | 296                              | 170                              | 166                               | -                             |
| Iron                 | 50.0 | mg/kg | 5710                             | 29900                            | 30900                            | 33100                             | -                             |
| Lead                 | 5.0  | mg/kg | nd                               | 635                              | 402                              | 452                               | -                             |
| Manganese            | 1.0  | mg/kg | 154                              | 268                              | 332                              | 322                               | -                             |
| Molybdenum           | 3.0  | mg/kg | nd                               | nd                               | 13.2                             | 15.5                              | -                             |
| Nickel               | 2.0  | mg/kg | 9.1                              | 38.0                             | 40.3                             | 39.6                              | -                             |
| Phosphorus           | 20.0 | mg/kg | 275                              | 509                              | 495                              | 455                               | -                             |
| Silver               | 0.3  | mg/kg | nd                               | nd                               | nd                               | nd                                | -                             |
| Titanium             | 1.0  | mg/kg | 143                              | 35.6                             | 336                              | 372                               | -                             |
| Vanadium             | 1.0  | mg/kg | 11.4                             | 41.0                             | 18.5                             | 19.3                              | -                             |
| Zinc                 | 5.0  | mg/kg | 12.6                             | 267                              | 232                              | 229                               | -                             |

LOQ Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.

- Not Requested

nd parameter not detected ! = LOQ higher than listed due to dilution ( ) Adjusted LOQ

Philip Analytical Services Corp

# Report of Analysis

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Report Date: November 25/98  
Lab Ref # : G984466  
Lab Quote #: 96-W238-VG  
Client PO#: EE98084/WSTN YD  
Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter                            | LOQ  | Units | BH98-24-3-<br>981113<br>98/11/13 | BH98-25-2-<br>981113<br>98/11/13 | BH98-26-1-<br>981113<br>98/11/13 | BH98-26-1-<br>981113<br>Replicate | PH-ASH-<br>981113<br>98/11/13 |
|--------------------------------------|------|-------|----------------------------------|----------------------------------|----------------------------------|-----------------------------------|-------------------------------|
| Date Sampled >                       |      |       |                                  |                                  |                                  |                                   |                               |
| pH                                   | 0.01 | Units | 8.58                             | 9.33                             | 8.65                             | 8.68                              | 12.0                          |
| Final pH(following Acetic Leach)     | 0.01 | Units | -                                | -                                | -                                | -                                 | 4.92                          |
| Initial pH(previous to Acetic Leach) | 0.01 | Units | -                                | -                                | -                                | -                                 | 11.3                          |
| Volume of Acetic Acid Used           | 0.01 | ml    | -                                | -                                | -                                | -                                 | 190                           |

LOQ Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.  
- Not Requested

Philip Analytical Services Corp

# Report of Analysis

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Report Date: November 25/98  
Lab Ref # : G984466  
Lab Quote #: 96-W238-VG  
Client PO#: EE98084/WSTN YD  
Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter            | LOQ  | Units | PH-ASH-<br>981113<br>Replicate |  |  |  |  |
|----------------------|------|-------|--------------------------------|--|--|--|--|
| Antimony             | 0.5  | mg/kg | -                              |  |  |  |  |
| Arsenic              | 0.5  | mg/kg | -                              |  |  |  |  |
| Selenium             | 0.2  | mg/kg | -                              |  |  |  |  |
| Bromide              | 0.5  | mg/kg | nd                             |  |  |  |  |
| Chloride             | 0.5  | mg/kg | 19.4                           |  |  |  |  |
| Fluoride             | 0.2  | mg/kg | nd                             |  |  |  |  |
| Nitrate(as N)        | 0.3  | mg/kg | 2.6                            |  |  |  |  |
| Nitrite(as N)        | 0.3  | mg/kg | 0.3                            |  |  |  |  |
| Orthophosphate(as P) | 0.2  | mg/kg | nd                             |  |  |  |  |
| Sulphate             | 0.5  | mg/kg | 19900                          |  |  |  |  |
| Aluminum             | 20.0 | mg/kg | -                              |  |  |  |  |
| Barium               | 5.0  | mg/kg | -                              |  |  |  |  |
| Beryllium            | 0.2  | mg/kg | -                              |  |  |  |  |
| Cadmium              | 0.3  | mg/kg | -                              |  |  |  |  |
| Chromium             | 1.0  | mg/kg | -                              |  |  |  |  |
| Cobalt               | 2.0  | mg/kg | -                              |  |  |  |  |
| Copper               | 1.0  | mg/kg | -                              |  |  |  |  |
| Iron                 | 50.0 | mg/kg | -                              |  |  |  |  |
| Lead                 | 5.0  | mg/kg | -                              |  |  |  |  |
| Manganese            | 1.0  | mg/kg | -                              |  |  |  |  |
| Molybdenum           | 3.0  | mg/kg | -                              |  |  |  |  |
| Nickel               | 2.0  | mg/kg | -                              |  |  |  |  |
| Phosphorus           | 20.0 | mg/kg | -                              |  |  |  |  |
| Silver               | 0.3  | mg/kg | -                              |  |  |  |  |
| Titanium             | 1.0  | mg/kg | -                              |  |  |  |  |
| Vanadium             | 1.0  | mg/kg | -                              |  |  |  |  |
| Zinc                 | 5.0  | mg/kg | -                              |  |  |  |  |

LOQ Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.  
- Not Requested  
nd parameter not detected ! = LOQ higher than listed due to dilution ( ) Adjusted LOQ

## Report of Analysis

Report Date: November 25/98  
Lab Ref # : G984466  
Lab Quote #: 96-W238-VG  
Client PO#: EE98084/WSTN YD  
Client Ref#: W8140

### Analysis of Soil, expressed on a dry weight basis

[illegible]

**LOQ** Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.

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MORROW ENVIRONMENTAL  
CONSULTANTS INC.  
WINNIPEG

Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: November 17/98  
Date Reported: November 23/98  
Lab Ref#: G984507  
Lab Quote#: 96-W238-VG  
Client PO#: EA WestonYard  
Client Ref#: W8140  
Sampled By: JDT

### Certificate of Analysis

Analysis Performed: Extractable Hydrocarbons(Manitoba Guidelines), C11-C32  
BTEX and Total Volatile Hydrocarbons(Manitoba Criteria)

Methodology: 1) The characterization of HydroCarbon in soil by GC  
analysis, following a solvent extraction.  
U.S. EPA Method No.8011(microextraction)  
2) Analysis of Benzene, Toluene, Ethylbenzene, Xylenes &  
Volatile Hydrocarbons by Static Headspace Capillary GC-P  
ID/FID. External std quantitation with Surrogate stds.  
U.S. EPA Method No. 3810(Modification)

Instrumentation: 1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S  
2) Varian 3400 GC PID/FID, Genesis Headspace Analyzer

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.



Certified By  
Elaine Grant  
Service Manager



Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

# Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Date Reported: November 23/98  
Lab Ref # : G984507  
Lab Quote#: 96-W238-VG  
Client PO#: EA WestonYard  
Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | SAMPLE ID<br>(spike) | LOQ  | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|------------------------------------------|----------------------|------|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|                                          |                      |      |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Total SemiVolatile Hydrocarbons(C11-C32) | na                   | 10.0 | mg/kg | nd            | 20.0           | yes    | 83                 | 70             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Benzene                                  | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 100                | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Ethylbenzene                             | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 97                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Toluene                                  | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 96                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Total Volatile Hydrocarbons              | na                   | 10   | mg/kg | nd            | 10             | yes    | 98                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Xylenes(Total)                           | na                   | 0.04 | mg/kg | nd            | 0.08           | yes    | 95                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |

LOQ = Limit of Quantitation = lowest level of the parameter that can be quantified with confidence

\* = Unavailable due to dilution required for analysis

na = Not Applicable

ns = Insufficient Sample Submitted

nd = parameter not detected

TR = trace level less than LOQ

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
 Contact: Alex Man

Report Date: November 23/98  
 Lab Ref # : G984507  
 Lab Quote #: 96-W238-VG  
 Client PO#: EA WestonYard  
 Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter<br>Date Sampled >              | LOQ  | Units | BH98-31-3<br>@981116<br>98/11/16 | BH98-31-3<br>@981116<br>Replicate | BH98-32-1<br>@981116<br>98/11/16 |  |  |
|------------------------------------------|------|-------|----------------------------------|-----------------------------------|----------------------------------|--|--|
| Resemblance                              | na   | na    | na                               | na                                | EDMO?                            |  |  |
| Total SemiVolatile Hydrocarbons(C11-C32) | 10.0 | mg/kg | nd                               | nd                                | 234                              |  |  |
| Benzene                                  | 0.02 | mg/kg | nd                               | nd                                | nd                               |  |  |
| Ethylbenzene                             | 0.02 | mg/kg | nd                               | nd                                | nd                               |  |  |
| Toluene                                  | 0.02 | mg/kg | nd                               | nd                                | nd                               |  |  |
| Total Volatile Hydrocarbons              | 10   | mg/kg | nd                               | nd                                | nd                               |  |  |
| Xylenes(Total)                           | 0.04 | mg/kg | nd                               | nd                                | nd                               |  |  |

LOQ Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.

EDMO? Contaminant elutes across the diesel/motor oil range but does not match reference standards.

na Not Applicable

nd parameter not detected ! = LOQ higher than listed due to dilution ( ) Adjusted LOQ

MORROW ENVIRONMENTAL  
CONSULTANTS INC.  
WINNIPEG

Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: November 18/98  
Date Reported: December 2/98  
Lab Ref#: G984527  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084/WSTN YD  
Client Ref#: W8140  
Sampled By: JDT

**Certificate of Analysis**

Analysis Performed: Extractable Hydrocarbons(Manitoba Guidelines), C11-C32  
BTEX and Total Volatile Hydrocarbons(Manitoba Criteria)  
Total Purgeable Hydrocarbons

Methodology:

- 1) The characterization of HydroCarbon in soil by GC analysis, following a solvent extraction.  
U.S. EPA Method No.8011(microextraction)
- 2) Analysis of Benzene, Toluene, Ethylbenzene, Xylenes & Volatile Hydrocarbons by Static Headspace Capillary GC-PID/FID. External std quantitation with Surrogate stds.  
U.S. EPA Method No. 3810(Modification)
- 3) Purge & Trap capillary GC/MS analysis of Soil samples for Total Purgeables.  
U.S. EPA Method No. 5030

Instrumentation:

- 1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S
- 2) Varian 3400 GC PID/FID, Genesis Headspace Analyzer
- 3) Purge & Trap-GC/MS

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.



Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: November 18/98  
Date Reported: December 2/98  
Lab Ref#: G984527  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084/WSTN YD  
Client Ref#: W8140  
Sampled By: JDT

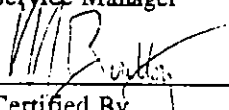
### Certificate of Analysis

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

  
\_\_\_\_\_  
Certified By  
Elaine Grant  
Service Manager

  
\_\_\_\_\_  
Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

# Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Date Reported: December 2/98  
Lab Ref # : G984527  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084/WSTN YD  
Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter                                 | SAMPLE ID<br>(spike) | LOQ  | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|-------------------------------------------|----------------------|------|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|                                           |                      |      |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Total Semi Volatile Hydrocarbons(C11-C32) | na                   | 10.0 | mg/kg | nd            | 20.0           | yes    | 96                 | 70             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Benzene                                   | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 82                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Ethylbenzene                              | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 86                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Toluene                                   | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 94                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Total Volatile Hydrocarbons               | na                   | 10   | mg/kg | nd            | 10             | yes    | 108                | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Xylenes(Total)                            | na                   | 0.04 | mg/kg | nd            | 0.08           | yes    | 89                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Total Purgable Hydrocarbons               | na                   | 10   | ug/g  | nd            | 20             | yes    | na                 | na             | na             | na     | na           | na     | na             | na             | na     | yes                         |

LOQ = Limit of Quantitation = lowest level of the parameter that can be quantified with confidence  
 \* = Unavailable due to dilution required for analysis  
 na = Not Applicable  
 ns = Insufficient Sample Submitted  
 nd = parameter not detected  
 TR = trace level less than LOQ

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Report Date: December 2/98  
Lab Ref # : G984527  
Lab Quote #: 96-W238-VG  
Client PO#: EE98084/WSTN YD  
Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter<br>Date Sampled >              | LOQ  | Units | BH98-33-3          | BH98-33-3           | BH98-33-5          | BH98-34-3          | BH98-34-3           |
|------------------------------------------|------|-------|--------------------|---------------------|--------------------|--------------------|---------------------|
|                                          |      |       | 981117<br>98/11/17 | 981117<br>Replicate | 981117<br>98/11/17 | 981117<br>98/11/17 | 981117<br>Replicate |
| Resemblance                              | na   | na    | WDMO               | WDMO                | na                 | ED?                | -                   |
| Total SemiVolatile Hydrocarbons(C11-C32) | 10.0 | mg/kg | 365                | 390                 | nd                 | 2790               | -                   |
| Benzene                                  | 0.02 | mg/kg | -                  | -                   | -                  | nd                 | nd                  |
| Ethylbenzene                             | 0.02 | mg/kg | -                  | -                   | -                  | 0.60               | nd                  |
| Toluene                                  | 0.02 | mg/kg | -                  | -                   | -                  | 0.12               | nd                  |
| Total Volatile Hydrocarbons              | 10   | mg/kg | -                  | -                   | -                  | 136                | nd                  |
| Xylenes(Total)                           | 0.04 | mg/kg | -                  | -                   | -                  | 0.79               | nd                  |
| Total Purgeable Hydrocarbons             | 10   | ug/g  | nd                 | nd                  | nd                 | -                  | -                   |

LOQ Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.  
- Not Requested  
ED? Contaminant elutes in the diesel range but does not match reference standard.  
na Not Applicable  
nd parameter not detected ! = LOQ higher than listed due to dilution ( ) Adjusted LOQ  
WDMO Weathered Diesel and Motor Oil.

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
 Contact: Alex Man

Report Date: December 2/98  
 Lab Ref # : G984527  
 Lab Quote #: 96-W238-VG  
 Client PO#: EE98084/WSTN YD  
 Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | LOQ  | Units | BH98-35-2<br>981117<br>98/11/17 | BH98-35-4<br>981117<br>98/11/17 |  |  |  |
|------------------------------------------|------|-------|---------------------------------|---------------------------------|--|--|--|
| Date Sampled >                           |      |       |                                 |                                 |  |  |  |
| Resemblance                              | na   | na    | EMO?                            | EMO?                            |  |  |  |
| Total SemiVolatile Hydrocarbons(C11-C32) | 10.0 | mg/kg | TR                              | TR                              |  |  |  |
| Benzene                                  | 0.02 | mg/kg | -                               | -                               |  |  |  |
| Ethylbenzene                             | 0.02 | mg/kg | -                               | -                               |  |  |  |
| Toluene                                  | 0.02 | mg/kg | -                               | -                               |  |  |  |
| Total Volatile Hydrocarbons              | 10   | mg/kg | -                               | -                               |  |  |  |
| Xylenes(Total)                           | 0.04 | mg/kg | -                               | -                               |  |  |  |
| Total Purgeable Hydrocarbons             | 10   | ug/g  | nd                              | nd                              |  |  |  |

LOQ Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.  
 - Not Requested  
 EMO? Contaminant elutes in the motor oil range but does not match reference standard.  
 na Not Applicable  
 nd parameter not detected ! = LOQ higher than listed due to dilution ( ) Adjusted LOQ  
 TR trace level less than LOQ ! = LOQ higher than listed due to dilution ( ) Adjusted LOQ

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MORROW ENVIRONMENTAL  
CONSULTANTS INC.  
WINNIPEG

Client: Morrow Environmental Consultants Inc.

Project Reference: W8140

Work Order: G984527V

Matrix: Soil

**VOLATILE ORGANIC COMPOUNDS**

Date: 27-Nov-98

Units: micrograms/gram (µg/g) dry weight

| Compound                               | LOQ<br>µg/g | BH98-33-<br>3981117 | BH98-33-<br>3981117<br>Dup. | LOQ<br>µg/g | BH98-33-<br>5981117<br>DF=250 |
|----------------------------------------|-------------|---------------------|-----------------------------|-------------|-------------------------------|
| Chloromethane                          | 1.0         | nd                  | nd                          | 250         | nd                            |
| Vinyl chloride                         | 0.5         | nd                  | nd                          | 125         | nd                            |
| Bromomethane                           | 1.0         | nd                  | nd                          | 250         | nd                            |
| Chloroethane                           | 1.0         | nd                  | nd                          | 250         | nd                            |
| Trichlorofluoromethane                 | 0.2         | nd                  | nd                          | 50          | nd                            |
| Acetone                                | 10.0        | nd                  | nd                          | 2500        | nd                            |
| 1,1-Dichloroethene                     | 0.1         | nd                  | nd                          | 25          | nd                            |
| Dichloromethane (Methylene Chloride)   | 0.5         | nd                  | nd                          | 125         | nd                            |
| trans-1,2-Dichloroethene               | 0.1         | nd                  | nd                          | 25          | nd                            |
| Methyl-t-Butyl Ether                   | 0.1         | nd                  | nd                          | 25          | nd                            |
| 1,1-Dichloroethane                     | 0.1         | nd                  | nd                          | 25          | nd                            |
| Methyl Ethyl Ketone (MEK)              | 5.0         | nd                  | nd                          | 1250        | nd                            |
| cis-1,2-Dichloroethene                 | 0.1         | 1.3                 | 1.0                         | 25          | nd                            |
| Chloroform                             | 0.1         | nd                  | nd                          | 25          | nd                            |
| 1,2-Dichloroethane                     | 0.1         | nd                  | nd                          | 25          | nd                            |
| 1,1,1-Trichloroethane                  | 0.1         | nd                  | nd                          | 25          | nd                            |
| Carbon Tetrachloride                   | 0.1         | nd                  | nd                          | 25          | nd                            |
| Benzene                                | 0.05        | nd                  | nd                          | 13          | nd                            |
| 1,2-Dichloropropane                    | 0.1         | nd                  | nd                          | 25          | nd                            |
| Trichloroethene                        | 0.1         | 0.3                 | 0.3                         | 25          | nd                            |
| Bromodichloromethane                   | 0.1         | nd                  | nd                          | 25          | nd                            |
| cis-1,3-Dichloropropene                | 0.1         | nd                  | nd                          | 25          | nd                            |
| Methyl Isobutyl Ketone (MIBK)          | 5.0         | nd                  | nd                          | 1250        | nd                            |
| trans-1,3-Dichloropropene              | 0.1         | nd                  | nd                          | 25          | nd                            |
| 1,1,2-Trichloroethane                  | 0.1         | nd                  | nd                          | 25          | nd                            |
| Toluene                                | 0.1         | nd                  | nd                          | 25          | nd                            |
| 2-Hexanone                             | 5.0         | nd                  | nd                          | 1250        | nd                            |
| Dibromochloromethane                   | 0.1         | nd                  | nd                          | 25          | nd                            |
| 1,2-Dibromoethane (Ethylene dibromide) | 0.1         | nd                  | nd                          | 25          | nd                            |
| Tetrachloroethene (Perchloroethylene)  | 0.1         | 6.2                 | 6.1                         | 25          | 1240                          |
| 1,1,1,2-Tetrachloroethane              | 0.1         | nd                  | nd                          | 25          | nd                            |
| Chlorobenzene                          | 0.1         | nd                  | nd                          | 25          | nd                            |
| Ethylbenzene                           | 0.1         | nd                  | nd                          | 25          | nd                            |
| m-Xylene & p-Xylene                    | 0.1         | nd                  | nd                          | 25          | nd                            |
| Bromoform                              | 0.1         | nd                  | nd                          | 25          | nd                            |
| Styrene                                | 0.1         | nd                  | nd                          | 25          | nd                            |
| 1,1,2,2-Tetrachloroethane              | 0.1         | nd                  | nd                          | 25          | nd                            |
| o-Xylene                               | 0.1         | nd                  | nd                          | 25          | nd                            |
| 1,3-Dichlorobenzene                    | 0.1         | nd                  | nd                          | 25          | nd                            |
| 1,4-Dichlorobenzene                    | 0.1         | nd                  | nd                          | 25          | nd                            |
| 1,2-Dichlorobenzene                    | 0.1         | nd                  | nd                          | 25          | nd                            |

Surrogate Standard Recoveries: Control Limits: 70-130%

|                      |      |      |      |
|----------------------|------|------|------|
| Dibromofluoromethane | 102% | 103% | 119% |
| Toluene-d8           | 105% | 102% | 106% |
| 4-Bromofluorobenzene | 94%  | 93%  | 97%  |

Client: Morrow Environmental Consultants Inc.  
Project Reference: W8140  
Work Order: G984527V  
Matrix: Soil

**VOLATILE ORGANIC COMPOUNDS**

Date: 27-Nov-98

Units: micrograms/gram (µg/g) dry weight

| Compound                               | LOQ<br>µg/g | BH98-35-<br>498117<br>DF=4 |
|----------------------------------------|-------------|----------------------------|
| Chloromethane                          | 4.0         | nd                         |
| Vinyl chloride                         | 2.0         | nd                         |
| Bromomethane                           | 4.0         | nd                         |
| Chloroethane                           | 4.0         | nd                         |
| Trichlorofluoromethane                 | 0.8         | nd                         |
| Acetone                                | 40.0        | nd                         |
| 1,1-Dichloroethene                     | 0.4         | 3.2                        |
| Dichloromethane (Methylene Chloride)   | 2.0         | nd                         |
| trans-1,2-Dichloroethene               | 0.4         | nd                         |
| Methyl-t-Butyl Ether                   | 0.4         | nd                         |
| 1,1-Dichloroethane                     | 0.4         | 1.1                        |
| Methyl Ethyl Ketone (MEK)              | 20.0        | nd                         |
| cis-1,2-Dichloroethene                 | 0.4         | 2.8                        |
| Chloroform                             | 0.4         | nd                         |
| 1,2-Dichloroethane                     | 0.4         | nd                         |
| 1,1,1-Trichloroethane                  | 0.4         | 1.2                        |
| Carbon Tetrachloride                   | 0.4         | nd                         |
| Benzene                                | 0.2         | nd                         |
| 1,2-Dichloropropane                    | 0.4         | nd                         |
| Trichloroethene                        | 0.4         | 51.1                       |
| Bromodichloromethane                   | 0.4         | nd                         |
| cis-1,3-Dichloropropene                | 0.4         | nd                         |
| Methyl Isobutyl Ketone (MIBK)          | 20.0        | nd                         |
| trans-1,3-Dichloropropene              | 0.4         | nd                         |
| 1,1,2-Trichloroethane                  | 0.4         | nd                         |
| Toluene                                | 0.4         | nd                         |
| 2-Hexanone                             | 20.0        | nd                         |
| Dibromochloromethane                   | 0.4         | nd                         |
| 1,2-Dibromoethane (Ethylene dibromide) | 0.4         | nd                         |
| Tetrachloroethene (Perchloroethylene)  | 0.4         | 3.4                        |
| 1,1,1,2-Tetrachloroethane              | 0.4         | nd                         |
| Chlorobenzene                          | 0.4         | nd                         |
| Ethylbenzene                           | 0.4         | nd                         |
| m-Xylene & p-Xylene                    | 0.4         | nd                         |
| Bromoform                              | 0.4         | nd                         |
| Styrene                                | 0.4         | nd                         |
| 1,1,2,2-Tetrachloroethane              | 0.4         | nd                         |
| o-Xylene                               | 0.4         | nd                         |
| 1,3-Dichlorobenzene                    | 0.4         | nd                         |
| 1,4-Dichlorobenzene                    | 0.4         | nd                         |
| 1,2-Dichlorobenzene                    | 0.4         | nd                         |

Surrogate Standard Recoveries: Control Limits: 70-130%

|                      |      |
|----------------------|------|
| Dibromofluoromethane | 110% |
| Toluene-d8           | 103% |
| 4-Bromofluorobenzene | 91%  |

Client: Morrow Environmental Consultants Inc.  
Project Reference: W8140  
Work Order: G984527V  
Matrix: Soil

**VOLATILE ORGANIC COMPOUNDS**

Date: 27-Nov-98

Units: micrograms/gram (µg/g) dry weight

| Compound                               | LOQ<br>µg/g | Method Blank |                |        | Spiked Method Blank |                |                |        |
|----------------------------------------|-------------|--------------|----------------|--------|---------------------|----------------|----------------|--------|
|                                        |             | Result       | Upper<br>Limit | Accept | %<br>Recovery       | Lower<br>Limit | Upper<br>Limit | Accept |
| Chloromethane                          | 1.0         | nd           | 1.0            | yes    | 107                 | 70             | 130            | yes    |
| Vinyl chloride                         | 0.5         | nd           | 0.5            | yes    | 90                  | 70             | 130            | yes    |
| Bromomethane                           | 1.0         | nd           | 1.0            | yes    | 104                 | 70             | 130            | yes    |
| Chloroethane                           | 1.0         | nd           | 1.0            | yes    | 106                 | 70             | 130            | yes    |
| Trichlorofluoromethane                 | 0.2         | nd           | 0.2            | yes    | 109                 | 70             | 130            | yes    |
| Acetone                                | 10.0        | nd           | 10.0           | yes    | 111                 | 60             | 140            | yes    |
| 1,1-Dichloroethene                     | 0.1         | nd           | 0.1            | yes    | 105                 | 70             | 130            | yes    |
| Dichloromethane (Methylene Chloride)   | 0.5         | nd           | 0.5            | yes    | 107                 | 70             | 130            | yes    |
| trans-1,2-Dichloroethene               | 0.1         | nd           | 0.1            | yes    | 101                 | 70             | 130            | yes    |
| Methyl-t-Butyl Ether                   | 0.1         | nd           | 0.1            | yes    | 94                  | 70             | 130            | yes    |
| 1,1-Dichloroethane                     | 0.1         | nd           | 0.1            | yes    | 104                 | 70             | 130            | yes    |
| Methyl Ethyl Ketone (MEK)              | 5.0         | nd           | 5.0            | yes    | 106                 | 60             | 140            | yes    |
| cis-1,2-Dichloroethene                 | 0.1         | nd           | 0.1            | yes    | 104                 | 70             | 130            | yes    |
| Chloroform                             | 0.1         | nd           | 0.1            | yes    | 110                 | 70             | 130            | yes    |
| 1,2-Dichloroethane                     | 0.1         | nd           | 0.1            | yes    | 105                 | 70             | 130            | yes    |
| 1,1,1-Trichloroethane                  | 0.1         | nd           | 0.1            | yes    | 109                 | 70             | 130            | yes    |
| Carbon Tetrachloride                   | 0.1         | nd           | 0.1            | yes    | 108                 | 70             | 130            | yes    |
| Benzene                                | 0.05        | nd           | 0.05           | yes    | 103                 | 70             | 130            | yes    |
| 1,2-Dichloropropane                    | 0.1         | nd           | 0.1            | yes    | 108                 | 70             | 130            | yes    |
| Trichloroethene                        | 0.1         | nd           | 0.1            | yes    | 106                 | 70             | 130            | yes    |
| Bromodichloromethane                   | 0.1         | nd           | 0.1            | yes    | 109                 | 70             | 130            | yes    |
| cis-1,3-Dichloropropene                | 0.1         | nd           | 0.1            | yes    | 108                 | 70             | 130            | yes    |
| Methyl Isobutyl Ketone (MIBK)          | 5.0         | nd           | 5.0            | yes    | 106                 | 60             | 140            | yes    |
| trans-1,3-Dichloropropene              | 0.1         | nd           | 0.1            | yes    | 103                 | 70             | 130            | yes    |
| 1,1,2-Trichloroethane                  | 0.1         | nd           | 0.1            | yes    | 110                 | 70             | 130            | yes    |
| Toluene                                | 0.1         | nd           | 0.1            | yes    | 111                 | 70             | 130            | yes    |
| 2-Hexanone                             | 5.0         | nd           | 5.0            | yes    | 117                 | 60             | 140            | yes    |
| Dibromochloromethane                   | 0.1         | nd           | 0.1            | yes    | 111                 | 70             | 130            | yes    |
| 1,2-Dibromoethane (Ethylene dibromide) | 0.1         | nd           | 0.1            | yes    | 114                 | 70             | 130            | yes    |
| Tetrachloroethene (Perchloroethylene)  | 0.1         | nd           | 0.1            | yes    | 113                 | 70             | 130            | yes    |
| 1,1,1,2-Tetrachloroethane              | 0.1         | nd           | 0.1            | yes    | 116                 | 70             | 130            | yes    |
| Chlorobenzene                          | 0.1         | nd           | 0.1            | yes    | 112                 | 70             | 130            | yes    |
| Ethylbenzene                           | 0.1         | nd           | 0.1            | yes    | 108                 | 70             | 130            | yes    |
| m-Xylene & p-Xylene                    | 0.1         | nd           | 0.1            | yes    | 109                 | 70             | 130            | yes    |
| Bromoform                              | 0.1         | nd           | 0.1            | yes    | 111                 | 70             | 130            | yes    |
| Styrene                                | 0.1         | nd           | 0.1            | yes    | 112                 | 70             | 130            | yes    |
| 1,1,2,2-Tetrachloroethane              | 0.1         | nd           | 0.1            | yes    | 118                 | 70             | 130            | yes    |
| o-Xylene                               | 0.1         | nd           | 0.1            | yes    | 110                 | 70             | 130            | yes    |
| 1,3-Dichlorobenzene                    | 0.1         | nd           | 0.1            | yes    | 109                 | 70             | 130            | yes    |
| 1,4-Dichlorobenzene                    | 0.1         | nd           | 0.1            | yes    | 107                 | 70             | 130            | yes    |
| 1,2-Dichlorobenzene                    | 0.1         | nd           | 0.1            | yes    | 113                 | 70             | 130            | yes    |

Surrogate Standard Recoveries: Control Limits: 70-130%

|                      |      |     |    |     |     |
|----------------------|------|-----|----|-----|-----|
| Dibromofluoromethane | 99%  | 97  | 70 | 130 | yes |
| Toluene-d8           | 98%  | 100 | 70 | 130 | yes |
| 4-Bromofluorobenzene | 100% | 96  | 70 | 130 | yes |



Client: Morrow Environmental Consultants Inc.

Project Reference: W8140

Work Order: G984527V

Matrix: Soil

**VOLATILE ORGANIC COMPOUNDS**

Date: 27-Nov-98

Units: micrograms/gram (µg/g) dry weight

| Compound                               | LOQ<br>µg/g | BH98-35-<br>2981117 |
|----------------------------------------|-------------|---------------------|
| Chloromethane                          | 0.005       | nd                  |
| Vinyl chloride                         | 0.003       | nd                  |
| Bromomethane                           | 0.005       | nd                  |
| Chloroethane                           | 0.005       | nd                  |
| Trichlorofluoromethane                 | 0.005       | nd                  |
| Acetone                                | 0.050       | nd                  |
| 1,1-Dichloroethene                     | 0.002       | 0.042               |
| Dichloromethane (Methylene Chloride)   | 0.010       | nd                  |
| trans-1,2-Dichloroethene               | 0.002       | nd                  |
| Methyl-t-Butyl Ether                   | 0.002       | nd                  |
| 1,1-Dichloroethane                     | 0.002       | 0.006               |
| Methyl Ethyl Ketone (MEK)              | 0.025       | nd                  |
| cis-1,2-Dichloroethene                 | 0.002       | 0.065               |
| Chloroform                             | 0.002       | nd                  |
| 1,2-Dichloroethane                     | 0.002       | nd                  |
| 1,1,1-Trichloroethane                  | 0.002       | 0.026               |
| Carbon Tetrachloride                   | 0.002       | nd                  |
| Benzene                                | 0.002       | nd                  |
| 1,2-Dichloropropane                    | 0.002       | nd                  |
| Trichloroethene                        | 0.002       | **0.4               |
| Bromodichloromethane                   | 0.002       | nd                  |
| cis-1,3-Dichloropropene                | 0.002       | nd                  |
| Methyl Isobutyl Ketone (MIBK)          | 0.025       | nd                  |
| trans-1,3-Dichloropropene              | 0.002       | nd                  |
| 1,1,2-Trichloroethane                  | 0.002       | nd                  |
| Toluene                                | 0.002       | nd                  |
| 2-Hexanone                             | 0.025       | nd                  |
| Dibromochloromethane                   | 0.002       | nd                  |
| 1,2-Dibromoethane (Ethylene dibromide) | 0.002       | nd                  |
| Tetrachloroethene (Perchloroethylene)  | 0.002       | **0.2               |
| 1,1,1,2-Tetrachloroethane              | 0.002       | nd                  |
| Chlorobenzene                          | 0.002       | nd                  |
| Ethylbenzene                           | 0.002       | nd                  |
| m-Xylene & p-Xylene                    | 0.002       | nd                  |
| Bromoform                              | 0.002       | nd                  |
| Styrene                                | 0.002       | nd                  |
| 1,1,2,2-Tetrachloroethane              | 0.002       | nd                  |
| o-Xylene                               | 0.002       | nd                  |
| 1,3-Dichlorobenzene                    | 0.002       | nd                  |
| 1,4-Dichlorobenzene                    | 0.002       | nd                  |
| 1,2-Dichlorobenzene                    | 0.002       | nd                  |

Surrogate Standard Recoveries: Control Limits: 70-130%

|                      |      |
|----------------------|------|
| Dibromofluoromethane | 106% |
| Toluene-d8           | 102% |
| 4-Bromofluorobenzene | 97%  |



Client: Morrow Environmental Consultants Inc.  
Project Reference: W8140  
Work Order: G984527V  
Matrix: Soil

# VOLATILE ORGANIC COMPOUNDS

Date: 27-Nov-98

Units: micrograms/gram (µg/g) dry weight

| Compound                               | LOQ<br>µg/g | Method Blank |                |        | Spiked Method Blank |                |                |        |
|----------------------------------------|-------------|--------------|----------------|--------|---------------------|----------------|----------------|--------|
|                                        |             | Result       | Upper<br>Limit | Accept | %<br>Recovery       | Lower<br>Limit | Upper<br>Limit | Accept |
| Chloromethane                          | 0.005       | nd           | 0.005          | yes    | 114                 | 70             | 130            | yes    |
| Vinyl chloride                         | 0.003       | nd           | 0.003          | yes    | 127                 | 70             | 130            | yes    |
| Bromomethane                           | 0.005       | nd           | 0.005          | yes    | 98                  | 70             | 130            | yes    |
| Chloroethane                           | 0.005       | nd           | 0.005          | yes    | 107                 | 70             | 130            | yes    |
| Trichlorofluoromethane                 | 0.005       | nd           | 0.005          | yes    | 97                  | 70             | 130            | yes    |
| Acetone                                | 0.050       | nd           | 0.050          | yes    | 88                  | 60             | 140            | yes    |
| 1,1-Dichloroethene                     | 0.002       | nd           | 0.002          | yes    | 94                  | 70             | 130            | yes    |
| Dichloromethane (Methylene Chloride)   | 0.010       | nd           | 0.010          | yes    | 92                  | 70             | 130            | yes    |
| trans-1,2-Dichloroethene               | 0.002       | nd           | 0.002          | yes    | 97                  | 70             | 130            | yes    |
| Methyl-t-Butyl Ether                   | 0.002       | nd           | 0.002          | yes    | 101                 | 70             | 130            | yes    |
| 1,1-Dichloroethane                     | 0.002       | nd           | 0.002          | yes    | 97                  | 70             | 130            | yes    |
| Methyl Ethyl Ketone (MEK)              | 0.025       | nd           | 0.025          | yes    | 93                  | 60             | 140            | yes    |
| cis-1,2-Dichloroethene                 | 0.002       | nd           | 0.002          | yes    | 101                 | 70             | 130            | yes    |
| Chloroform                             | 0.002       | nd           | 0.002          | yes    | 99                  | 70             | 130            | yes    |
| 1,2-Dichloroethane                     | 0.002       | nd           | 0.002          | yes    | 101                 | 70             | 130            | yes    |
| 1,1,1-Trichloroethane                  | 0.002       | nd           | 0.002          | yes    | 101                 | 70             | 130            | yes    |
| Carbon Tetrachloride                   | 0.002       | nd           | 0.002          | yes    | 99                  | 70             | 130            | yes    |
| Benzene                                | 0.002       | nd           | 0.002          | yes    | 98                  | 70             | 130            | yes    |
| 1,2-Dichloropropane                    | 0.002       | nd           | 0.002          | yes    | 102                 | 70             | 130            | yes    |
| Trichloroethene                        | 0.002       | nd           | 0.002          | yes    | 90                  | 70             | 130            | yes    |
| Bromodichloromethane                   | 0.002       | nd           | 0.002          | yes    | 101                 | 70             | 130            | yes    |
| cis-1,3-Dichloropropene                | 0.002       | nd           | 0.002          | yes    | 106                 | 70             | 130            | yes    |
| Methyl Isobutyl Ketone (MIBK)          | 0.025       | nd           | 0.025          | yes    | 100                 | 60             | 140            | yes    |
| trans-1,3-Dichloropropene              | 0.002       | nd           | 0.002          | yes    | 100                 | 70             | 130            | yes    |
| 1,1,2-Trichloroethane                  | 0.002       | nd           | 0.002          | yes    | 103                 | 70             | 130            | yes    |
| Toluene                                | 0.002       | nd           | 0.002          | yes    | 106                 | 70             | 130            | yes    |
| 2-Hexanone                             | 0.025       | nd           | 0.025          | yes    | 97                  | 60             | 140            | yes    |
| Dibromochloromethane                   | 0.002       | nd           | 0.002          | yes    | 104                 | 70             | 130            | yes    |
| 1,2-Dibromoethane (Ethylene dibromide) | 0.002       | nd           | 0.002          | yes    | 101                 | 70             | 130            | yes    |
| Tetrachloroethene (Perchloroethylene)  | 0.002       | nd           | 0.002          | yes    | 100                 | 70             | 130            | yes    |
| 1,1,1,2-Tetrachloroethane              | 0.002       | nd           | 0.002          | yes    | 102                 | 70             | 130            | yes    |
| Chlorobenzene                          | 0.002       | nd           | 0.002          | yes    | 104                 | 70             | 130            | yes    |
| Ethylbenzene                           | 0.002       | nd           | 0.002          | yes    | 105                 | 70             | 130            | yes    |
| m-Xylene & p-Xylene                    | 0.002       | nd           | 0.002          | yes    | 110                 | 70             | 130            | yes    |
| Bromoform                              | 0.002       | nd           | 0.002          | yes    | 103                 | 70             | 130            | yes    |
| Styrene                                | 0.002       | nd           | 0.002          | yes    | 108                 | 70             | 130            | yes    |
| 1,1,2,2-Tetrachloroethane              | 0.002       | nd           | 0.002          | yes    | 111                 | 70             | 130            | yes    |
| o-Xylene                               | 0.002       | nd           | 0.002          | yes    | 108                 | 70             | 130            | yes    |
| 1,3-Dichlorobenzene                    | 0.002       | nd           | 0.002          | yes    | 113                 | 70             | 130            | yes    |
| 1,4-Dichlorobenzene                    | 0.002       | nd           | 0.002          | yes    | 112                 | 70             | 130            | yes    |
| 1,2-Dichlorobenzene                    | 0.002       | nd           | 0.002          | yes    | 113                 | 70             | 130            | yes    |

## Surrogate Standard Recoveries:

|                      |      |     |     |    |     |     |
|----------------------|------|-----|-----|----|-----|-----|
| Dibromofluoromethane | 104% | yes | 102 | 70 | 130 | yes |
| Toluene-d8           | 107% | yes | 102 | 70 | 130 | yes |
| 4-Bromofluorobenzene | 95%  | yes | 104 | 70 | 130 | yes |



Client: Morrow Environmental Consultants Inc.

**VOLATILE ORGANIC COMPOUNDS**

Date: 27-Nov-98

Project Reference: W8140

Work Order: G984527V

Matrix: Soil

Legend: LOQ = Limit of Quantitation  
 nd = Not Detected Above LOQ  
 Dup. = Duplicate  
 DF = Dilution Factor  
 \*\* = Data obtained from medium level purge & trap

Date of sample receipt: November 18, 1998

Date of sample analysis: November 26, 1998

## Analytical Method:

The soil sample BH98-35-2981117 was analysed by low level purge & trap (US EPA Method 5035) gas chromatography/ mass spectrometry using US EPA Method 8260B (modified).

Due to a level of target compounds beyond the appropriate range, the rest of the samples could not be analysed by the low level direct purge method. The samples were analysed by medium level purge & trap (US EPA Method 5035) gas chromatography/mass spectrometry using US EPA Method 8260B (modified).

## Report Discussion:

Since some target compounds present were at a level above the calibration range of the instrument, some of the samples were run at a dilution factor to avoid exceeding the calibration range and causing excessive contamination of the purge & trap equipment. The quantitation limits for these samples are higher than the LOQ's for undiluted samples as indicated above. The amounts reported have been corrected for the dilution factors that were used.

*NOTE: All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analysis done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangement.*

## Job Approved By:

.....  
 Monica Lupescu, B.Sc.  
 Chemist

RECEIVED

DEC 08 1998

MORROW ENVIRONMENTAL  
CONSULTANTS INC.  
WINNIPEG

Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: November 19/98  
Date Reported: November 26/98  
Lab Ref#: G984565  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084/WSTN YD  
Client Ref#: W8140  
Sampled By: JDT/RDR

### Certificate of Analysis

Analysis Performed: Extractable Hydrocarbons(Manitoba Guidelines), C11-C32  
BTEx and Total Volatile Hydrocarbons(Manitoba Criteria)

Methodology: 1) The characterization of HydroCarbon in soil by GC  
analysis, following a solvent extraction.  
U.S. EPA Method No.8011(microextraction)  
2) Analysis of Benzene, Toluene, Ethylbenzene, Xylenes &  
Volatile Hydrocarbons by Static Headspace Capillary GC-P  
ID/FID. External std quantitation with Surrogate stds.  
U.S. EPA Method No. 3810(Modification)

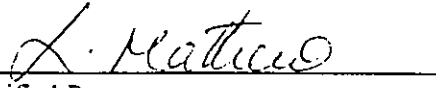
Instrumentation: 1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S  
2) Varian 3400 GC PID/FID, Genesis Headspace Analyzer

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

  
Certified By  
Elaine Grant  
Service Manager

  
Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager



All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

# Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Date Reported: November 26/98  
Lab Ref # : G984565  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084/WSTN YD  
Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | SAMPLE ID<br>(spike) | LOQ  | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|------------------------------------------|----------------------|------|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|                                          |                      |      |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Total SemiVolatile Hydrocarbons(C11-C32) | na                   | 10.0 | mg/kg | nd            | 20.0           | yes    | 104                | 70             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Benzene                                  | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 84                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Ethylbenzene                             | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 90                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Toluene                                  | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 88                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Total Volatile Hydrocarbons              | na                   | 10   | mg/kg | nd            | 10             | yes    | 101                | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Xylenes(Total)                           | na                   | 0.04 | mg/kg | nd            | 0.08           | yes    | 87                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |

LOQ = Limit of Quantitation = lowest level of the parameter that can be quantified with confidence

\* = Unavailable due to dilution required for analysis

na = Not Applicable

ns = Insufficient Sample Submitted

nd = parameter not detected

TR = trace level less than LOQ

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Report Date: November 26/98  
Lab Ref # : G984565  
Lab Quote #: 96-W238-VG  
Client PO#: EE98084/WSTN YD  
Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter<br>Date Sampled >              | LOQ  | Units | SP1<br>@981118<br>98/11/18 | TP98-1-2<br>@981118<br>98/11/18 | TP98-1-5<br>@981118<br>98/11/18 | TP98-11-3<br>@981118<br>98/11/18 | TP98-2-1<br>@981118<br>98/11/18 |
|------------------------------------------|------|-------|----------------------------|---------------------------------|---------------------------------|----------------------------------|---------------------------------|
| Resemblance                              | na   | na    | PWDMO                      | WDS                             | WDS                             | na                               | WDMO                            |
| Total SemiVolatile Hydrocarbons(C11-C32) | 10.0 | mg/kg | 8440                       | 3550                            | 3020                            | nd                               | 14900                           |
| Benzene                                  | 0.02 | mg/kg | nd                         | nd                              | nd                              | nd                               | nd                              |
| Ethylbenzene                             | 0.02 | mg/kg | 0.55                       | 0.26                            | 0.24                            | nd                               | nd                              |
| Toluene                                  | 0.02 | mg/kg | nd                         | 0.07                            | 0.06                            | nd                               | nd                              |
| Total Volatile Hydrocarbons              | 10   | mg/kg | 108                        | 82                              | 61                              | nd                               | nd                              |
| Xylenes(Total)                           | 0.04 | mg/kg | 1.53                       | 1.06                            | 0.61                            | nd                               | nd                              |

LOQ Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.

na Not Applicable

nd parameter not detected ! = LOQ higher than listed due to dilution ( ) Adjusted LOQ

PWDMO Predominately weathered diesel with some motor oil.

WDMO Weathered Diesel and Motor Oil.

WDS Weathered Diesel

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.

Contact: Alex Man

Report Date: November 26/98

Lab Ref # : G984565

Lab Quote #: 96-W238-VG

Client PO#: EE98084/WSTN YD

Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | LOQ  | Units | TP98-2-1<br>@981118<br>Replicate | TP98-4-2<br>@981118<br>98/11/18 | TP98-4-3<br>@981118<br>98/11/18 | TP98-5-1<br>@981118<br>98/11/18 | TP98-6-3<br>@981118<br>98/11/18 |
|------------------------------------------|------|-------|----------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| Resemblance                              | na   | na    | WDMO                             | EMO?                            | na                              | WDMO                            | na                              |
| Total SemiVolatile Hydrocarbons(C11-C32) | 10.0 | mg/kg | 15100                            | 117                             | nd                              | 650                             | nd                              |
| Benzene                                  | 0.02 | mg/kg | nd                               | nd                              | nd                              | nd                              | nd                              |
| Ethylbenzene                             | 0.02 | mg/kg | nd                               | nd                              | nd                              | nd                              | nd                              |
| Toluene                                  | 0.02 | mg/kg | nd                               | nd                              | nd                              | nd                              | nd                              |
| Total Volatile Hydrocarbons              | 10   | mg/kg | nd                               | nd                              | nd                              | nd                              | nd                              |
| Xylenes(Total)                           | 0.04 | mg/kg | nd                               | nd                              | nd                              | nd                              | nd                              |

LOQ Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.

EMO? Contaminant elutes in the motor oil range but does not match reference standard.

na Not Applicable

nd parameter not detected ! = LOQ higher than listed due to dilution ( ) Adjusted LOQ

WDMO Weathered Diesel and Motor Oil.

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.

Contact: Alex Man

Report Date: November 26/98

Lab Ref # : G984565

Lab Quote #: 96-W238-VG

Client PO#: EE98084/WSTN YD

Client Ref#: W8140

Analysis of Soil, expressed on a dry weight basis

| Parameter<br>Date Sampled >              | LOQ  | Units | TP98-7-1<br>@981118<br>98/11/18 | TP98-8-4<br>@981118<br>98/11/18 |  |  |  |
|------------------------------------------|------|-------|---------------------------------|---------------------------------|--|--|--|
| Resemblance                              | na   | na    | WDMO                            | EMO?                            |  |  |  |
| Total SemiVolatile Hydrocarbons(C11-C32) | 10.0 | mg/kg | 4920                            | 213                             |  |  |  |
| Benzene                                  | 0.02 | mg/kg | nd                              | nd                              |  |  |  |
| Ethylbenzene                             | 0.02 | mg/kg | 0.13                            | nd                              |  |  |  |
| Toluene                                  | 0.02 | mg/kg | nd                              | nd                              |  |  |  |
| Total Volatile Hydrocarbons              | 10   | mg/kg | 41                              | nd                              |  |  |  |
| Xylenes(Total)                           | 0.04 | mg/kg | 0.57                            | nd                              |  |  |  |

LOQ Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.

EMO? Contaminant elutes in the motor oil range but does not match reference standard.

na Not Applicable

nd parameter not detected ! = LOQ higher than listed due to dilution ( ) Adjusted LOQ

WDMO Weathered Diesel and Motor Oil.



RECEIVED  
DEC 24 1998

Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

MORROW ENVIRONMENTAL  
CONSULTANTS INC.  
WINNIPEG

Fax: 204-477-9194

Attn: J. Derek Trinke

Date Received: December 10/98  
Date Reported: December 17/98  
Lab Ref#: G984936  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084WestonYd  
Client Ref#: W8140  
Sampled By: JDT

### Certificate of Analysis

Analysis Performed: HydroCarbon Characterization, FID

Methodology: 1) HydroCarbon characterization is done by GC analysis,  
following a solvent extraction.  
U.S. EPA Method No.8011(microextraction)

Instrumentation: 1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S

Sample Description: Oil/Gasoline/Fuel

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

Certified By  
Elaine Grant  
Service Manager

Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

## Report of Analysis

Report Date: December 17/98  
Lab Ref # : G984936  
Lab Quote #: 96-W238-VG  
Client PO#: EE98084WestonYd  
Client Ref#: W8140

Client Ref#: W8140

| Parameter                               | Date Sampled > | LOQ | Units | MW98-10-LPH-981203<br>98/12/03 | MW98-10-LPH-981203<br>Replicate | MW98-13-LPH-981203<br>98/12/03 |  |  |
|-----------------------------------------|----------------|-----|-------|--------------------------------|---------------------------------|--------------------------------|--|--|
| Resemblance                             |                | na  | na    | ED?                            | -                               | ED?                            |  |  |
| Total Extractable Hydrocarbons(C07-C10) |                | na  | %     | 5.08                           | -                               | 3.61                           |  |  |
| Total Extractable Hydrocarbons(C11-C20) |                | na  | %     | 89.1                           | -                               | 88.0                           |  |  |
| Total Extractable Hydrocarbons(C20-C32) |                | na  | %     | 5.78                           | -                               | 8.38                           |  |  |

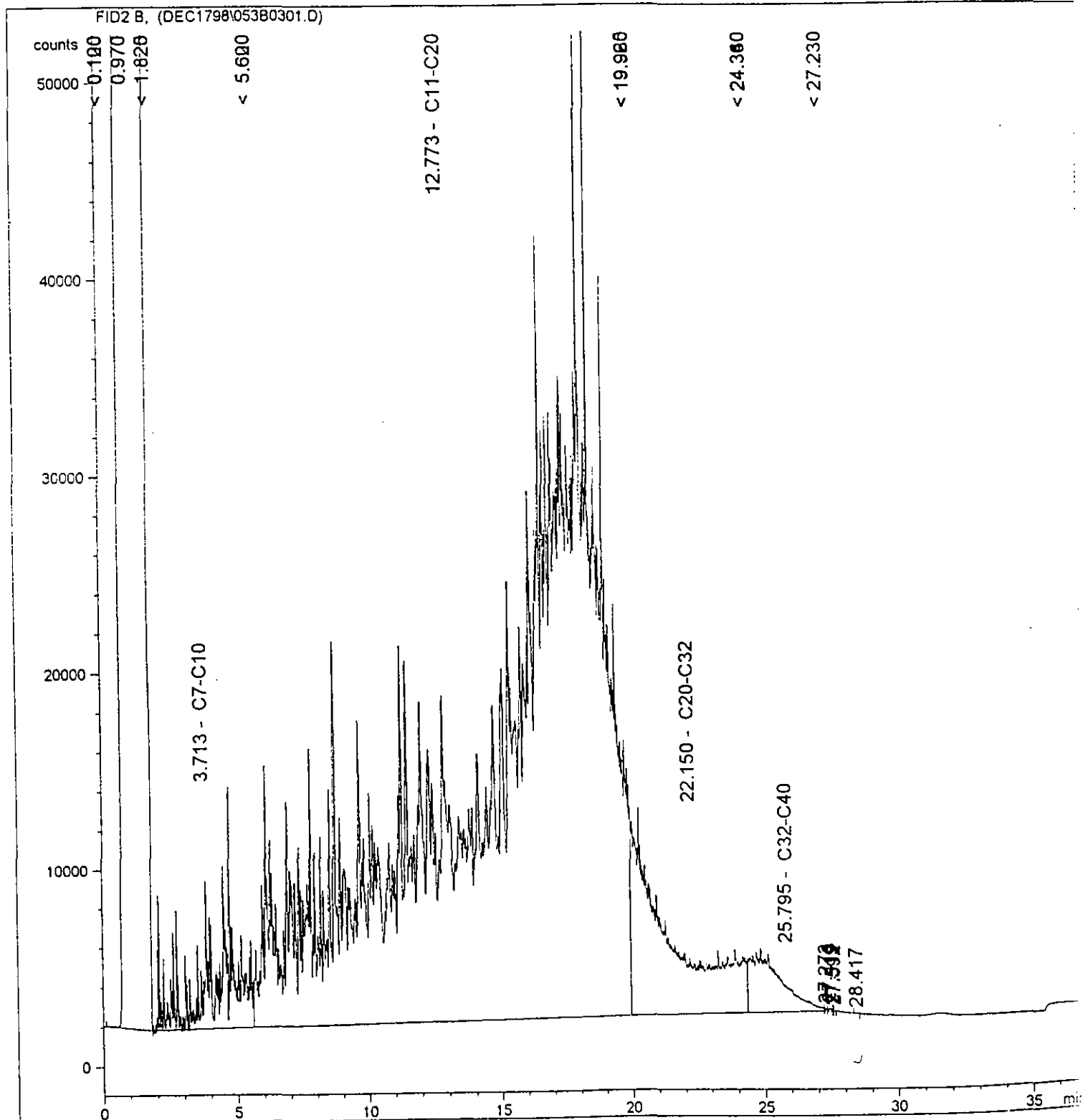
|     |                                                                                               |
|-----|-----------------------------------------------------------------------------------------------|
| LOQ | Limit of Quantitation = lowest level of the parameter that can be quantified with confidence. |
| -   | Not Requested                                                                                 |
| ED? | Contaminant elutes in the diesel range but does not match reference standard.                 |
| na  | Not Applicable                                                                                |

=====

|                |                       |            |        |
|----------------|-----------------------|------------|--------|
| Injection Date | : 12/17/98 4:19:18 PM | Seq. Line  | : 3    |
| Sample Name    | : 4936-2              | Vial       | : 53   |
| Acq. Operator  | : D. MCLEOD           | Inj        | : 1    |
|                |                       | Inj Volume | : 1 µl |

Acq. Method : C:\HPCHEM\2\METHODS\4TPHIFA.M  
Last changed : 12/16/98 1:46:56 PM by D. MCLEOD  
Analysis Method : C:\HPCHEM\2\METHODS\4HCCR.M  
Last changed : 12/17/98 5:13:41 PM by D. MCLEOD  
(modified after loading)

4TPHIR METHOD FOR REAR CHANNEL ON FID IV-15M,DB1-HT



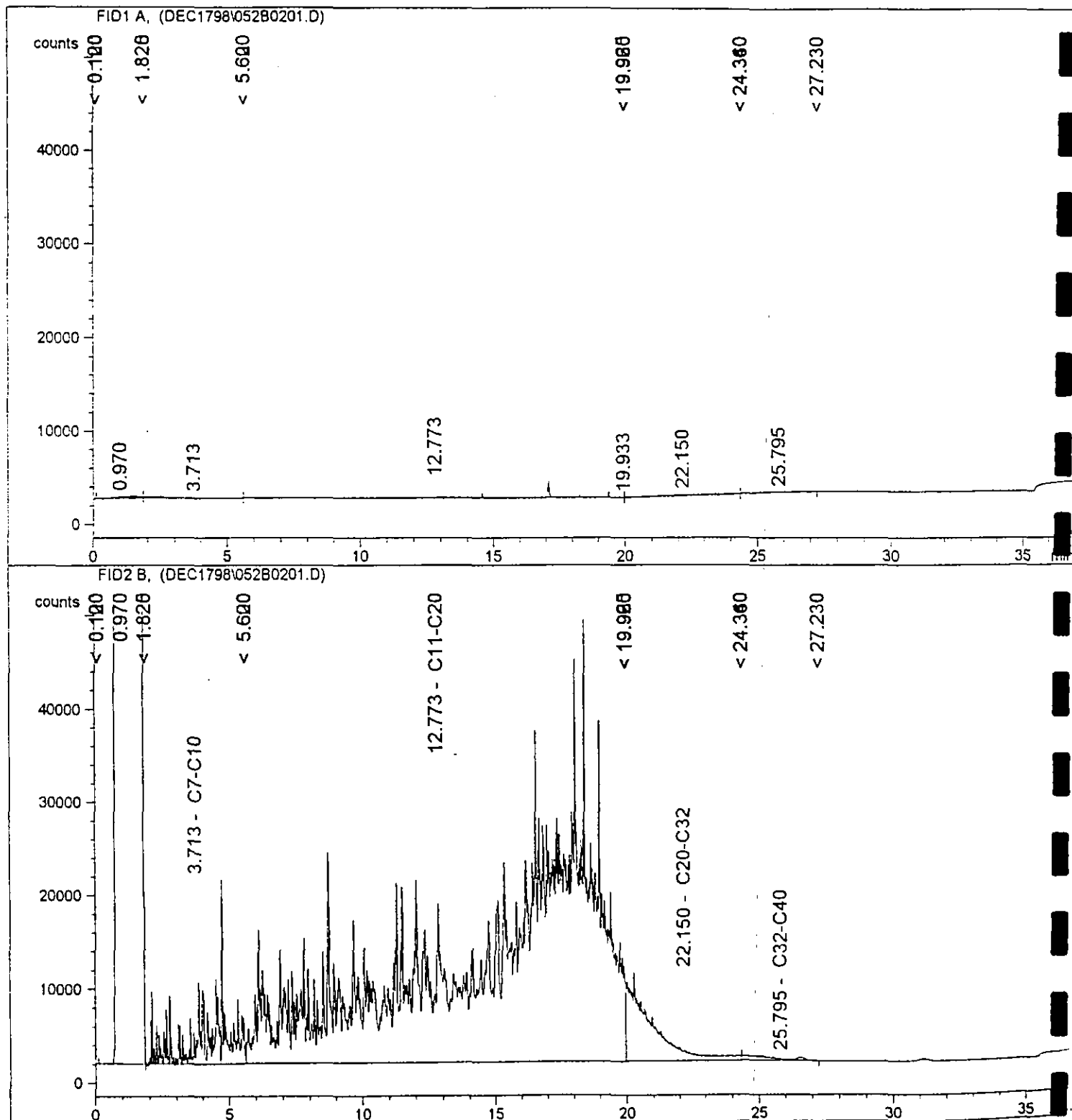
=====

|                |                       |            |             |
|----------------|-----------------------|------------|-------------|
| Injection Date | : 12/17/98 3:32:02 PM | Seq. Line  | : 2         |
| Sample Name    | : 4936-1              | Vial       | : 52        |
| Acq. Operator  | : D. MCLEOD           | Inj        | : 1         |
|                |                       | Inj Volume | : 1 $\mu$ l |

Acq. Method : C:\HPCHEM\2\METHODS\4TPHIFA.M  
Last changed : 12/16/98 1:46:56 PM by D. MCLEOD  
Analysis Method : C:\HPCHEM\2\METHODS\4HCCR.M  
Last changed : 12/17/98 5:16:12 PM by D. MCLEOD  
(modified after loading)

4TPHIR METHOD FOR REAR CHANNEL ON FID IV-15M,DB1-HT

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Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: J. Derek Trinke

Date Received: December 16/98  
Date Reported: December 23/98  
Lab Ref#: G985040  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084WestonYd  
Client Ref#: W8140  
Sampled By: JDT

### Certificate of Analysis

Analysis Performed: Extractable Hydrocarbons(Manitoba Guidelines), C11-C32  
BTEX and Total Volatile Hydrocarbons(Manitoba Criteria)  
Total Purgeable Hydrocarbons

Methodology:

- 1) The characterization of HydroCarbon in water by GC analysis, following a solvent extraction.  
U.S. EPA Method No.8011(microextraction)
- 2) Analysis of Benzene, Toluene, Ethylbenzene, Xylenes & volatile Hydrocarbons by Static Headspace capillary GC-PID/FID. External std quantitation with surrogate stds.  
U.S. EPA Method No. 3810(Modification)
- 3) Analysis of total purgeables in water by Purge & Trap capillary GC/MS.  
U.S. EPA Method No. 5030

Instrumentation:

- 1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S
- 2) Varian 3400 GC PID/FID, Genesis Headspace Analyzer
- 3) Purge & Trap-GC/MS

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.



Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: J. Derek Trinke

Date Received: December 16/98  
Date Reported: December 23/98  
Lab Ref#: G985040  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084WestonYd  
Client Ref#: W8140  
Sampled By: JDT

### Certificate of Analysis

Sample Description: Water

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

Certified By  
Nick Boulton  
Service Manager

Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer-Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

# Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.  
Contact: J. Derek Trinke

Date Reported: December 23/98  
Lab Ref # : G985040  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084WestonYd  
Client Ref#: W8140

Analysis of Water

| Parameter                                | SAMPLE ID<br>(spike) | LOQ    | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|------------------------------------------|----------------------|--------|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|                                          |                      |        |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Total SemiVolatile Hydrocarbons(C11-C32) | na                   | 0.100  | mg/L  | nd            | 0.200          | yes    | 114                | 70             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Total SemiVolatile Hydrocarbons(C11-C32) | na                   | 0.100  | mg/L  | nd            | 0.200          | yes    | 114                | 70             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Benzene                                  | na                   | 0.0002 | mg/L  | nd            | 0.0004         | yes    | 94                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Ethylbenzene                             | na                   | 0.0002 | mg/L  | nd            | 0.0004         | yes    | 106                | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Toluene                                  | na                   | 0.0002 | mg/L  | nd            | 0.0004         | yes    | 102                | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Total Volatile Hydrocarbons              | na                   | 0.100  | mg/L  | nd            | 0.200          | yes    | 86                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Xylenes(Total)                           | na                   | 0.0004 | mg/L  | nd            | 0.0008         | yes    | 103                | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Total Purgeable Hydrocarbons             | na                   | 100.0  | ug/L  | nd            | 200.0          | yes    | na                 | na             | na             | na     | na           | na     | na             | na             | na     | yes                         |

LOQ = Limit of Quantitation = lowest level of the parameter that can be quantified with confidence

\* = Unavailable due to dilution required for analysis

na = Not Applicable

ns = Insufficient Sample Submitted

nd = parameter not detected

TR = trace level less than LOQ

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
 Contact: J. Derek Trinke

Report Date: December 23/98  
 Lab Ref # : G985040  
 Lab Quote #: 96-W238-VG  
 Client PO#: EE98084WestonYd  
 Client Ref#: W8140

## Analysis of Water

| Parameter                                | LOQ    | Units | MW98-11-<br>981215<br>98/12/15 | MW98-14-<br>981215<br>98/12/15 | MW98-17-<br>981215<br>98/12/15 | MW98-19-<br>981215<br>98/12/15 | MW98-2 -<br>981215<br>98/12/15 |
|------------------------------------------|--------|-------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Date Sampled >                           |        |       |                                |                                |                                |                                |                                |
| Resemblance                              | na     | na    | na                             | na                             | na                             | na                             | EGD?                           |
| Total SemiVolatile Hydrocarbons(C11-C32) | 0.100  | mg/L  | nd                             | nd                             | nd                             | nd                             | 2.05                           |
| Benzene                                  | 0.0002 | mg/L  | nd                             | 0.0003                         | nd                             | nd                             | 0.0435                         |
| Ethylbenzene                             | 0.0002 | mg/L  | nd                             | 0.0003                         | nd                             | nd                             | 0.0766                         |
| Toluene                                  | 0.0002 | mg/L  | nd                             | nd                             | nd                             | nd                             | 0.0817                         |
| Total Volatile Hydrocarbons              | 0.100  | mg/L  | nd                             | nd                             | nd                             | nd                             | 3.25                           |
| Xylenes(Total)                           | 0.0004 | mg/L  | nd                             | 0.0013                         | nd                             | nd                             | 0.4690                         |
| Total Purgeable Hydrocarbons             | 100.0  | ug/L  | -                              | -                              | -                              | -                              | -                              |

LOQ Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.

- Not Requested

EGD? Contaminant elutes in the gasoline/diesel range but does not match our reference standards.

na Not Applicable

nd parameter not detected ! = LOQ higher than listed due to dilution ( ) Adjusted LOQ

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
 Contact: J. Derek Trinke

Report Date: December 23/98  
 Lab Ref # : G985040  
 Lab Quote #: 96-W238-VG  
 Client PO#: EE98084WestonYd  
 Client Ref#: W8140

## Analysis of Water

| Parameter<br>Date Sampled >              | LOQ    | Units | MW98-22-<br>981215<br>98/12/15 | MW98-24-<br>981215<br>98/12/15 | MW98-24-<br>981215<br>Replicate | MW98-25-<br>981215<br>98/12/15 | MW98-26-<br>981215<br>98/12/15 |
|------------------------------------------|--------|-------|--------------------------------|--------------------------------|---------------------------------|--------------------------------|--------------------------------|
| Resemblance                              | na     | na    | na                             | WDMO                           | -                               | na                             | na                             |
| Total SemiVolatile Hydrocarbons(C11-C32) | 0.100  | mg/L  | nd                             | 2.37                           | -                               | nd                             | nd                             |
| Benzene                                  | 0.0002 | mg/L  | nd                             | nd                             | nd                              | -                              | -                              |
| Ethylbenzene                             | 0.0002 | mg/L  | nd                             | nd                             | nd                              | -                              | -                              |
| Toluene                                  | 0.0002 | mg/L  | nd                             | nd                             | nd                              | -                              | -                              |
| Total Volatile Hydrocarbons              | 0.100  | mg/L  | nd                             | nd                             | nd                              | -                              | -                              |
| Xylenes(Total)                           | 0.0004 | mg/L  | nd                             | nd                             | nd                              | -                              | -                              |
| Total Purgeable Hydrocarbons             | 100.0  | ug/L  | -                              | -                              | -                               | nd                             | nd                             |

LOQ Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.

- Not Requested

na Not Applicable

nd parameter not detected ! = LOQ higher than listed due to dilution ( ) Adjusted LOQ

WDMO Weathered Diesel and Motor Oil.

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
 Contact: J. Derek Trinke

Report Date: December 23/98  
 Lab Ref # : G985040  
 Lab Quote #: 96-W238-VG  
 Client PO#: EE98084WestonYd  
 Client Ref#: W8140

## Analysis of Water

| Parameter                                | LOQ    | Units | MW98-33-<br>981215<br>98/12/15 | MW98-34-<br>981215<br>98/12/15 | MW98-35-<br>981215<br>98/12/15 | MW98-35-<br>981215<br>Replicate | MW98-37-<br>981215<br>98/12/15 |
|------------------------------------------|--------|-------|--------------------------------|--------------------------------|--------------------------------|---------------------------------|--------------------------------|
| Date Sampled >                           |        |       |                                |                                |                                |                                 |                                |
| Resemblance                              | na     | na    | na                             | EGD?                           | na                             | na                              | EGD?                           |
| Total SemiVolatile Hydrocarbons(C11-C32) | 0.100  | mg/L  | nd                             | 1.69                           | nd                             | nd                              | 2.77                           |
| Benzene                                  | 0.0002 | mg/L  | -                              | nd                             | -                              | -                               | nd                             |
| Ethylbenzene                             | 0.0002 | mg/L  | -                              | 0.0007                         | -                              | -                               | 0.0011                         |
| Toluene                                  | 0.0002 | mg/L  | -                              | 0.0009                         | -                              | -                               | 0.0011                         |
| Total Volatile Hydrocarbons              | 0.100  | mg/L  | -                              | 0.157                          | -                              | -                               | 0.154                          |
| Xylenes(Total)                           | 0.0004 | mg/L  | -                              | 0.0030                         | -                              | -                               | 0.0041                         |
| Total Purgeable Hydrocarbons             | 100.0  | ug/L  | 132000                         | -                              | 16100                          | 14100                           | -                              |

LOQ Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.  
 - Not Requested  
 EGD? Contaminant elutes in the gasoline/diesel range but does not match our reference standards.  
 na Not Applicable  
 nd parameter not detected ! = LOQ higher than listed due to dilution ( ) Adjusted LOQ

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
 Contact: J. Derek Trinke

Report Date: December 23/98  
 Lab Ref # : G985040  
 Lab Quote #: 96-W238-VG  
 Client PO#: EE98084WestonYd  
 Client Ref#: W8140

## Analysis of Water

| Parameter                                | LOQ    | Units | MW98-37-<br>981215<br>Replicate | MW98-4 -<br>981215<br>98/12/15 | MW98-44-<br>981215<br>98/12/15 | MW98-8 -<br>981215<br>98/12/15 |  |
|------------------------------------------|--------|-------|---------------------------------|--------------------------------|--------------------------------|--------------------------------|--|
| Resemblance                              | na     | na    | EGD?                            | EGD?                           | EGD?                           | EGD?                           |  |
| Total SemiVolatile Hydrocarbons(C11-C32) | 0.100  | mg/L  | 2.82                            | 1.72                           | 1.53                           | 0.270                          |  |
| Benzene                                  | 0.0002 | mg/L  | -                               | 0.0180                         | 0.0398                         | nd                             |  |
| Ethylbenzene                             | 0.0002 | mg/L  | -                               | 0.0090                         | 0.0629                         | 0.0005                         |  |
| Toluene                                  | 0.0002 | mg/L  | -                               | 0.0004                         | 0.0663                         | nd                             |  |
| Total Volatile Hydrocarbons              | 0.100  | mg/L  | -                               | 1.27                           | 2.59                           | 0.152                          |  |
| Xylenes(Total)                           | 0.0004 | mg/L  | -                               | 0.1550                         | 0.4290                         | 0.0005                         |  |
| Total Purgeable Hydrocarbons             | 100.0  | ug/L  | -                               | -                              | -                              | -                              |  |

LOQ Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.

- Not Requested

EGD? Contaminant elutes in the gasoline/diesel range but does not match our reference standards.

na Not Applicable

nd parameter not detected ! = LOQ higher than listed due to dilution ( ) Adjusted LOQ



Client: Morrow Environmental Consultants Inc.  
 Project Reference: W8140  
 Work Order Number: G985040A  
 Matrix: Water

**Polynuclear Aromatic Hydrocarbons (PAH's)**

Date: 24-Dec-98

Units: Micrograms/Liter (µg/L)

| Compound               | LOQ<br>µg/L | MW98-2<br>981215<br>DF=20 | LOQ<br>µg/L | MW98-19<br>981215 | MW98-24<br>981215 | MW98-25<br>981215 |
|------------------------|-------------|---------------------------|-------------|-------------------|-------------------|-------------------|
| Naphthalene            | 1.0         | 32.8                      | 0.050       | nd                | 0.708             | nd                |
| 2-Methylnaphthalene    | 1.0         | 71.3                      | 0.050       | nd                | 1.44              | nd                |
| 1-Methylnaphthalene    | 1.0         | 60.1                      | 0.050       | nd                | 1.33              | nd                |
| Acenaphthylene         | 1.0         | nd                        | 0.050       | nd                | nd                | nd                |
| Acenaphthene           | 1.0         | nd                        | 0.050       | nd                | 0.781             | nd                |
| Fluorene               | 1.0         | 4.90                      | 0.050       | nd                | 1.28              | nd                |
| Phenanthrene           | 1.0         | 2.78                      | 0.050       | nd                | 1.18              | nd                |
| Anthracene             | 1.0         | nd                        | 0.050       | nd                | 0.666             | nd                |
| Fluoranthene           | 1.0         | nd                        | 0.050       | 0.060             | 12.5              | nd                |
| Pyrene                 | 1.0         | nd                        | 0.050       | 0.061             | 7.36              | nd                |
| Benzo(a)anthracene     | 1.0         | nd                        | 0.050       | nd                | 1.22              | nd                |
| Chrysene               | 1.0         | nd                        | 0.050       | nd                | 0.652             | nd                |
| Benzo(b)fluoranthene   | 1.0         | nd                        | 0.050       | nd                | 0.264             | nd                |
| Benzo(k)fluoranthene   | 1.0         | nd                        | 0.050       | nd                | 0.273             | nd                |
| Benzo(a)pyrene         | 0.2         | nd                        | 0.010       | 0.023             | 0.235             | nd                |
| Indeno(1,2,3-cd)pyrene | 1.0         | nd                        | 0.050       | nd                | 0.133             | nd                |
| Dibenzo(a,h)anthracene | 1.0         | nd                        | 0.050       | nd                | nd                | nd                |
| Benzo(ghi)perylene     | 1.0         | nd                        | 0.050       | nd                | 0.089             | nd                |

**Surrogate Standard Recoveries (Amount Spiked 0.625 µg/L, Control Limits 30 -120%)**

|                    |     |     |     |     |
|--------------------|-----|-----|-----|-----|
| Acenaphthene-d10   | 71% | 48% | 58% | 62% |
| Anthracene-d10     | 92% | 56% | 83% | 73% |
| Benzo(a)pyrene-d12 | 60% | 79% | 93% | 94% |

Client: Morrow Environmental Consultants Inc.  
Project Reference: W8140  
Work Order Number: G985040A  
Matrix: Water

### Polynuclear Aromatic Hydrocarbons (PAH's)

Date: 24-Dec-98

Units: micrograms/liter (µg/L)

| Compound               | LOQ<br>µg/L | Method Blank |                |        | Spiked Method Blank |                |                |        |
|------------------------|-------------|--------------|----------------|--------|---------------------|----------------|----------------|--------|
|                        |             | Result       | Upper<br>Limit | Accept | %<br>Recovery       | Lower<br>Limit | Upper<br>Limit | Accept |
| Naphthalene            | 0.050       | nd           | 0.050          | yes    | 77                  | 30             | 120            | yes    |
| 2-Methylnaphthalene    | 0.050       | nd           | 0.050          | yes    | 72                  | 30             | 120            | yes    |
| 1-Methylnaphthalene    | 0.050       | nd           | 0.050          | yes    | 74                  | 30             | 120            | yes    |
| Acenaphthylene         | 0.050       | nd           | 0.050          | yes    | 84                  | 30             | 120            | yes    |
| Acenaphthene           | 0.050       | nd           | 0.050          | yes    | 67                  | 30             | 120            | yes    |
| Fluorene               | 0.050       | nd           | 0.050          | yes    | 71                  | 30             | 120            | yes    |
| Phenanthrene           | 0.050       | nd           | 0.050          | yes    | 83                  | 30             | 120            | yes    |
| Anthracene             | 0.050       | nd           | 0.050          | yes    | 83                  | 30             | 120            | yes    |
| Fluoranthene           | 0.050       | nd           | 0.050          | yes    | 102                 | 30             | 120            | yes    |
| Pyrene                 | 0.050       | nd           | 0.050          | yes    | 106                 | 30             | 120            | yes    |
| Benzo(a)anthracene     | 0.050       | nd           | 0.050          | yes    | 75                  | 30             | 120            | yes    |
| Chrysene               | 0.050       | nd           | 0.050          | yes    | 86                  | 30             | 120            | yes    |
| Benzo(b)fluoranthene   | 0.050       | nd           | 0.050          | yes    | 96                  | 30             | 120            | yes    |
| Benzo(k)fluoranthene   | 0.050       | nd           | 0.050          | yes    | 108                 | 30             | 120            | yes    |
| Benzo(a)pyrene         | 0.010       | nd           | 0.010          | yes    | 92                  | 30             | 120            | yes    |
| Indeno(1,2,3-cd)pyrene | 0.050       | nd           | 0.050          | yes    | 76                  | 30             | 120            | yes    |
| Dibenzo(a,h)anthracene | 0.050       | nd           | 0.050          | yes    | 89                  | 30             | 120            | yes    |
| Benzo(ghi)perylene     | 0.050       | nd           | 0.050          | yes    | 93                  | 30             | 120            | yes    |

#### Surrogate Standard Recoveries

|                    |     |    |    |     |     |
|--------------------|-----|----|----|-----|-----|
| Acenaphthene-d10   | 70% | 63 | 30 | 120 | yes |
| Anthracene-d10     | 85% | 77 | 30 | 120 | yes |
| Benzo(a)pyrene-d12 | 84% | 81 | 30 | 120 | yes |

Client: Morrow Environmental Consultants Inc.  
Project Reference: W8140  
Work Order Number: G985040A  
Matrix: Water

**Polynuclear Aromatic Hydrocarbons (PAH'S)**

Date: 24-Dec-98

Legend: LOQ = Limit of Quantitation  
nd = Not detected above LOQ  
DF = Dilution Factor

Date received: December 16, 1998  
Date extracted: December 22, 1998  
Date analysed: December 23-24, 1998

**ANALYTICAL METHOD:**

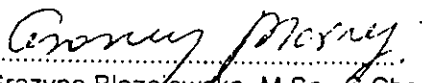
The water sample was prepared by liquid-liquid extraction and analysed by gas chromatography/mass spectrometry in selected ion monitoring mode using U.S. EPA Method 8270B (modified).

**REPORT DISCUSSION:**

Since target compounds present were at a level above the calibration range of the instrument, sample MW98-2 was run at a dilution factor in order to avoid exceeding the calibration range and to limit the contamination of the equipment. The amounts reported have been corrected for the dilution factors that were used.

*NOTE: All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analysis done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangement.*

Job Approved By:

  
Grazyna Blazewaska, M.Sc., Chem.  
Chemist, Mass Spectrometry Services

Client: Morrow Environmental Consultants Inc.

Project Reference: W8140

Work Order: G985040V

Matrix: Water

## VOLATILE ORGANIC COMPOUNDS

Date: 23-Dec-98

Units: micrograms/liter (µg/L)

| Compound                               | LOQ<br>µg/L | MW98-25<br>981215 | MW98-26<br>981215 | LOQ<br>µg/L | MW98-33<br>981215<br>DF=25000 | LOQ<br>µg/L | MW98-35<br>981215<br>DF=1000 | MW98-35<br>981215<br>DF=1000<br>Dup. |
|----------------------------------------|-------------|-------------------|-------------------|-------------|-------------------------------|-------------|------------------------------|--------------------------------------|
| Chloromethane                          | 1.0         | nd                | nd                | 25000       | nd                            | 1000        | nd                           | nd                                   |
| Vinyl chloride                         | 0.5         | nd                | nd                | 12500       | nd                            | 500         | 560                          | 572                                  |
| Bromomethane                           | 0.5         | nd                | nd                | 12500       | nd                            | 500         | nd                           | nd                                   |
| Chloroethane                           | 0.5         | nd                | nd                | 12500       | nd                            | 500         | nd                           | nd                                   |
| Trichlorofluoromethane                 | 0.5         | nd                | nd                | 12500       | nd                            | 500         | nd                           | nd                                   |
| Acetone                                | 10.0        | nd                | nd                | 250000      | nd                            | 10000       | nd                           | nd                                   |
| 1,1-Dichloroethene                     | 0.2         | nd                | nd                | 5000        | nd                            | 200         | 3040                         | 3190                                 |
| Dichloromethane (Methylene Chloride)   | 1.0         | nd                | nd                | 25000       | nd                            | 1000        | nd                           | nd                                   |
| trans-1,2-Dichloroethene               | 0.2         | nd                | nd                | 5000        | nd                            | 200         | nd                           | nd                                   |
| Methyl-t-Butyl Ether                   | 0.2         | nd                | nd                | 5000        | nd                            | 200         | nd                           | nd                                   |
| 1,1-Dichloroethane                     | 0.2         | nd                | nd                | 5000        | nd                            | 200         | 910                          | 947                                  |
| Methyl Ethyl Ketone (MEK)              | 5.0         | nd                | nd                | 125000      | nd                            | 5000        | nd                           | nd                                   |
| cis-1,2-Dichloroethene                 | 0.2         | nd                | nd                | 5000        | nd                            | 200         | 3640                         | 4320                                 |
| Chloroform                             | 0.2         | nd                | nd                | 5000        | nd                            | 200         | nd                           | nd                                   |
| 1,2-Dichloroethane                     | 0.2         | 0.4               | nd                | 5000        | nd                            | 200         | nd                           | nd                                   |
| 1,1,1-Trichloroethane                  | 0.2         | nd                | nd                | 5000        | nd                            | 200         | 1450                         | 1830                                 |
| Carbon Tetrachloride                   | 0.2         | nd                | nd                | 5000        | nd                            | 200         | nd                           | nd                                   |
| Benzene                                | 0.1         | nd                | nd                | 2500        | nd                            | 100         | nd                           | nd                                   |
| 1,2-Dichloropropane                    | 0.2         | nd                | nd                | 5000        | nd                            | 200         | nd                           | nd                                   |
| Trichloroethene                        | 0.2         | nd                | nd                | 5000        | nd                            | 200         | 11800                        | 12400                                |
| Bromodichloromethane                   | 0.2         | nd                | nd                | 5000        | nd                            | 200         | nd                           | nd                                   |
| cis-1,3-Dichloropropene                | 0.2         | nd                | nd                | 5000        | nd                            | 200         | nd                           | nd                                   |
| Methyl Isobutyl Ketone (MIBK)          | 5.0         | nd                | nd                | 125000      | nd                            | 5000        | nd                           | nd                                   |
| trans-1,3-Dichloropropene              | 0.2         | nd                | nd                | 5000        | nd                            | 200         | nd                           | nd                                   |
| 1,1,2-Trichloroethane                  | 0.2         | nd                | nd                | 5000        | nd                            | 200         | nd                           | nd                                   |
| Toluene                                | 0.2         | nd                | nd                | 5000        | nd                            | 200         | nd                           | nd                                   |
| n-Hexanone                             | 5.0         | nd                | nd                | 125000      | nd                            | 5000        | nd                           | nd                                   |
| Dibromochloromethane                   | 0.2         | nd                | nd                | 5000        | nd                            | 200         | nd                           | nd                                   |
| 1,2-Dibromoethane (Ethylene dibromide) | 0.2         | nd                | nd                | 5000        | nd                            | 200         | nd                           | nd                                   |
| Tetrachloroethene (Perchloroethylene)  | 0.2         | nd                | nd                | 5000        | 133000                        | 200         | 570                          | 810                                  |
| 1,1,1,2-Tetrachloroethane              | 0.2         | nd                | nd                | 5000        | nd                            | 200         | nd                           | nd                                   |
| Chlorobenzene                          | 0.2         | nd                | nd                | 5000        | nd                            | 200         | nd                           | nd                                   |
| Ethylbenzene                           | 0.2         | nd                | nd                | 5000        | nd                            | 200         | nd                           | nd                                   |
| m-Xylene & p-Xylene                    | 0.2         | nd                | nd                | 5000        | nd                            | 200         | nd                           | nd                                   |
| Bromoform                              | 0.2         | nd                | nd                | 5000        | nd                            | 200         | nd                           | nd                                   |
| Styrene                                | 0.2         | nd                | nd                | 5000        | nd                            | 200         | nd                           | nd                                   |
| 1,1,2,2-Tetrachloroethane              | 0.2         | nd                | nd                | 5000        | nd                            | 200         | nd                           | nd                                   |
| n-Xylene                               | 0.2         | nd                | nd                | 5000        | nd                            | 200         | nd                           | nd                                   |
| 1,3-Dichlorobenzene                    | 0.2         | nd                | nd                | 5000        | nd                            | 200         | nd                           | nd                                   |
| 1,4-Dichlorobenzene                    | 0.2         | nd                | nd                | 5000        | nd                            | 200         | nd                           | nd                                   |
| 1,2-Dichlorobenzene                    | 0.2         | nd                | nd                | 5000        | nd                            | 200         | nd                           | nd                                   |

Surrogate Standard Recoveries: Control Limits: 70-130%

|                      |      |      |      |      |      |
|----------------------|------|------|------|------|------|
| Dibromofluoromethane | 96%  | 95%  | 96%  | 108% | 109% |
| Toluene-d8           | 110% | 108% | 112% | 99%  | 98%  |
| 4-Bromofluorobenzene | 99%  | 103% | 103% | 101% | 98%  |

Client: Morrow Environmental Consultants Inc.  
Project Reference: W8140  
Work Order: G985040V  
Matrix: Water

# VOLATILE ORGANIC COMPOUNDS

Date: 23-Dec-98

Units: micrograms/liter (µg/L)

| Compound                               | LOQ<br>µg/L | MW98-38<br>981215<br>DF=1000 | LOQ<br>µg/L | MW98-43<br>981215<br>DF=10000 |
|----------------------------------------|-------------|------------------------------|-------------|-------------------------------|
| Chloromethane                          | 1000        | nd                           | 10000       | nd                            |
| Vinyl chloride                         | 500         | 612                          | 5000        | nd                            |
| Bromomethane                           | 500         | nd                           | 5000        | nd                            |
| Chloroethane                           | 500         | nd                           | 5000        | nd                            |
| Trichlorofluoromethane                 | 500         | nd                           | 5000        | nd                            |
| Acetone                                | 10000       | nd                           | 100000      | nd                            |
| 1,1-Dichloroethene                     | 200         | 3390                         | 2000        | nd                            |
| Dichloromethane (Methylene Chloride)   | 1000        | nd                           | 10000       | nd                            |
| trans-1,2-Dichloroethene               | 200         | nd                           | 2000        | nd                            |
| Methyl-t-Butyl Ether                   | 200         | nd                           | 2000        | nd                            |
| 1,1-Dichloroethane                     | 200         | 985                          | 2000        | nd                            |
| Methyl Ethyl Ketone (MEK)              | 5000        | nd                           | 50000       | nd                            |
| cis-1,2-Dichloroethene                 | 200         | 4490                         | 2000        | nd                            |
| Chloroform                             | 200         | nd                           | 2000        | nd                            |
| 1,2-Dichloroethane                     | 200         | nd                           | 2000        | nd                            |
| 1,1,1-Trichloroethane                  | 200         | 1710                         | 2000        | nd                            |
| Carbon Tetrachloride                   | 200         | nd                           | 2000        | nd                            |
| Benzene                                | 100         | nd                           | 1000        | nd                            |
| 1,2-Dichloropropane                    | 200         | nd                           | 2000        | nd                            |
| Trichloroethene                        | 200         | 11600                        | 2000        | nd                            |
| Bromodichloromethane                   | 200         | nd                           | 2000        | nd                            |
| cis-1,3-Dichloropropene                | 200         | nd                           | 2000        | nd                            |
| Methyl Isobutyl Ketone (MIBK)          | 5000        | nd                           | 50000       | nd                            |
| trans-1,3-Dichloropropene              | 200         | nd                           | 2000        | nd                            |
| 1,1,2-Trichloroethane                  | 200         | nd                           | 2000        | nd                            |
| Toluene                                | 200         | nd                           | 2000        | nd                            |
| 2-Hexanone                             | 5000        | nd                           | 50000       | nd                            |
| Dibromochloromethane                   | 200         | nd                           | 2000        | nd                            |
| 1,2-Dibromoethane (Ethylene dibromide) | 200         | nd                           | 2000        | nd                            |
| Tetrachloroethene (Perchloroethylene)  | 200         | 788                          | 2000        | 101000                        |
| 1,1,1,2-Tetrachloroethane              | 200         | nd                           | 2000        | nd                            |
| Chlorobenzene                          | 200         | nd                           | 2000        | nd                            |
| Ethylbenzene                           | 200         | nd                           | 2000        | nd                            |
| m-Xylene & p-Xylene                    | 200         | nd                           | 2000        | nd                            |
| Bromoform                              | 200         | nd                           | 2000        | nd                            |
| Styrene                                | 200         | nd                           | 2000        | nd                            |
| 1,1,2,2-Tetrachloroethane              | 200         | nd                           | 2000        | nd                            |
| o-Xylene                               | 200         | nd                           | 2000        | nd                            |
| 1,3-Dichlorobenzene                    | 200         | nd                           | 2000        | nd                            |
| 1,4-Dichlorobenzene                    | 200         | nd                           | 2000        | nd                            |
| 1,2-Dichlorobenzene                    | 200         | nd                           | 2000        | nd                            |

Surrogate Standard Recoveries: Control Limits: 70-130%

|                      |      |      |
|----------------------|------|------|
| Dibromofluoromethane | 110% | 109% |
| Toluene-d8           | 103% | 101% |
| 4-Bromofluorobenzene | 100% | 103% |

Client: Morrow Environmental Consultants Inc.  
Project Reference: W8140  
Work Order: G985040V  
Matrix: Water

# VOLATILE ORGANIC COMPOUNDS

Date: 23-Dec-98

Units: micrograms/liter (µg/L)

## Method Blank

## Spiked Method Blank

| Compound                               | LOQ<br>µg/L | Result | Upper<br>Limit | Accept | %<br>Recovery | Lower<br>Limit | Upper<br>Limit | Accept |
|----------------------------------------|-------------|--------|----------------|--------|---------------|----------------|----------------|--------|
| Chloromethane                          | 1.0         | nd     | 1.0            | yes    | 95            | 70             | 130            | yes    |
| Vinyl chloride                         | 0.5         | nd     | 0.5            | yes    | 99            | 70             | 130            | yes    |
| Bromomethane                           | 0.5         | nd     | 0.5            | yes    | 102           | 70             | 130            | yes    |
| Chloroethane                           | 0.5         | nd     | 0.5            | yes    | 98            | 70             | 130            | yes    |
| Trichlorofluoromethane                 | 0.5         | nd     | 0.5            | yes    | 103           | 70             | 130            | yes    |
| Acetone                                | 10.0        | nd     | 10.0           | yes    | 99            | 60             | 140            | yes    |
| 1,1-Dichloroethene                     | 0.2         | nd     | 0.2            | yes    | 99            | 70             | 130            | yes    |
| Dichloromethane (Methylene Chloride)   | 1.0         | nd     | 1.0            | yes    | 100           | 70             | 130            | yes    |
| trans-1,2-Dichloroethene               | 0.2         | nd     | 0.2            | yes    | 102           | 70             | 130            | yes    |
| Methyl-t-Butyl Ether                   | 0.2         | nd     | 0.2            | yes    | 99            | 70             | 130            | yes    |
| 1,1-Dichloroethane                     | 0.2         | nd     | 0.2            | yes    | 99            | 70             | 130            | yes    |
| Methyl Ethyl Ketone (MEK)              | 5.0         | nd     | 5.0            | yes    | 99            | 60             | 140            | yes    |
| cis-1,2-Dichloroethene                 | 0.2         | nd     | 0.2            | yes    | 99            | 70             | 130            | yes    |
| Chloroform                             | 0.2         | nd     | 0.2            | yes    | 101           | 70             | 130            | yes    |
| 1,2-Dichloroethane                     | 0.2         | nd     | 0.2            | yes    | 101           | 70             | 130            | yes    |
| 1,1,1-Trichloroethane                  | 0.2         | nd     | 0.2            | yes    | 101           | 70             | 130            | yes    |
| Carbon Tetrachloride                   | 0.2         | nd     | 0.2            | yes    | 101           | 70             | 130            | yes    |
| Benzene                                | 0.1         | nd     | 0.1            | yes    | 100           | 70             | 130            | yes    |
| 1,2-Dichloropropane                    | 0.2         | nd     | 0.2            | yes    | 100           | 70             | 130            | yes    |
| Trichloroethene                        | 0.2         | nd     | 0.2            | yes    | 101           | 70             | 130            | yes    |
| Bromodichloromethane                   | 0.2         | nd     | 0.2            | yes    | 100           | 70             | 130            | yes    |
| cis-1,3-Dichloropropene                | 0.2         | nd     | 0.2            | yes    | 98            | 70             | 130            | yes    |
| Methyl Isobutyl Ketone (MIBK)          | 5.0         | nd     | 5.0            | yes    | 100           | 60             | 140            | yes    |
| trans-1,3-Dichloropropene              | 0.2         | nd     | 0.2            | yes    | 99            | 70             | 130            | yes    |
| 1,1,2-Trichloroethane                  | 0.2         | nd     | 0.2            | yes    | 99            | 70             | 130            | yes    |
| Toluene                                | 0.2         | nd     | 0.2            | yes    | 98            | 70             | 130            | yes    |
| 2-Hexanone                             | 5.0         | nd     | 5.0            | yes    | 99            | 60             | 140            | yes    |
| Dibromochloromethane                   | 0.2         | nd     | 0.2            | yes    | 99            | 70             | 130            | yes    |
| 1,2-Dibromoethane (Ethylene dibromide) | 0.2         | nd     | 0.2            | yes    | 97            | 70             | 130            | yes    |
| Tetrachloroethene (Perchloroethylene)  | 0.2         | nd     | 0.2            | yes    | 99            | 70             | 130            | yes    |
| 1,1,1,2-Tetrachloroethane              | 0.2         | nd     | 0.2            | yes    | 99            | 70             | 130            | yes    |
| Chlorobenzene                          | 0.2         | nd     | 0.2            | yes    | 100           | 70             | 130            | yes    |
| Ethylbenzene                           | 0.2         | nd     | 0.2            | yes    | 103           | 70             | 130            | yes    |
| m-Xylene & p-Xylene                    | 0.2         | nd     | 0.2            | yes    | 101           | 70             | 130            | yes    |
| Bromoform                              | 0.2         | nd     | 0.2            | yes    | 99            | 70             | 130            | yes    |
| Styrene                                | 0.2         | nd     | 0.2            | yes    | 101           | 70             | 130            | yes    |
| 1,1,2,2-Tetrachloroethane              | 0.2         | nd     | 0.2            | yes    | 101           | 70             | 130            | yes    |
| o-Xylene                               | 0.2         | nd     | 0.2            | yes    | 101           | 70             | 130            | yes    |
| 1,3-Dichlorobenzene                    | 0.2         | nd     | 0.2            | yes    | 102           | 70             | 130            | yes    |
| 1,4-Dichlorobenzene                    | 0.2         | nd     | 0.2            | yes    | 103           | 70             | 130            | yes    |
| 1,2-Dichlorobenzene                    | 0.2         | nd     | 0.2            | yes    | 101           | 70             | 130            | yes    |

## Surrogate Standard Recoveries:

|                      |      |     |    |     |     |
|----------------------|------|-----|----|-----|-----|
| Dibromofluoromethane | 89%  | 102 | 70 | 130 | yes |
| Toluene-d8           | 111% | 100 | 70 | 130 | yes |
| 4-Bromofluorobenzene | 103% | 101 | 70 | 130 | yes |

Client: Morrow Environmental Consultants Inc.  
Project Reference: W8140  
Work Order: G985040V  
Matrix: Water

**VOLATILE ORGANIC COMPOUNDS**

Date: 23-Dec-98

Legend: LOQ = Limit of Quantitation  
nd = Not Detected Above LOQ  
Dup. = Duplicate  
DF = Dilution Factor

Date of sample receipt: December 16, 1998  
Date of sample analysis: December 22, 1998

Analytical Method:

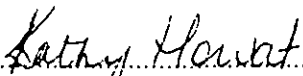
The water samples were analysed by purge & trap gas chromatography/mass spectrometry using US EPA Method 8260B (modified).

Report Discussion:

Since some target compounds present were at a level above the calibration range of the instrument, some of the samples were run at a dilution factor to avoid exceeding the calibration range and causing excessive contamination of the purge & trap equipment. The quantitation limits for these samples are higher than the LOQ's for undiluted samples as indicated above. The amounts reported have been corrected for the dilution factors that were used.

*NOTE: All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analysis done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangement.*

Job Approved By:

  
Kathy Horvat, B.Sc.  
Chemist



RECEIVED  
JAN 12 1998

MORROW ENVIRONMENTAL  
CONSULTANTS INC.  
WINNIPEG

Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: J. Derek Trinke

Date Received: December 16/98  
Date Reported: December 23/98  
Lab Ref#: G985040  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084WestonYd  
Client Ref#: W8140  
Sampled By: JDT

### Certificate of Analysis

Analysis Performed: 30 Element ICP-MS Scan

Methodology: 1) Analysis of trace metals in water by Inductively Coupled Plasma Mass Spectrophotometry.  
U.S. EPA Method No. 200.8(Modification)

Instrumentation: 1) PE Sciex ELAN 6000 ICP-MS Spectrometer

Sample Description: Water

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

Certified By  
Nick Boulton  
Service Manager

Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

# Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.  
Contact: J. Derek Trinke

Date Reported: December 23/98  
Lab Ref # : G985040  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084WestonYd  
Client Ref#: W8140

## Analysis of Water

| Parameter  | SAMPLE ID<br>(spike) | LOQ    | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|------------|----------------------|--------|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|            |                      |        |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Aluminum   | na                   | 0.01   | mg/L  | nd(b)         | 0.03           | yes    | 88                 | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Antimony   | na                   | 0.002  | mg/L  | nd(b)         | 0.004          | yes    | 97                 | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Arsenic    | na                   | 0.002  | mg/L  | nd(b)         | 0.004          | yes    | 98                 | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Barium     | na                   | 0.005  | mg/L  | nd(b)         | 0.01           | yes    | 98                 | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Beryllium  | na                   | 0.005  | mg/L  | nd(b)         | 0.01           | yes    | 96                 | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Bismuth    | na                   | 0.002  | mg/L  | nd(b)         | 0.004          | yes    | 95                 | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Boron      | na                   | 0.005  | mg/L  | nd(b)         | 0.02           | yes    | 101                | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Calcium    | na                   | 0.0005 | mg/L  | nd(b)         | 0.0001         | yes    | 100                | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Calcium    | na                   | 0.1    | mg/L  | nd(b)         | 0.2            | yes    | 102                | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Chromium   | na                   | 0.002  | mg/L  | nd(b)         | 0.004          | yes    | 96                 | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Cobalt     | na                   | 0.001  | mg/L  | nd(b)         | 0.002          | yes    | 99                 | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Copper     | na                   | 0.002  | mg/L  | nd(b)         | 0.004          | yes    | 98                 | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Iron       | na                   | 0.02   | mg/L  | nd(b)         | 0.03           | yes    | 98                 | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Lead       | na                   | 0.0001 | mg/L  | nd(b)         | 0.002          | yes    | 94                 | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Magnesium  | na                   | 0.1    | mg/L  | nd(b)         | 0.2            | yes    | 96                 | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Manganese  | na                   | 0.002  | mg/L  | nd(b)         | 0.004          | yes    | 95                 | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Molybdenum | na                   | 0.002  | mg/L  | nd(b)         | 0.004          | yes    | 102                | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Nickel     | na                   | 0.002  | mg/L  | nd(b)         | 0.004          | yes    | 98                 | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Phosphorus | na                   | 0.1    | mg/L  | nd(b)         | 0.2            | yes    | 109                | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Potassium  | na                   | 0.5    | mg/L  | nd(b)         | 1.0            | yes    | 100                | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |

LOQ = Limit of Quantitation = lowest level of the parameter that can be quantified with confidence

\* = Unavailable due to dilution required for analysis

na = Not Applicable

ns = Insufficient Sample Submitted

nd = parameter not detected

TR = trace level less than LOQ

(b) = Analyte results on REPORT of ANALYSIS have been background corrected for the process blank.

# Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.

Contact: J. Derek Trinke

Date Reported: December 23/98

Lab Ref # : G985040

Lab Quote#: 96-W238-VG

Client PO#: EE98084WestonYd

Client Ref#: W8140

## Analysis of Water

| Parameter | SAMPLE ID<br>(spike) | LOQ    | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|-----------|----------------------|--------|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|           |                      |        |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Selenium  | na                   | 0.002  | mg/L  | nd(b)         | 0.004          | yes    | 98                 | 60             | 140            | yes    | na           | na     | na             | na             | na     | yes                         |
| Silver    | na                   | 0.0005 | mg/L  | nd(b)         | 0.0001         | yes    | 92                 | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Sodium    | na                   | 0.1    | mg/L  | nd(b)         | 0.2            | yes    | 94                 | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Strontium | na                   | 0.005  | mg/L  | nd(b)         | 0.01           | yes    | 97                 | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Thallium  | na                   | 0.0001 | mg/L  | nd(b)         | 0.0002         | yes    | 97                 | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Tin       | na                   | 0.002  | mg/L  | nd(b)         | 0.004          | yes    | 99                 | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Titanium  | na                   | 0.002  | mg/L  | nd(b)         | 0.004          | yes    | 100                | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Uranium   | na                   | 0.0001 | mg/L  | nd(b)         | 0.0002         | yes    | 104                | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Vanadium  | na                   | 0.002  | mg/L  | nd(b)         | 0.004          | yes    | 96                 | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |
| Zinc      | na                   | 0.002  | mg/L  | nd(b)         | 0.02           | yes    | 96                 | 85             | 115            | yes    | na           | na     | na             | na             | na     | yes                         |

LOQ = Limit of Quantitation = lowest level of the parameter that can be quantified with confidence

• = Unavailable due to dilution required for analysis

na = Not Applicable

ns = Insufficient Sample Submitted

nd = parameter not detected

TR = trace level less than LOQ

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
 Contact: J. Derek Trinke

Report Date: December 23/98  
 Lab Ref # : G985040  
 Lab Quote #: 96-W238-VG  
 Client PO#: EE98084WestonYd  
 Client Ref#: W8140

## Analysis of Water

| Parameter      | LOQ    | Units | MW98-24-<br>981215<br>98/12/15 | MW98-25-<br>981215<br>98/12/15 | MW98-26-<br>981215<br>98/12/15 | MW98-33-<br>981215<br>98/12/15 | MW98-35-<br>981215<br>98/12/15 |
|----------------|--------|-------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Date Sampled > |        |       |                                |                                |                                |                                |                                |
| Aluminum       | 0.01   | mg/L  | 0.04                           | 0.01                           | nd                             | 0.04                           | 0.02                           |
| Antimony       | 0.002  | mg/L  | nd                             | nd                             | nd                             | nd                             | nd                             |
| Arsenic        | 0.002  | mg/L  | 0.007                          | nd                             | 0.005                          | 0.002                          | 0.003                          |
| Barium         | 0.005  | mg/L  | 0.247                          | 0.051                          | 0.043                          | 0.056                          | 0.047                          |
| Beryllium      | 0.005  | mg/L  | nd                             | nd                             | nd                             | nd                             | nd                             |
| Bismuth        | 0.002  | mg/L  | nd                             | nd                             | nd                             | nd                             | nd                             |
| Boron          | 0.005  | mg/L  | 0.241                          | 1.08                           | 0.177                          | 0.351                          | 0.199                          |
| Cadmium        | 0.0005 | mg/L  | nd                             | nd                             | nd                             | nd                             | nd                             |
| Calcium        | 0.1    | mg/L  | 146                            | 100                            | 512                            | 243                            | 124                            |
| Chromium       | 0.002  | mg/L  | nd                             | 0.002                          | nd                             | nd                             | nd                             |
| Cobalt         | 0.001  | mg/L  | 0.002                          | 0.002                          | 0.009                          | 0.001                          | 0.003                          |
| Copper         | 0.002  | mg/L  | nd                             | nd                             | nd                             | 0.007                          | nd                             |
| Iron           | 0.02   | mg/L  | 2.39                           | 0.03                           | nd                             | nd                             | nd                             |
| Lead           | 0.0001 | mg/L  | 0.0002                         | 0.0005                         | nd                             | 0.0006                         | nd                             |
| Magnesium      | 0.1    | mg/L  | 57.0                           | 99.3                           | 572                            | 135                            | 106                            |
| Manganese      | 0.002  | mg/L  | 0.517                          | 0.600                          | 1.67                           | 0.373                          | 0.942                          |
| Molybdenum     | 0.002  | mg/L  | 0.008                          | 0.003                          | 0.002                          | 0.005                          | 0.007                          |
| Nickel         | 0.002  | mg/L  | 0.003                          | 0.008                          | 0.022                          | 0.008                          | 0.015                          |
| Phosphorus     | 0.1    | mg/L  | nd                             | nd                             | nd                             | nd                             | nd                             |
| Potassium      | 0.5    | mg/L  | 14.3                           | 1.3                            | 5.9                            | 7.8                            | 8.1                            |
| Selenium       | 0.002  | mg/L  | nd                             | nd                             | nd                             | 0.005                          | nd                             |
| Silver         | 0.0005 | mg/L  | nd                             | nd                             | nd                             | nd                             | nd                             |
| Sodium         | 0.1    | mg/L  | 112                            | 143                            | 432                            | 201                            | 115                            |
| Strontium      | 0.005  | mg/L  | 0.710                          | 0.462                          | 3.05                           | 1.57                           | 0.676                          |
| Thallium       | 0.0001 | mg/L  | nd                             | nd                             | nd                             | nd                             | nd                             |
| Tin            | 0.002  | mg/L  | nd                             | nd                             | nd                             | nd                             | nd                             |
| Titanium       | 0.002  | mg/L  | 0.004                          | nd                             | nd                             | 0.004                          | 0.002                          |

LOQ Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.  
 nd parameter not detected ! = LOQ higher than listed due to dilution ( ) Adjusted LOQ

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
 Contact: J. Derek Trinke

Report Date: December 23/98  
 Lab Ref # : G985040  
 Lab Quote #: 96-W238-VG  
 Client PO#: EE98084WestonYd  
 Client Ref#: W8140

Analysis of Water

| Parameter      | LOQ    | Units | MW98-24-<br>981215<br>98/12/15 | MW98-25-<br>981215<br>98/12/15 | MW98-26-<br>981215<br>98/12/15 | MW98-33-<br>981215<br>98/12/15 | MW98-35-<br>981215<br>98/12/15 |
|----------------|--------|-------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Date Sampled > |        |       |                                |                                |                                |                                |                                |
| Uranium        | 0.0001 | mg/L  | 0.0039                         | 0.0072                         | 0.0441                         | 0.0434                         | 0.0124                         |
| Vanadium       | 0.002  | mg/L  | nd                             | nd                             | nd                             | nd                             | nd                             |
| Zinc           | 0.002  | mg/L  | 0.003                          | 0.025                          | 0.006                          | 0.019                          | 0.047                          |

LOQ Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.  
 nd parameter not detected ! = LOQ higher than listed due to dilution ( ) Adjusted LOQ

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
 Contact: J. Derek Trinke

Report Date: December 23/98  
 Lab Ref # : G985040  
 Lab Quote #: 96-W238-VG  
 Client PO#: EE98084WestonYd  
 Client Ref#: W8140

## Analysis of Water

| Parameter  | LOQ    | Units | MW98-35-<br>981215<br>Replicate |  |  |  |  |
|------------|--------|-------|---------------------------------|--|--|--|--|
| Aluminum   | 0.01   | mg/L  | 0.03                            |  |  |  |  |
| Antimony   | 0.002  | mg/L  | nd                              |  |  |  |  |
| Arsenic    | 0.002  | mg/L  | 0.004                           |  |  |  |  |
| Barium     | 0.005  | mg/L  | 0.046                           |  |  |  |  |
| Beryllium  | 0.005  | mg/L  | nd                              |  |  |  |  |
| Bismuth    | 0.002  | mg/L  | nd                              |  |  |  |  |
| Boron      | 0.005  | mg/L  | 0.191                           |  |  |  |  |
| Cadmium    | 0.0005 | mg/L  | nd                              |  |  |  |  |
| Calcium    | 0.1    | mg/L  | 127                             |  |  |  |  |
| Chromium   | 0.002  | mg/L  | nd                              |  |  |  |  |
| Cobalt     | 0.001  | mg/L  | 0.003                           |  |  |  |  |
| Copper     | 0.002  | mg/L  | nd                              |  |  |  |  |
| Iron       | 0.02   | mg/L  | nd                              |  |  |  |  |
| Lead       | 0.0001 | mg/L  | nd                              |  |  |  |  |
| Magnesium  | 0.1    | mg/L  | 109                             |  |  |  |  |
| Manganese  | 0.002  | mg/L  | 0.947                           |  |  |  |  |
| Molybdenum | 0.002  | mg/L  | 0.007                           |  |  |  |  |
| Nickel     | 0.002  | mg/L  | 0.015                           |  |  |  |  |
| Phosphorus | 0.1    | mg/L  | nd                              |  |  |  |  |
| Potassium  | 0.5    | mg/L  | 8.1                             |  |  |  |  |
| Selenium   | 0.002  | mg/L  | nd                              |  |  |  |  |
| Silver     | 0.0005 | mg/L  | nd                              |  |  |  |  |
| Sodium     | 0.1    | mg/L  | 122                             |  |  |  |  |
| Strontium  | 0.005  | mg/L  | 0.668                           |  |  |  |  |
| Thallium   | 0.0001 | mg/L  | nd                              |  |  |  |  |
| Tin        | 0.002  | mg/L  | nd                              |  |  |  |  |
| Titanium   | 0.002  | mg/L  | 0.002                           |  |  |  |  |

LOQ Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.

nd parameter not detected ! = LOQ higher than listed due to dilution ( ) Adjusted LOQ

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
Contact: J. Derek Trinke

Report Date: December 23/98  
Lab Ref # : G985040  
Lab Quote #: 96-W238-VG  
Client PO#: EE98084WestonYd  
Client Ref#: W8140

## Analysis of Water

[illegible]

LOQ Limit of Quantitation = lowest level of the parameter that can be quantified with confidence.  
nd parameter not detected != LOQ higher than listed due to dilution ( ) Adjusted LOQ



Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: July 15/1999  
Date Reported: July 22/1999  
Lab Ref#: G992806  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084WstnYrd  
Client Ref#: W8140B  
Sampled By: JDT

### Certificate of Analysis

Analysis Performed: Extractable Hydrocarbons(Manitoba Guidelines), C11-C32  
BTEX and Total Volatile Hydrocarbons(Manitoba Criteria)

Methodology: 1) The characterization of HydroCarbon in soil by GC  
analysis, following a solvent extraction.  
U.S. EPA Method No.8011(microextraction)  
2) Analysis of Benzene, Toluene, Ethylbenzene, Xylenes &  
Volatile Hydrocarbons by Static Headspace Capillary GC-P  
ID/FID. External std quantitation with Surrogate stds.  
U.S. EPA Method No. 3810(Modification)

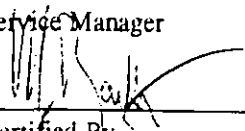
Instrumentation: 1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S  
2) Varian 3400 GC PID/FID, Genesis Headspace Analyzer

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

  
\_\_\_\_\_  
Certified By  
Elaine Grant  
Service Manager

  
\_\_\_\_\_  
Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

# Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Date Reported: July 22/1999  
Lab Ref # : G992806  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084WstnYrd  
Client Ref#: W8140B

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | SAMPLE ID<br>(spike) | EQL  | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|------------------------------------------|----------------------|------|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|                                          |                      |      |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Total SemiVolatile Hydrocarbons(C11-C32) | na                   | 10.0 | mg/kg | nd            | 20.0           | yes    | 105                | 70             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Benzene                                  | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 88                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Ethylbenzene                             | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 90                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Toluene                                  | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 94                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Total Volatile Hydrocarbons              | na                   | 10   | mg/kg | nd            | 10             | yes    | 111                | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Xylenes(Total)                           | na                   | 0.04 | mg/kg | nd            | 0.08           | yes    | 93                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence

\* = Unavailable due to dilution required for analysis

na = Not Applicable

ns = Insufficient Sample Submitted

nd = parameter not detected

TR = trace level less than EQL

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
 Contact: Alex Man

Report Date: July 22/1999  
 Lab Ref # : G992806  
 Lab Quote #: 96-W238-VG  
 Client PO#: EE98084WstnYrd  
 Client Ref#: W8140B

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | EQL  | Units | BH99-36-3-<br>990713<br>1999/07/13 | BH99-36-3-<br>990713<br>Replicate | BH99-36-8-<br>990713<br>1999/07/13 | BH99-37-3-<br>990713<br>1999/07/13 | BH99-38-3-<br>990713<br>1999/07/13 |
|------------------------------------------|------|-------|------------------------------------|-----------------------------------|------------------------------------|------------------------------------|------------------------------------|
| Resemblance                              | na   | na    | EGD?                               | EGD?                              | EGD?                               | EGD?                               | EGDMO?                             |
| Total SemiVolatile Hydrocarbons(C11-C32) | 10.0 | mg/kg | 6160                               | 6040                              | 4240                               | 5680                               | 2130                               |
| Benzene                                  | 0.02 | mg/kg | nd                                 | nd                                | nd                                 | nd                                 | nd                                 |
| Ethylbenzene                             | 0.02 | mg/kg | 6.51                               | 6.66                              | 1.24                               | 3.25                               | 1.39                               |
| Toluene                                  | 0.02 | mg/kg | 0.84                               | 0.85                              | 0.74                               | 0.38                               | 0.23                               |
| Total Volatile Hydrocarbons              | 10   | mg/kg | 1090                               | 1210                              | 638                                | 451                                | 150                                |
| Xylenes(Total)                           | 0.04 | mg/kg | 30.7                               | 32.8                              | 8.20                               | 3.97                               | 1.07                               |

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

EGD? Contaminant elutes in the gasoline/diesel range but does not match our reference standards.

EGDMO? Contaminant elutes across the gasoline/diesel/motor oil range but does not match our reference standards.

na Not Applicable

nd parameter not detected ! = LOQ higher than listed due to dilution ( ) Adjusted LOQ

## Report of Analysis

Report Date: July 22/1999  
Lab Ref # : G992806  
Lab Quote #: 96-W238-VG  
Client PO#: EE98084WstnYrd  
Client Ref#: W8140B

### Analysis of Soil, expressed on a dry weight basis

| Parameter                                | EQL  | Units | BH99-39-3-<br>990713<br>1999/07/13 | BH99-40-3-<br>990713<br>1999/07/13 | BH99-42-4-<br>990713<br>1999/07/13 |  |  |
|------------------------------------------|------|-------|------------------------------------|------------------------------------|------------------------------------|--|--|
| Resemblance                              | na   | na    | EGDMO?                             | EGD?                               | EGD?                               |  |  |
| Total SemiVolatile Hydrocarbons(C11-C32) | 10.0 | mg/kg | 6610                               | 2010                               | 1490                               |  |  |
| Benzene                                  | 0.02 | mg/kg | 0.14                               | nd                                 | nd                                 |  |  |
| Ethylbenzene                             | 0.02 | mg/kg | 6.93                               | 0.27                               | nd                                 |  |  |
| Toluene                                  | 0.02 | mg/kg | 1.03                               | nd                                 | nd                                 |  |  |
| Total Volatile Hydrocarbons              | 10   | mg/kg | 1210                               | 20                                 | nd                                 |  |  |
| Xylenes(Total)                           | 0.04 | mg/kg | 33.4                               | 0.32                               | 0.18                               |  |  |

nd parameter not detected != LOQ higher than listed due to dilution ( ) Adjusted LOQ

Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: July 15/1999  
Date Reported: July 22/1999  
Lab Ref#: G992806  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084WstnYrd  
Client Ref#: W8140B  
Sampled By: JDT

### Certificate of Analysis

---

Additional Comments:

BTEX analysis of soils:

Please view the BTEX results for all samples with discretion; results may be biased high due to overlapping matrix background.



RECEIVED

SEP 2 1999

MORROW ENVIRONMENTAL CONSULTANTS INC.  
601-888-1111  
Winnipeg

Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

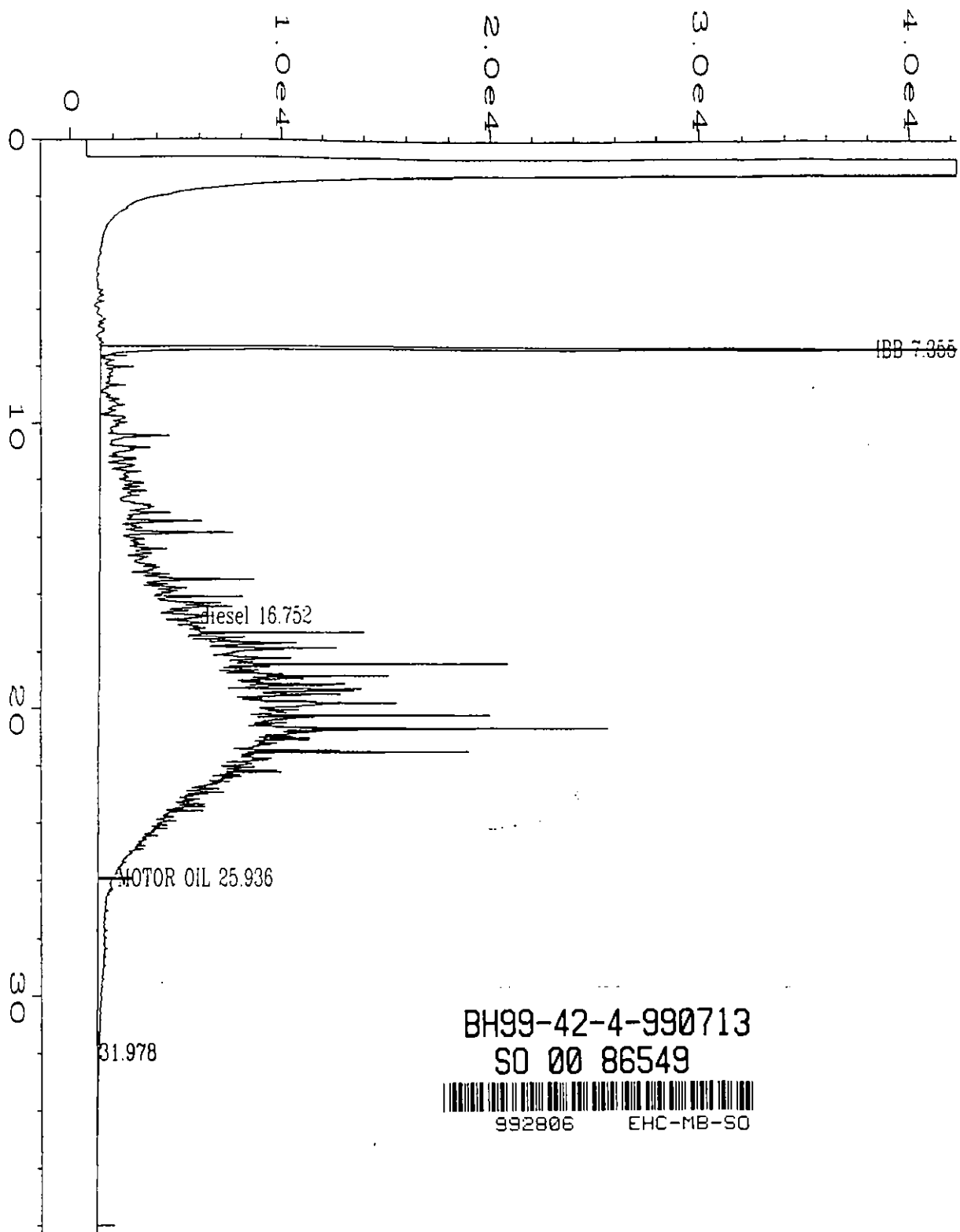
Fax: 204-477-9194

Attn: Alex Man

Date Received: July 15/1999  
Date Reported: August 26/1999  
Lab Ref#: G992806  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084WstnYrd  
Client Ref#: W8140B  
Sampled By: JDT

Attached are the chromatograms for your samples.

If you have any questions, please call Elaine Grant,  
your Service Manager at Philip Analytical Services Corp.



BH99-42-4-990713

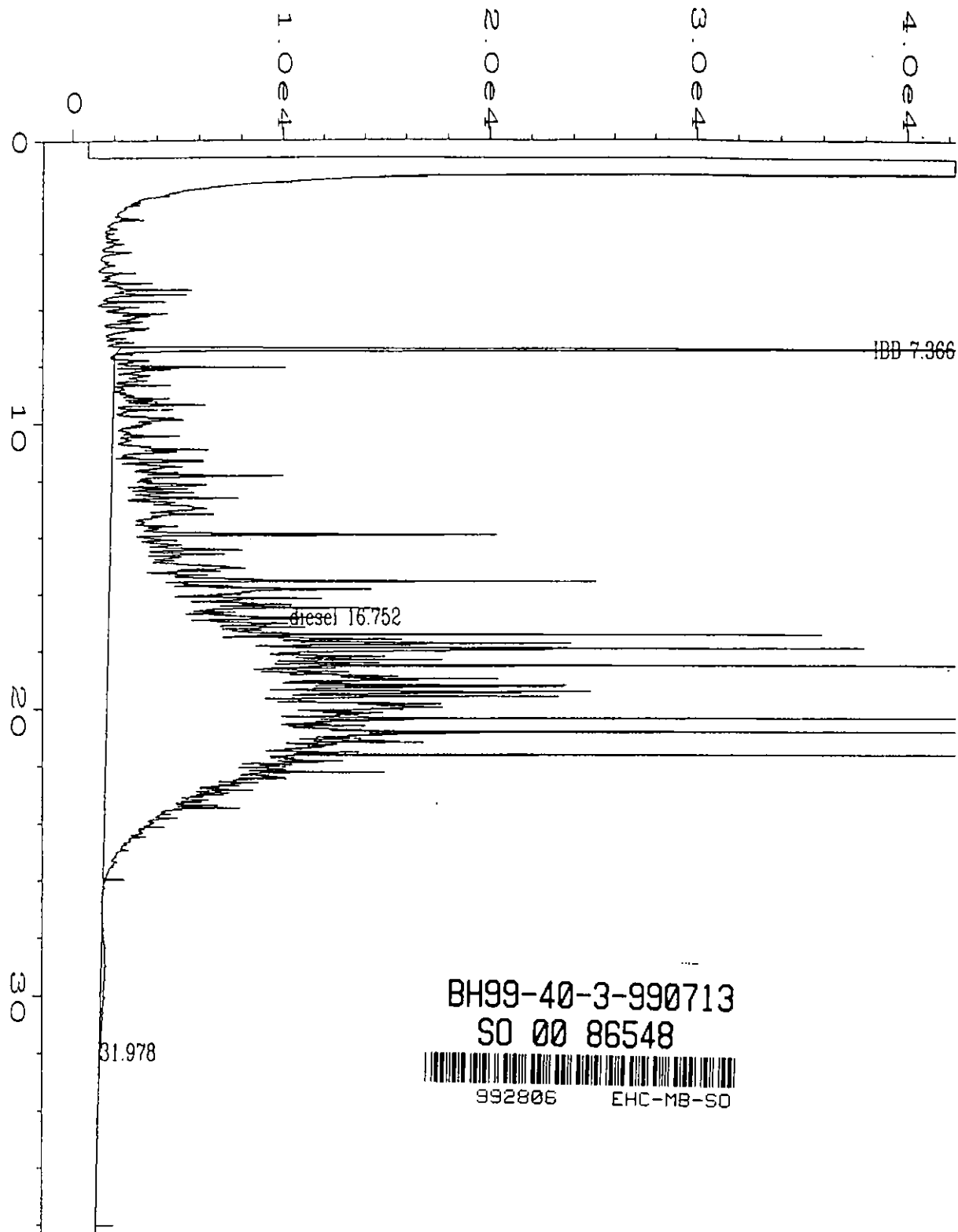
SO 00 86549



992806

EHC-MB-SO

|                    |                                        |                   |            |
|--------------------|----------------------------------------|-------------------|------------|
| Data File Name     | : C:\HPCHEM\1\DATA\JULY2099\017F0301.D | Page Number       | : 1        |
| Operator           | : JEEVA                                | Vial Number       | : 17       |
| Instrument         | : INSTRUMEN                            | Injection Number  | : 1        |
| Sample Name        | : 2806-23                              | Sequence Line     | : 3        |
| Run Time Bar Code: |                                        | Instrument Method | : 1DIF.MTH |
| Acquired on        | : 20 Jul 99 11:04 PM                   | Analysis Method   | : 1DIF.MTH |
| Report Created on: | 20 Jul 99 11:52 PM                     | Sample Amount     | : 0        |
| Last Recalib on    | : 02 JUL 99 04:08 PM                   | ISTD Amount       | :          |
| Multiplier         | : 1                                    |                   |            |



BH99-40-3-990713

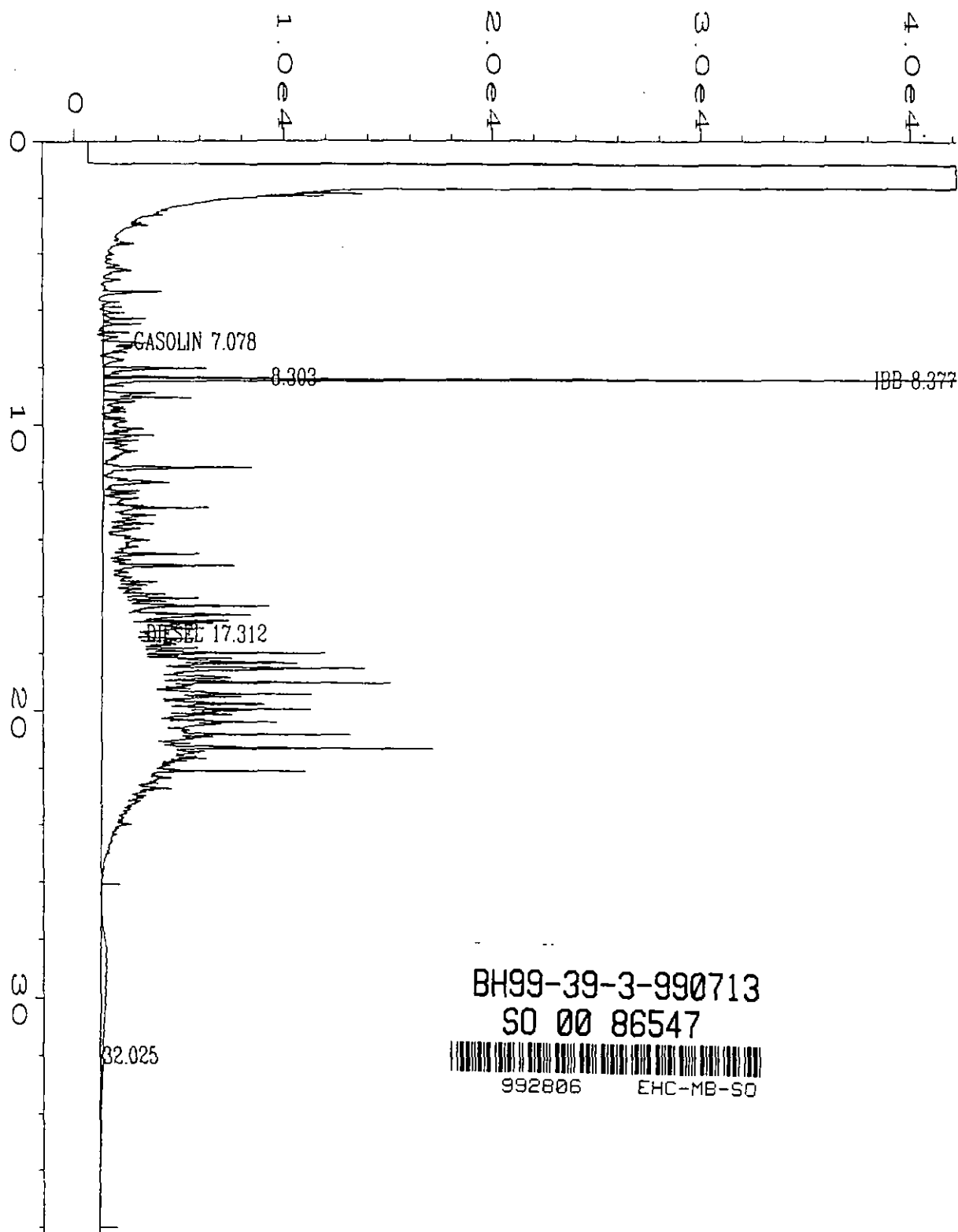
SO 00 86548



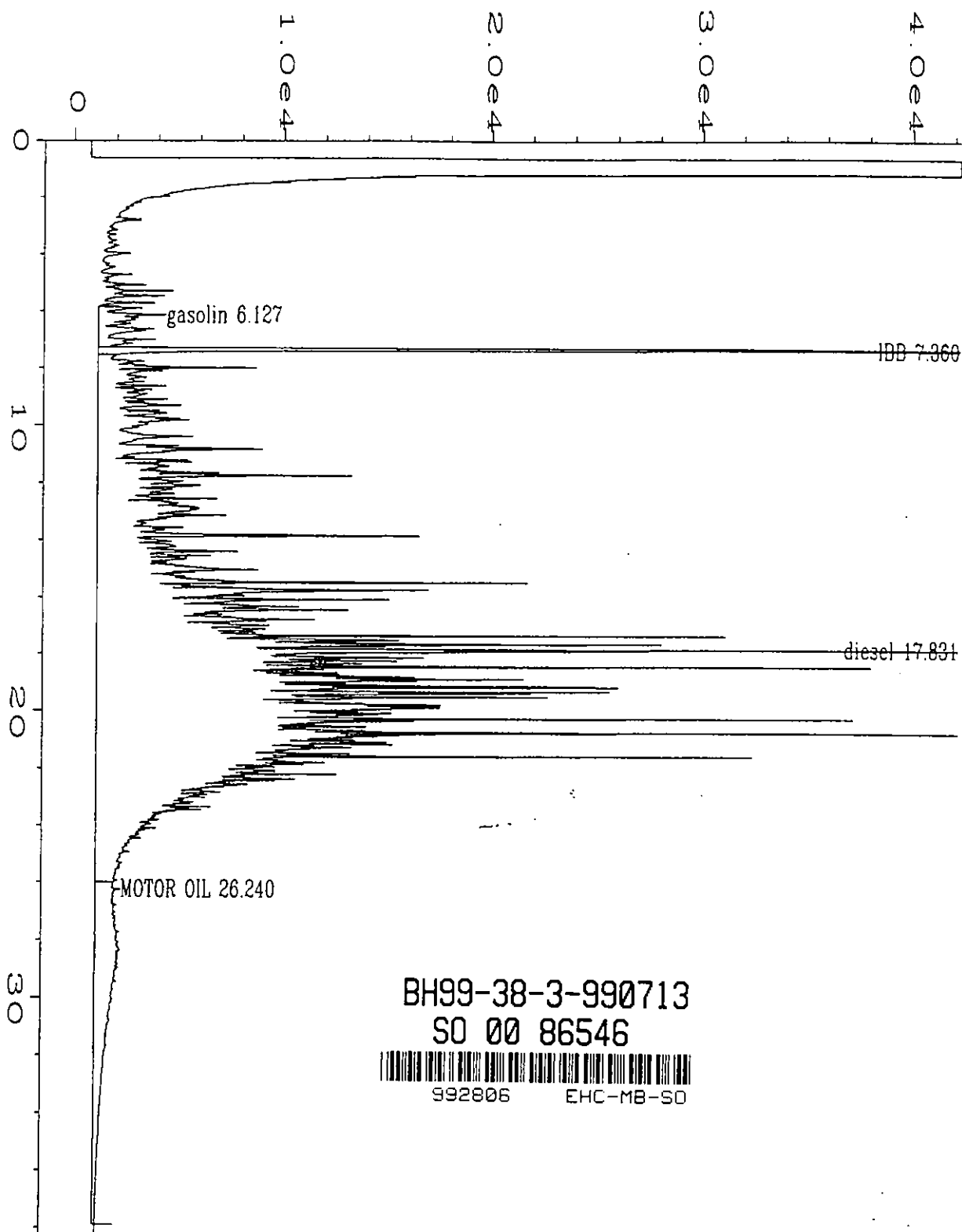
992806

EHC-MB-SO

|                   |                                        |                    |            |
|-------------------|----------------------------------------|--------------------|------------|
| ata File Name     | : C:\HPCHEM\1\DATA\JULY2099\016F0301.D | Page Number        | : 1        |
| erator            | : JEEVA                                | Vial Number        | : 16       |
| strument          | : INSTRUMEN                            | Injection Number   | : 1        |
| ample Name        | : 2806-22                              | Sequence Line      | : 3        |
| Time Bar Code:    |                                        | Instrument Method: | 1DIF.MTH   |
| quired on         | : 20 Jul 99 10:15 PM                   | Analysis Method    | : 1DIF.MTH |
| eport Created on: | 20 Jul 99 11:03 PM                     | Sample Amount      | : 0        |
| et Recalib on     | : 02 JUL 99 04:08 PM                   | ISTD Amount        | :          |
| tiplier           | : 1                                    |                    |            |



|                      |                                        |                   |            |
|----------------------|----------------------------------------|-------------------|------------|
| Sample File Name     | : C:\HPCHEM\1\DATA\JULY2199\055R0101.D | Page Number       | : 1        |
| Operator             | : JEEVA                                | Vial Number       | : 55       |
| Instrument           | : INSTRUMEN                            | Injection Number  | : 1        |
| Sample Name          | : 2806-21DF10                          | Sequence Line     | : 1        |
| Print Time Bar Code: |                                        | Instrument Method | : 1DIF.MTH |
| Acquired on          | : 21 Jul 99 11:22 AM                   | Analysis Method   | : 1DIR.MTH |
| Report Created on:   | : 21 Jul 99 12:11 PM                   | Sample Amount     | : 0        |
| Next Recalib on      | : 02 JUL 99 04:19 PM                   | ISTD Amount       | :          |
| Multiplier           | : 1                                    |                   |            |



BH99-38-3-990713

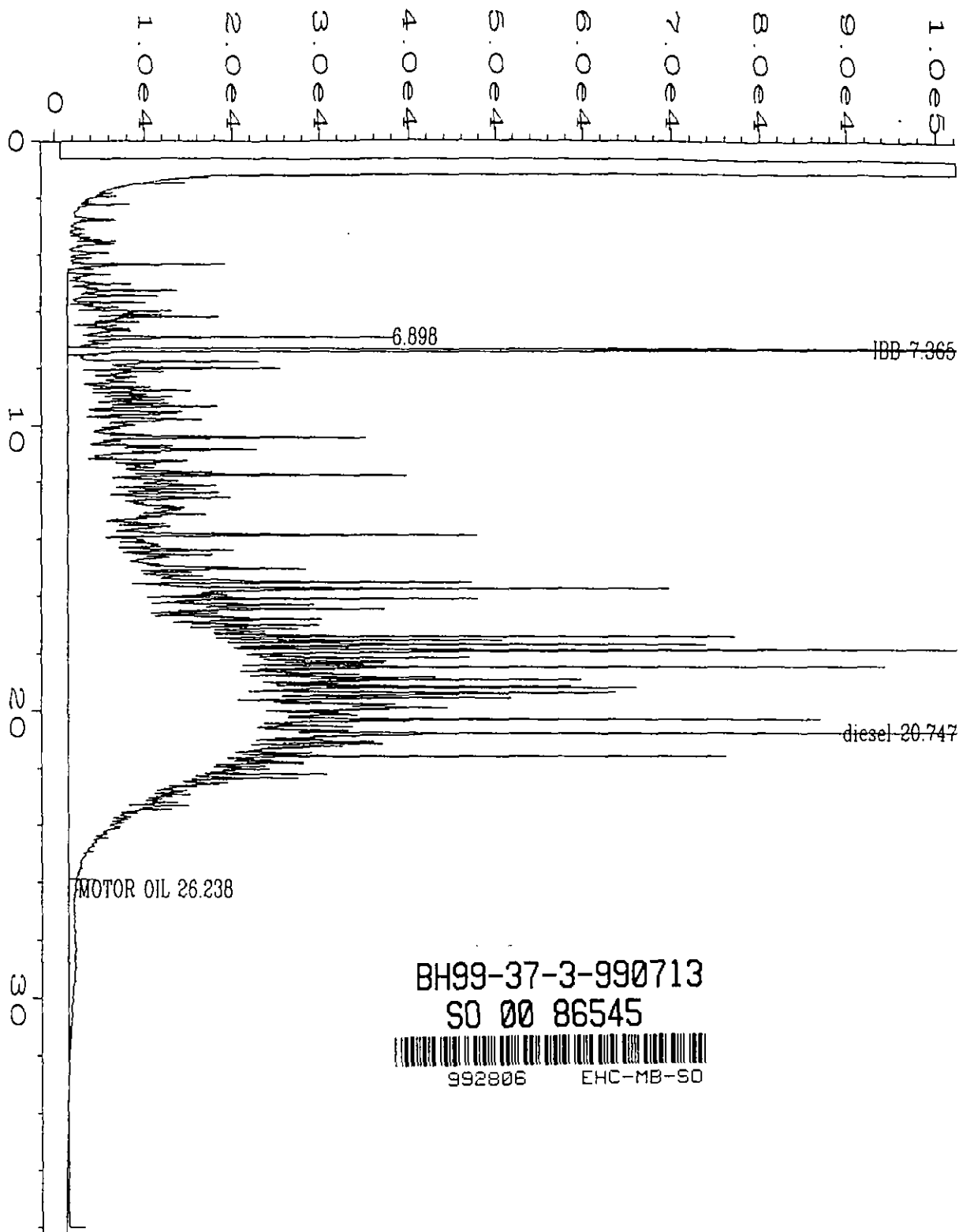
SO 00 86546



992806

EHC-MB-SO

|                    |                                        |                    |            |
|--------------------|----------------------------------------|--------------------|------------|
| Data File Name     | : C:\HPCHEM\1\DATA\JULY2099\014F0301.D | Page Number        | : 1        |
| Operator           | : JEEVA                                | Vial Number        | : 14       |
| Instrument         | : INSTRUMEN                            | Injection Number   | : 1        |
| Sample Name        | : 2806-19                              | Sequence Line      | : 3        |
| Run Time Bar Code: |                                        | Instrument Method: | 1DIF.MTH   |
| Acquired on        | : 20 Jul 99 08:38 PM                   | Analysis Method    | : 1DIF.MTH |
| Report Created on: | 21 Jul 99 04:42 PM                     | Sample Amount      | : 0        |
| Last Recalib on    | : 02 JUL 99 04:08 PM                   | ISTD Amount        | :          |
| Multiplier         | : 1                                    |                    |            |



user modified

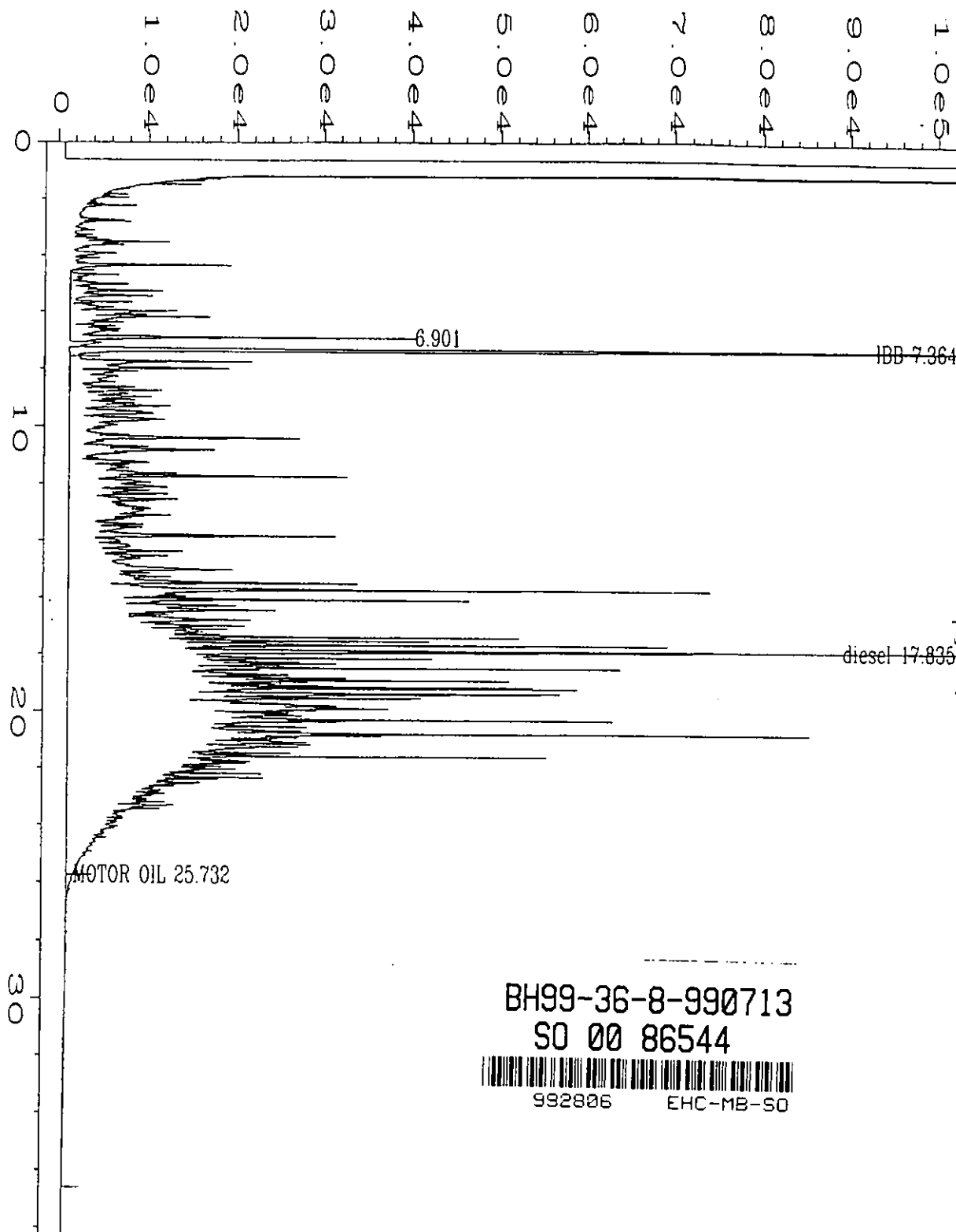
BH99-37-3-990713  
SO 00 86545



992806

EHC-MB-SO

|                   |                                        |                    |            |
|-------------------|----------------------------------------|--------------------|------------|
| ata File Name     | : C:\HPCHEM\1\DATA\JULY2099\013F0301.D | Page Number        | : 1        |
| perator           | : JEEVA                                | Vial Number        | : 13       |
| nstrument         | : INSTRUMEN                            | Injection Number   | : 1        |
| ample Name        | : 2806-18                              | Sequence Line      | : 3        |
| un Time Bar Code: |                                        | Instrument Method: | 1DIF.MTH   |
| cquired on        | : 20 Jul 99 07:49 PM                   | Analysis Method    | : 1DIF.MTH |
| eport Created on: | 21 Jul 99 03:37 PM                     | Sample Amount      | : 0        |
| ast Recalib on    | : 02 JUL 99 04:08 PM                   | ISTD Amount        | :          |
| ultiplier         | : 1                                    |                    |            |



user modified

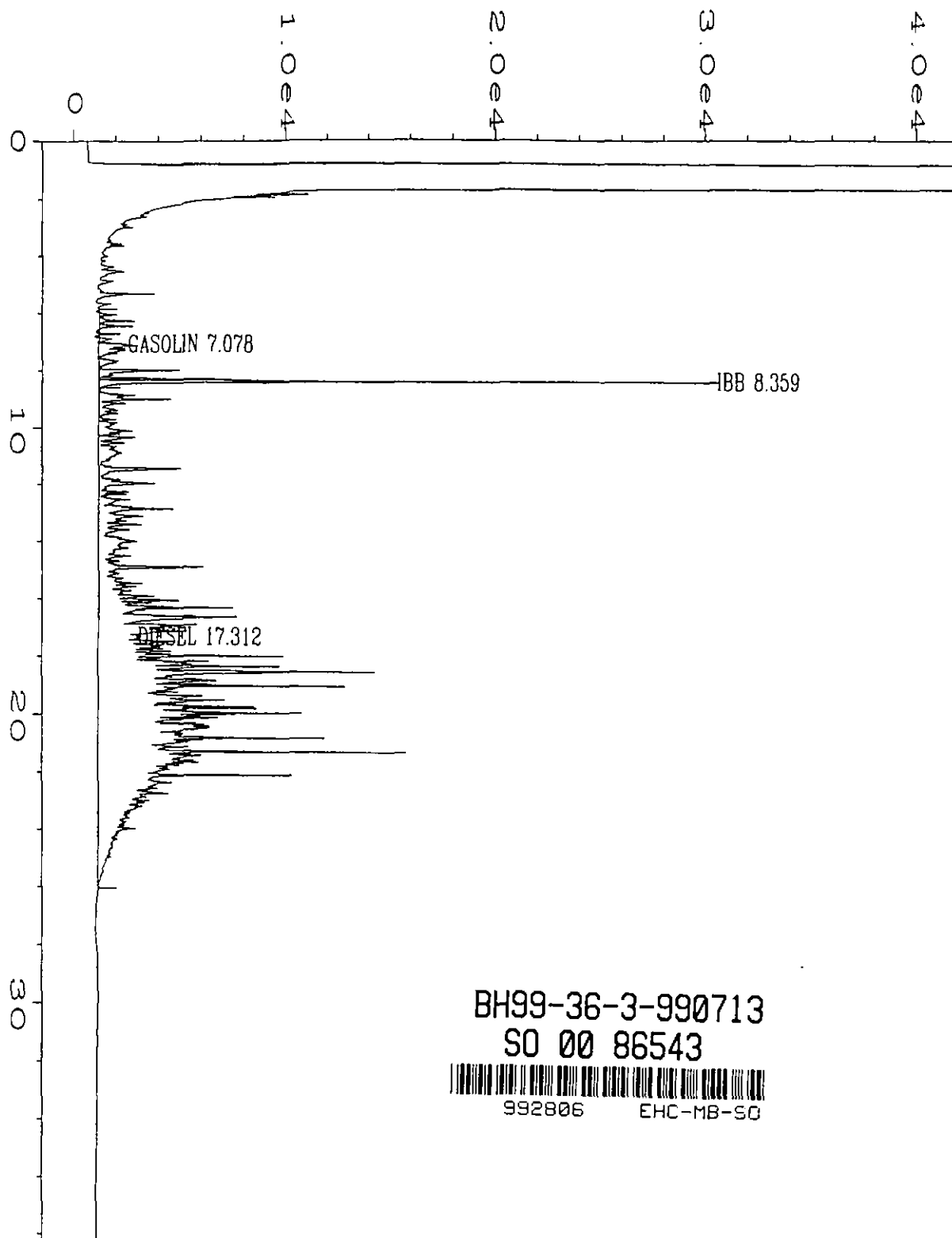
BH99-36-8-990713  
SO 00 86544



992806

EHC-MB-SO

|                    |                                        |                    |            |
|--------------------|----------------------------------------|--------------------|------------|
| File Name          | : C:\HPCHEM\1\DATA\JULY2099\012F0301.D | Page Number        | : 1        |
| Operator           | : JEEVA                                | Vial Number        | : 12       |
| Instrument         | : INSTRUMEN                            | Injection Number   | : 1        |
| Sample Name        | : 2806-17                              | Sequence Line      | : 3        |
| Time Bar Code:     |                                        | Instrument Method: | 1DIF.MTH   |
| Acquired on        | : 20 Jul 99 06:59 PM                   | Analysis Method    | : 1DIF.MTH |
| Report Created on: | 21 Jul 99 03:33 PM                     | Sample Amount      | : 0        |
| Recalib on         | : 02 JUL 99 04:08 PM                   | ISTD Amount        | :          |
| Multiplier         | : 1                                    |                    |            |

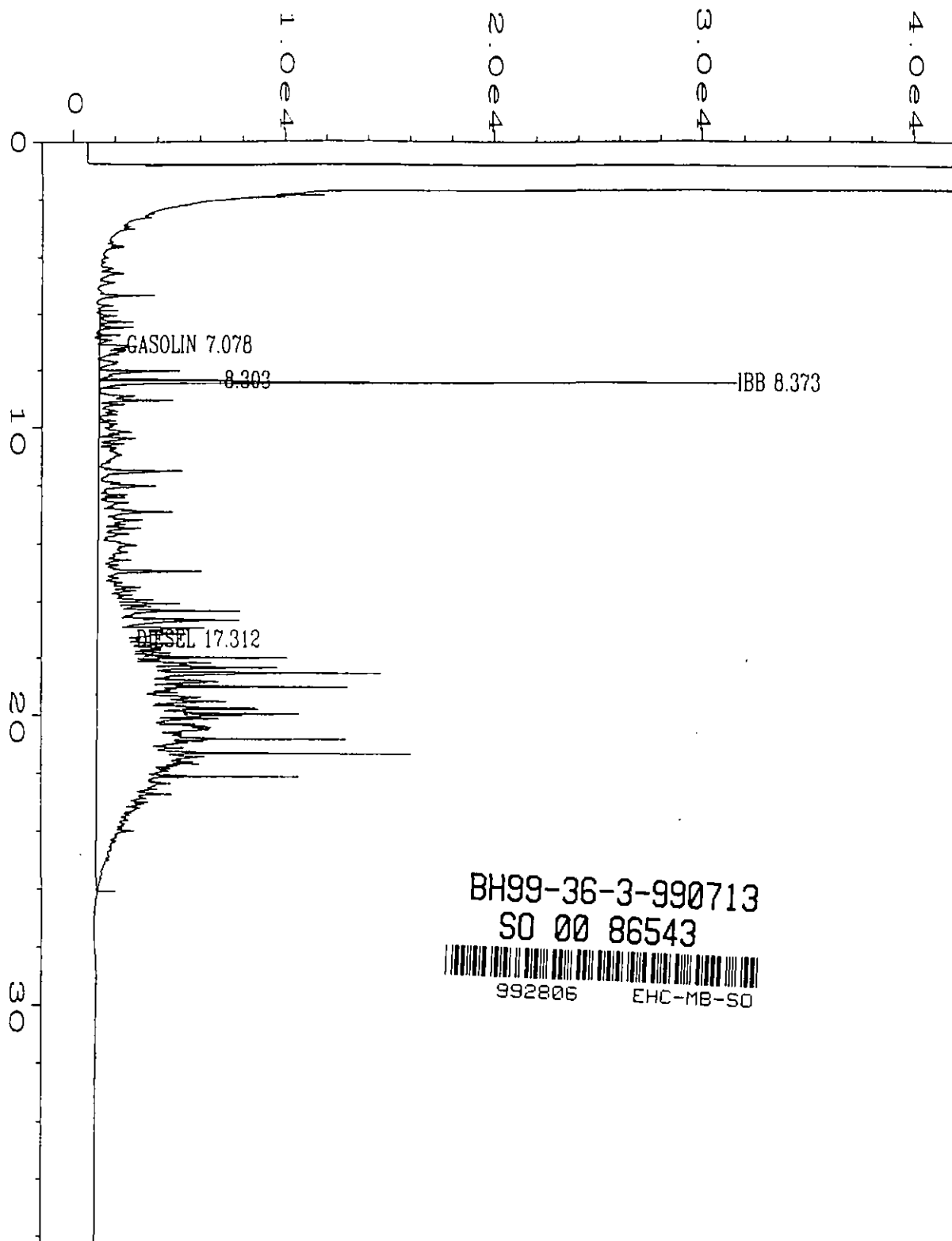


BH99-36-3-990713  
SO 00 86543



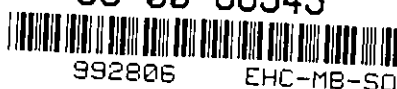
EHC-MB-SO

|                  |                                        |                    |            |
|------------------|----------------------------------------|--------------------|------------|
| ta File Name     | : C:\HPCHEM\1\DATA\JULY2199\057R0401.D | Page Number        | : 1        |
| erator           | : JEEVA                                | Vial Number        | : 57       |
| strument         | : INSTRUMEN                            | Injection Number   | : 1        |
| mple Name        | : 2806-16QCDF10                        | Sequence Line      | : 4        |
| n Time Bar Code: |                                        | Instrument Method: | 1DIF.MTH   |
| quired on        | : 21 Jul 99 04:41 PM                   | Analysis Method    | : 1DIR.MTH |
| port Created on: | 21 Jul 99 05:30 PM                     | Sample Amount      | : 0        |
| st Recalib on    | : 02 JUL 99 04:19 PM                   | ISTD Amount        | :          |
| ltiplier         | : 1                                    |                    |            |



BH99-36-3-990713

SO 00 86543



992806

EHC-MB-SO

Data File Name : C:\HPCHEM\1\DATA\JULY2199\056R0201.D

Operator : JEEVA

Instrument : INSTRUMEN

Sample Name : 2806-15DF10

Run Time Bar Code:

Acquired on : 21 Jul 99 01:26 PM

Report Created on: 21 Jul 99 02:15 PM

Last Recalib on : 02 JUL 99 04:19 PM

Multiplier : 1

Page Number : 1

Vial Number : 56

Injection Number : 1

Sequence Line : 2

Instrument Method: 1DIF.MTH

Analysis Method : 1DIR.MTH

Sample Amount : 0

ISTD Amount :



Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: July 15/1999  
Date Reported: July 22/1999  
Lab Ref#: G992806  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084WstnYrd  
Client Ref#: W8140B  
Sampled By: JDT

### Certificate of Analysis

Analysis Performed: Mineral Oil and Grease(Gravimetric)

Methodology: 1) Analysis of Mineral Oil and Grease gravimetrically in soil.  
U.S. EPA Method No. 413.1

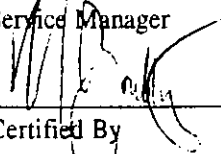
Instrumentation: 1) Sartorius Research Balance, Model R200D

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

  
\_\_\_\_\_  
Certified By  
Elaine Grant  
Service Manager

  
\_\_\_\_\_  
Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

# Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Date Reported: July 22/1999  
Lab Ref # : G992806  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084WstnYrd  
Client Ref#: W8140B

Analysis of Soil, expressed on a dry weight basis

| Parameter            | SAMPLE ID<br>(spike) | EQL | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|----------------------|----------------------|-----|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|                      |                      |     |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Mineral Oil & Grease | na                   | 100 | mg/kg | nd            | 200            | yes    | 94                 | 78             | 122            | yes    | na           | na     | na             | na             | na     | yes                         |

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence

\* = Unavailable due to dilution required for analysis

na = Not Applicable

ns = Insufficient Sample Submitted

nd = parameter not detected

TR = trace level less than EQL

## Report of Analysis

Report Date: July 22/1999  
Lab Ref # : G992806  
Lab Quote #: 96-W238-VG  
Client PO#: EE98084WstnYrd  
Client Ref#: W8140B

### Analysis of Soil, expressed on a dry weight basis

| Parameter            | EQL | Units | BH99-38-3-<br>990713<br>1999/07/13 | BH99-38-3-<br>990713<br>Replicate | BH99-40-3-<br>990713<br>1999/07/13 |  |  |
|----------------------|-----|-------|------------------------------------|-----------------------------------|------------------------------------|--|--|
| Mineral Oil & Grease | 100 | mg/kg | 437                                | 458                               | 146                                |  |  |

Page 1 of 1

Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6  
  
Fax: 204-477-9194  
  
Attn: Alex Man

Date Received: July 15/1999  
Date Reported: July 22/1999  
Lab Ref#: G992807  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084WstnYrd  
Client Ref#: W8140B  
Sampled By: JDT

### Certificate of Analysis

Analysis Performed: Extractable Hydrocarbons(Manitoba Guidelines), C11-C32  
BTEX and Total Volatile Hydrocarbons(Manitoba Criteria)

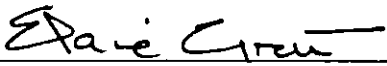
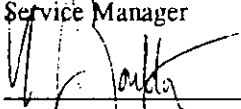
Methodology: 1) The characterization of HydroCarbon in soil by GC  
analysis, following a solvent extraction.  
U.S. EPA Method No.8011(microextraction)  
2) Analysis of Benzene, Toluene, Ethylbenzene, Xylenes &  
Volatile Hydrocarbons by Static Headspace Capillary GC-P  
ID/FID. External std quantitation with Surrogate stds.  
U.S. EPA Method No. 3810(Modification)

Instrumentation: 1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S  
2) Varian 3400 GC PID/FID, Genesis Headspace Analyzer

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

  
\_\_\_\_\_  
Certified By  
Elaine Grant  
Service Manager  
  
\_\_\_\_\_  
Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

# Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Date Reported: July 22/1999  
Lab Ref # : G992807  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084WstnYrd  
Client Ref#: W8140B

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | SAMPLE ID<br>(spike) | EQL  | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|------------------------------------------|----------------------|------|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|                                          |                      |      |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Total SemiVolatile Hydrocarbons(C11-C32) | na                   | 10.0 | mg/kg | nd            | 20.0           | yes    | 88                 | 70             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Benzene                                  | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 106                | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Ethylbenzene                             | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 120                | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Toluene                                  | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 108                | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Total Volatile Hydrocarbons              | na                   | 10   | mg/kg | nd            | 10             | yes    | 91                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Xylenes(Total)                           | na                   | 0.04 | mg/kg | nd            | 0.08           | yes    | 112                | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence

\* = Unavailable due to dilution required for analysis

na = Not Applicable

ns = Insufficient Sample Submitted

nd = parameter not detected

TR = trace level less than EQL

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Report Date: July 22/1999  
Lab Ref # : G992807  
Lab Quote #: 96-W238-VG  
Client PO#: EE98084WstnYrd  
Client Ref#: W8140B

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | EQL  | Units | BH99-43-2-<br>990714<br>1999/07/14 | BH99-43-2-<br>990714<br>Replicate | BH99-44-4-<br>990714<br>1999/07/14 | BH99-46-2-<br>990714<br>1999/07/14 | BH99-48-1-<br>990714<br>1999/07/14 |
|------------------------------------------|------|-------|------------------------------------|-----------------------------------|------------------------------------|------------------------------------|------------------------------------|
| Resemblance                              | na   | na    | EDMO?                              | EDMO?                             | PDMO                               | PDMO                               | EMO?                               |
| Total SemiVolatile Hydrocarbons(C11-C32) | 10.0 | mg/kg | 6720                               | 6910                              | 1300                               | 5260                               | 521                                |
| Benzene                                  | 0.02 | mg/kg | nd                                 | nd                                | nd                                 | nd                                 | -                                  |
| Ethylbenzene                             | 0.02 | mg/kg | 0.98                               | 0.97                              | 0.15                               | 0.16                               | -                                  |
| Toluene                                  | 0.02 | mg/kg | 0.14                               | 0.14                              | nd                                 | nd                                 | -                                  |
| Total Volatile Hydrocarbons              | 10   | mg/kg | 446                                | 444                               | 94                                 | 155                                | -                                  |
| Xylenes(Total)                           | 0.04 | mg/kg | 6.50                               | 6.60                              | 0.62                               | 0.71                               | -                                  |

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

- Not Requested

EDMO? Contaminant elutes across the diesel/motor oil range but does not match reference standards.

EMO? Contaminant elutes in the motor oil range but does not match reference standard.

na Not Applicable

nd parameter not detected ! = LOQ higher than listed due to dilution ( ) Adjusted LOQ

PDMO Predominantly Diesel with some Motor Oil.

## Report of Analysis

Report Date: July 22/1999  
Lab Ref # : G992807  
Lab Quote #: 96-W238-VG  
Client PO#: EE98084WstnYrd  
Client Ref#: W8140B

### Analysis of Soil, expressed on a dry weight basis

| Parameter                                | EQL  | Units | BH99-49-3-<br>990714<br>1999/07/14 |  |  |  |  |
|------------------------------------------|------|-------|------------------------------------|--|--|--|--|
| Resemblance                              | na   | na    | EKD?                               |  |  |  |  |
| Total SemiVolatile Hydrocarbons(C11-C32) | 10.0 | mg/kg | 2050                               |  |  |  |  |
| Benzene                                  | 0.02 | mg/kg | nd                                 |  |  |  |  |
| Ethylbenzene                             | 0.02 | mg/kg | 1.97                               |  |  |  |  |
| Toluene                                  | 0.02 | mg/kg | 0.14                               |  |  |  |  |
| Total Volatile Hydrocarbons              | 10   | mg/kg | 289                                |  |  |  |  |
| Xylenes(Total)                           | 0.04 | mg/kg | 4.39                               |  |  |  |  |

|      |                                                                                                      |
|------|------------------------------------------------------------------------------------------------------|
| EQL  | Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence. |
| EKD? | Contaminant elutes in the kerosene/diesel range but does not match reference standards.              |
| na   | Not Applicable                                                                                       |
| nd   | parameter not detected    ! = LOQ higher than listed due to dilution    ( ) Adjusted LOQ             |



AUG 23 1953

MOORE  
COLL

Date Received: July 15/1999  
Date Reported: August 12/1999  
Lab Ref#: G992807  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084WstnYrd  
Client Ref#: W8140B  
Sampled By: JDT

If you have any questions, please call Elaine Grant,  
your Service Manager at Philip Analytical Services Corp.

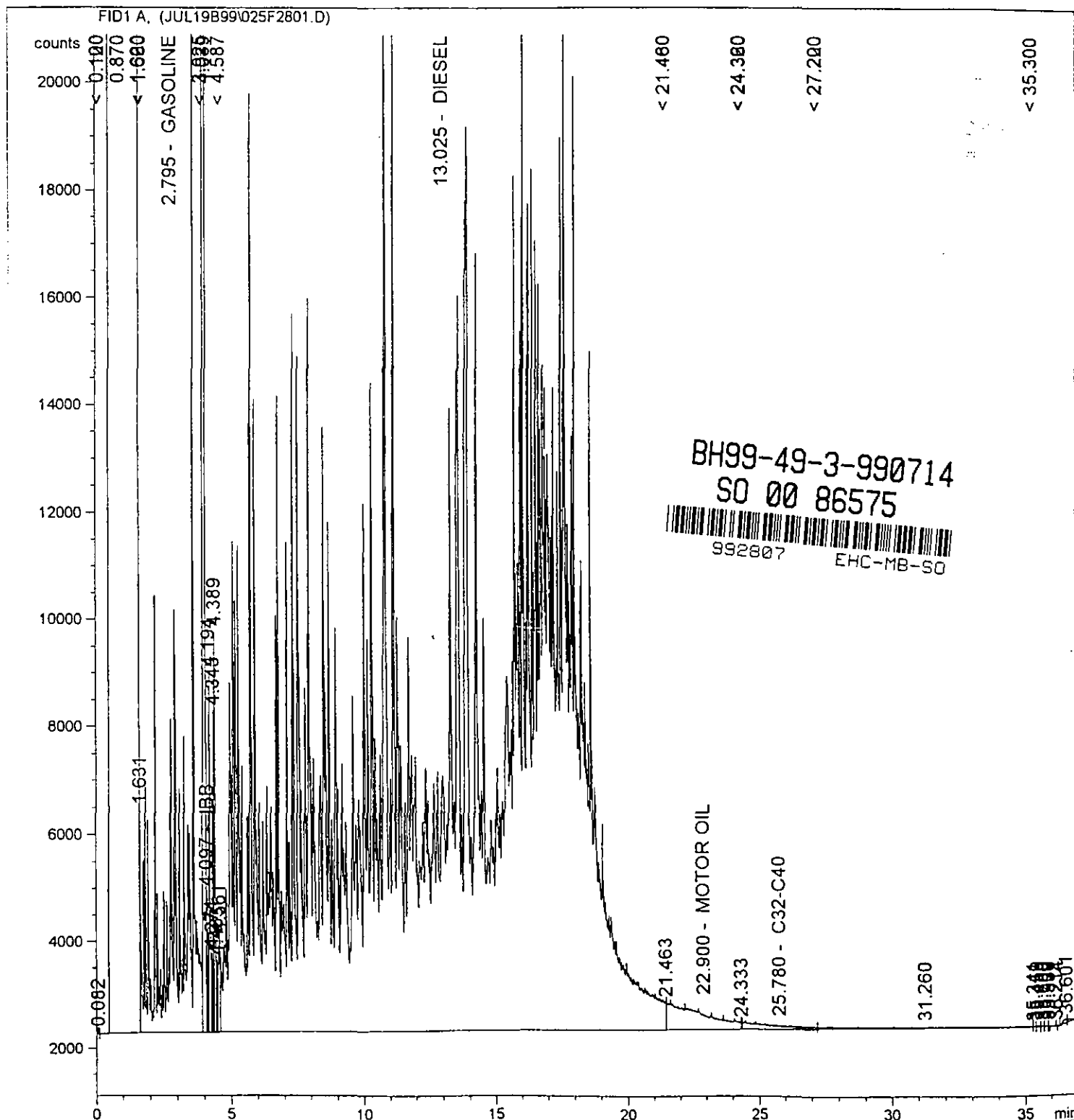
=====

|                |                         |            |        |
|----------------|-------------------------|------------|--------|
| Injection Date | : 07/20/1999 3:40:13 PM | Seq. Line  | : 28   |
| Sample Name    | : 2807-103              | Vial       | : 25   |
| Acq. Operator  | : D. MCLEOD             | Inj        | : 1    |
|                |                         | Inj Volume | : 1 µl |

Acq. Method : C:\HPCHEM\2\METHODS\4TPHIFA.M  
Last changed : 07/13/1999 12:49:33 PM by D. MCLEOD  
Analysis Method : C:\HPCHEM\2\METHODS\4TPHIFA.M  
Last changed : 07/21/1999 10:02:12 AM by D. MCLEOD  
(modified after loading)

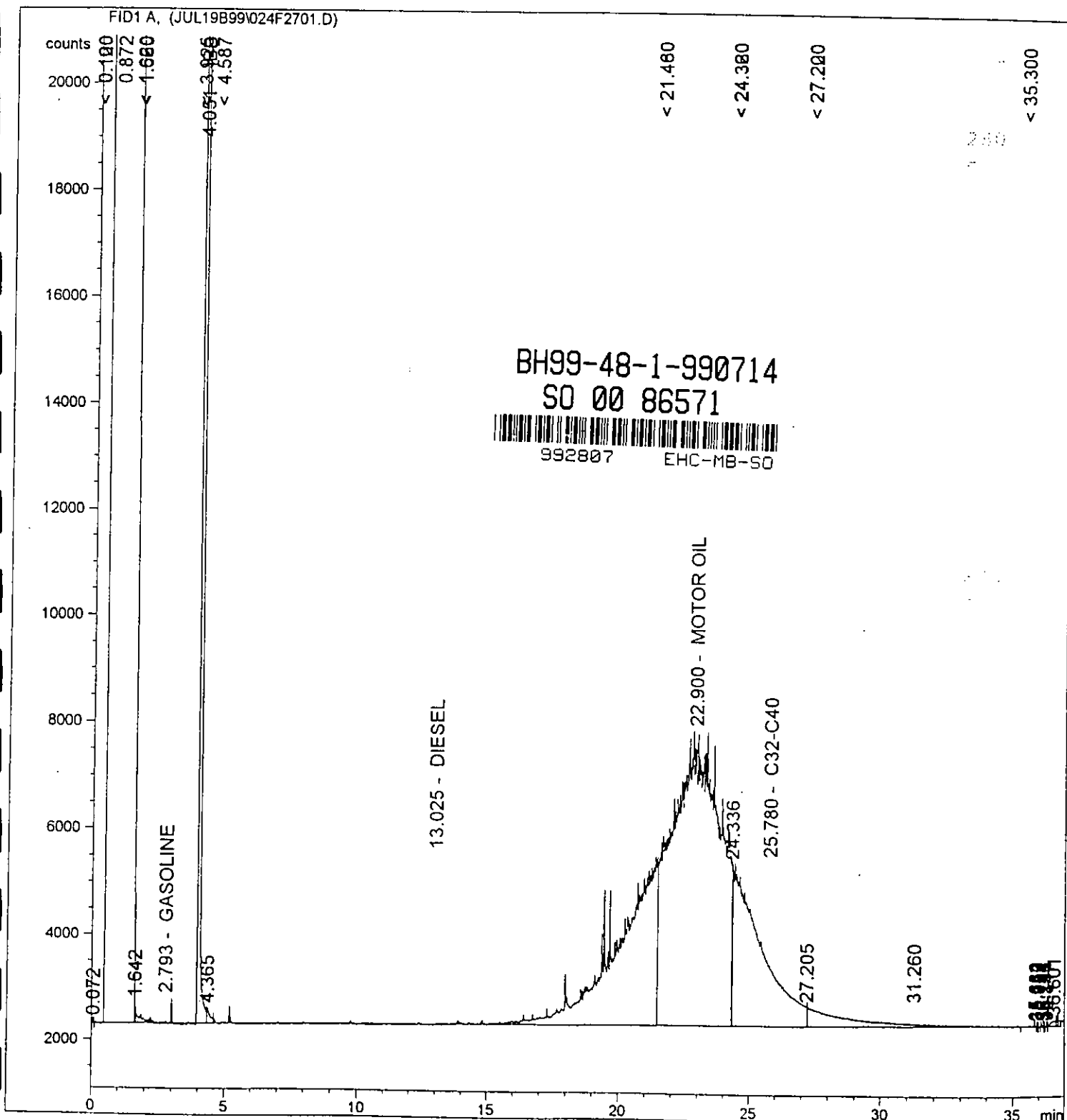
4TPHIF METHOD FOR FRONT CHANNEL ON FID IV-15M COLUMN DB-1,HT

=====



Injection Date : 07/20/1999 2:51:37 PM Seq. Line : 27  
 Sample Name : 2807-102 Vial : 24  
 Acq. Operator : D. MCLEOD Inj : 1  
 Inj Volume : 1 µl  
 Acq. Method : C:\HPCHEM\2\METHODS\4TPHIFA.M  
 Last changed : 07/13/1999 12:49:33 PM by D. MCLEOD  
 Analysis Method : C:\HPCHEM\2\METHODS\4TPHIFA.M  
 Last changed : 07/21/1999 10:02:12 AM by D. MCLEOD  
 (modified after loading)

4TPHIF METHOD FOR FRONT CHANNEL ON FID IV-15M COLUMN DB-1,HT

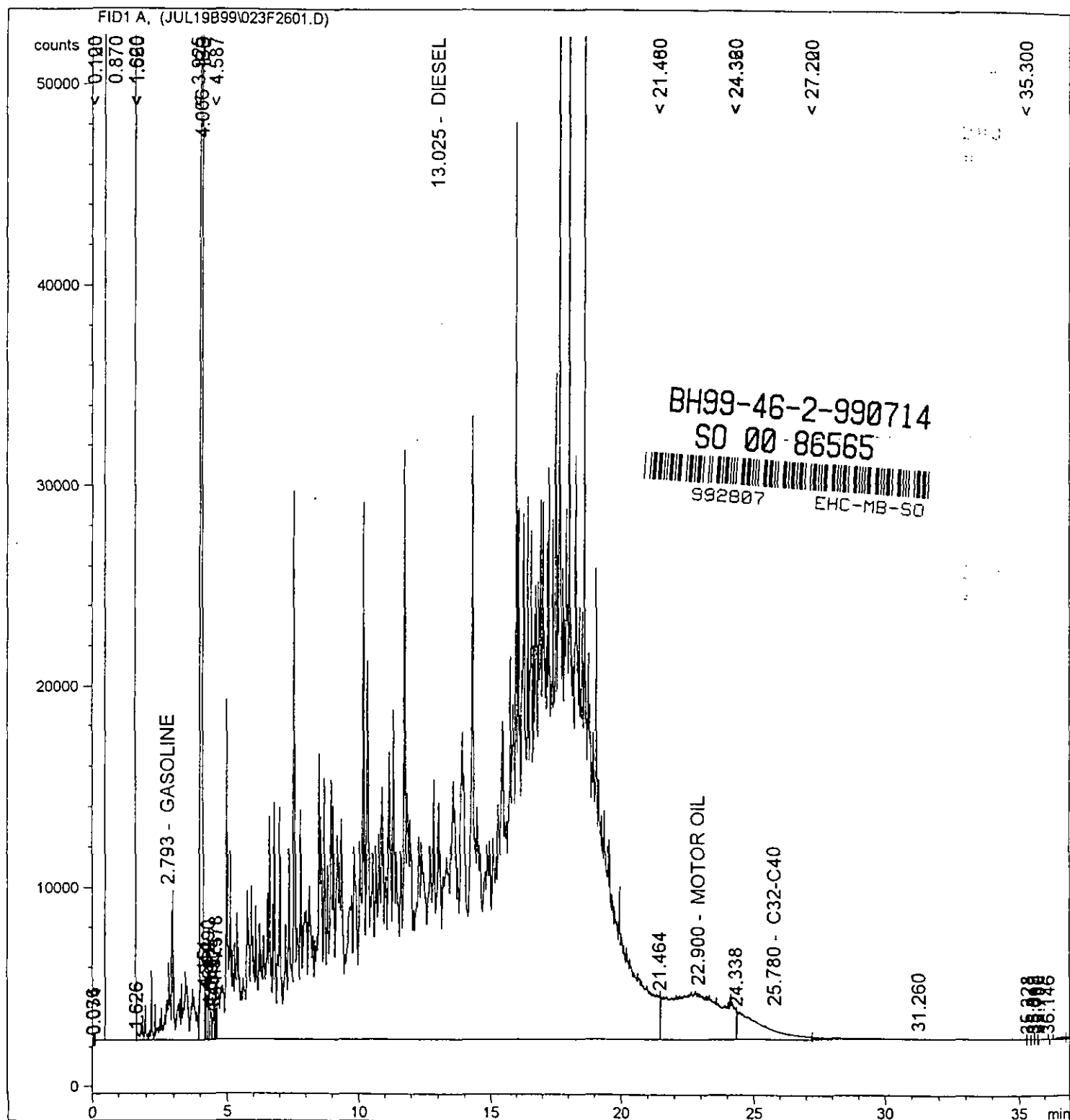


Injection Date : 07/20, 1999 2:03:22 PM  
Sample Name : 2807-101  
Acq. Operator : D. MCLEOD

Seq. Line : 26  
Vial : 23  
Inj : 1  
Inj Volume : 1  $\mu$ l

Acq. Method : C:\HPCHEM\2\METHODS\4TPHIFA.M  
Last changed : 07/13/1999 12:49:33 PM by D. MCLEOD  
Analysis Method : C:\HPCHEM\2\METHODS\4TPHIFA.M  
Last changed : 07/21/1999 10:01:04 AM by D. MCLEOD  
(modified after loading)

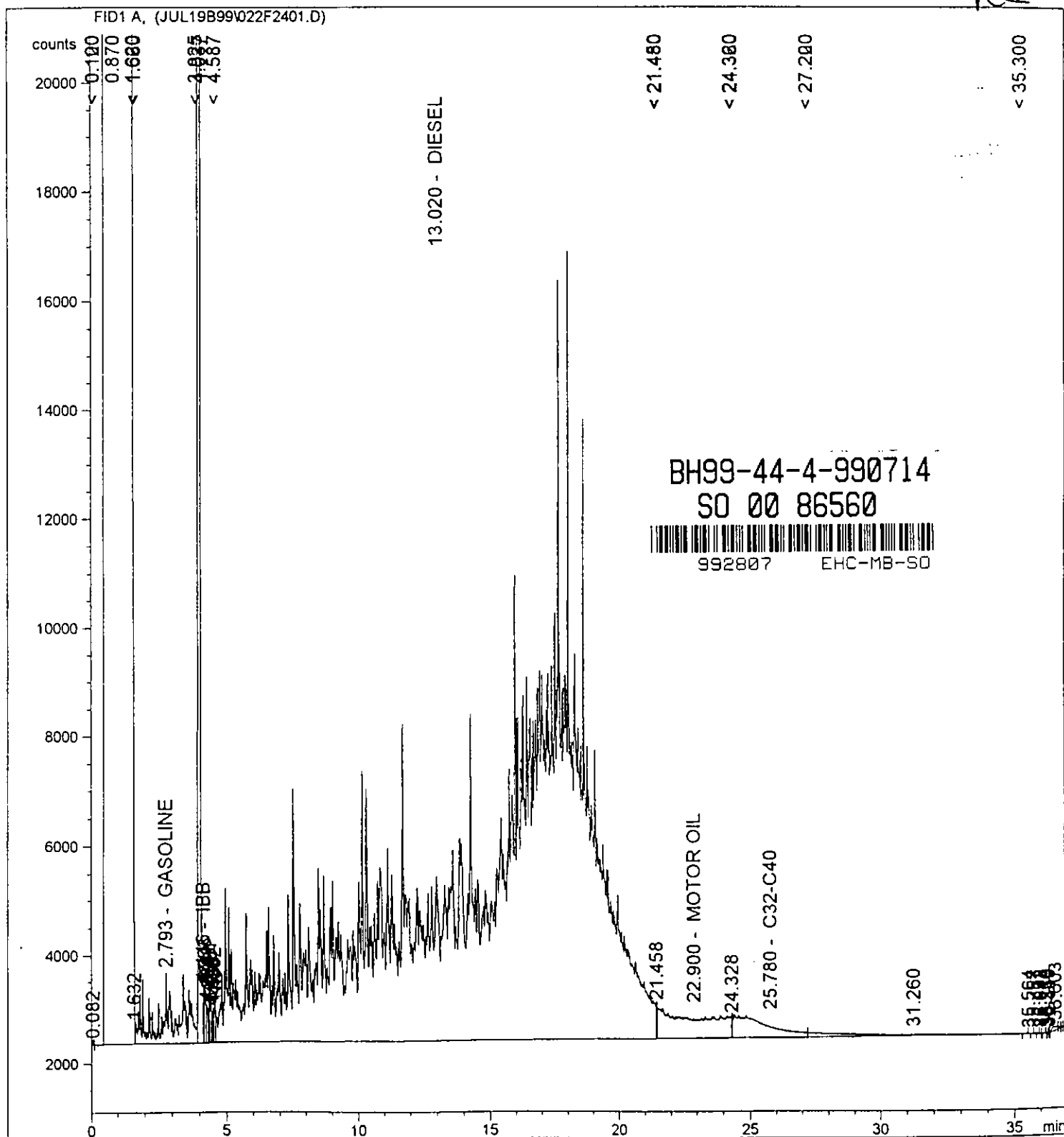
4TPHIF METHOD FOR FRONT CHANNEL ON FID IV-15M COLUMN DB-1,HT



Injection Date : 07/20/1999 12:27:09 PM  
Sample Name : 2807-100  
Acq. Operator : D. MCLEOD

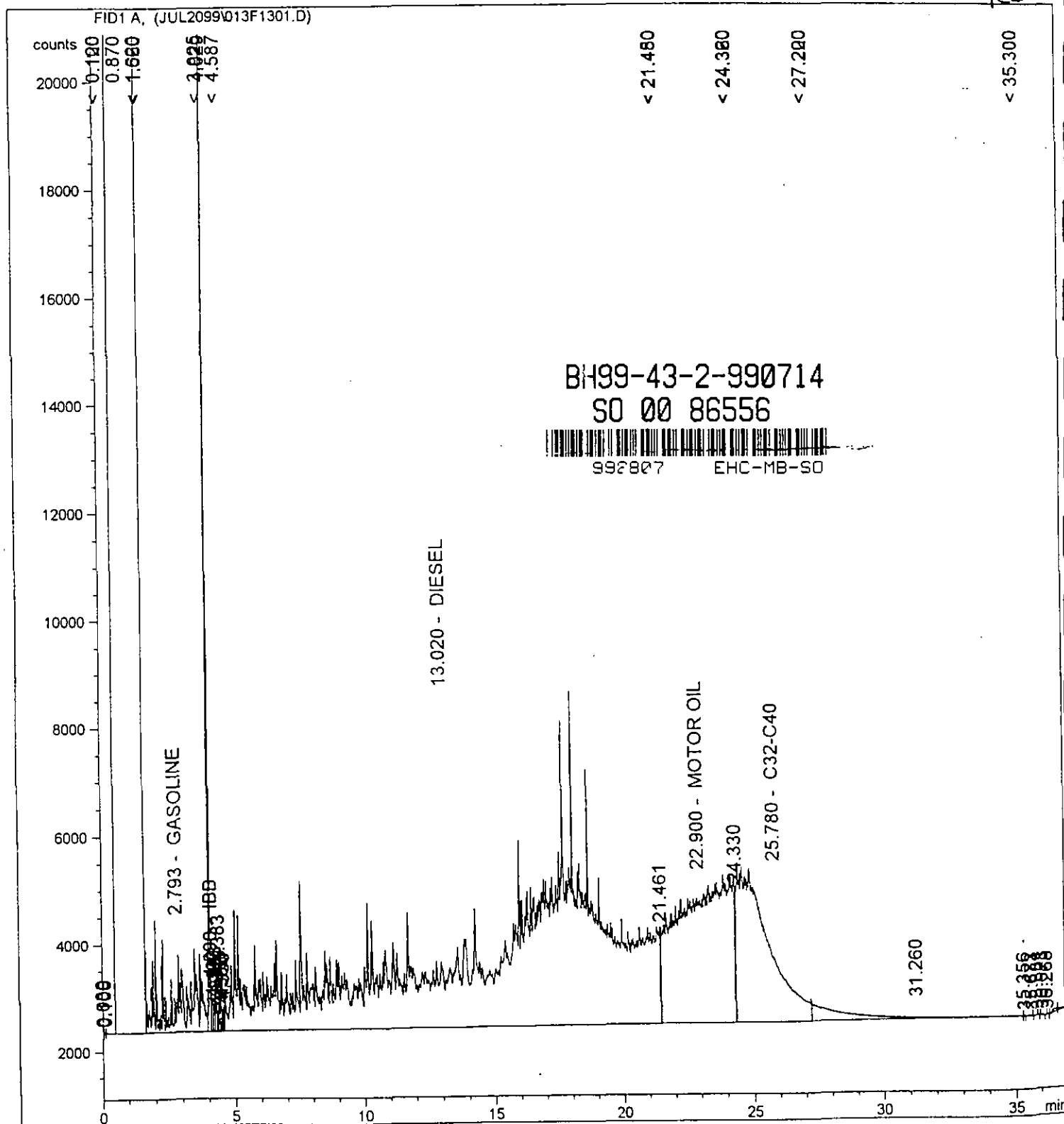
Seq. Line : 24  
Vial : 22  
Inj : 1  
Inj Volume : 1  $\mu$ l

Acq. Method : C:\HPCHEM\2\METHODS\4TPHIFA.M  
Last changed : 07/13/1999 12:49:33 PM by D. MCLEOD  
Analysis Method : C:\HPCHEM\2\METHODS\4TPHIFA.M  
Last changed : 07/20/1999 5:16:03 PM by D. MCLEOD  
4TPHIF METHOD FOR FRONT CHANNEL ON FID IV-15M COLUMN DB-1,HT



```
Seq. Line : 13
      Vial : 13
      Inj  : 1
Inj Volume : 1  $\mu$ l
```

```
Acq. Method      : C:\HPCHEM\2\METHODS\4TPHIFA.M
Last changed     : 07/20/1999 5:15:17 PM by D. MCLEOD
Analysis Method  : C:\HPCHEM\2\METHODS\4TPHIFA.M
Last changed     : 07/20/1999 5:16:03 PM by D. MCLEOD
4TPHIF METHOD FOR FRONT CHANNEL ON FID IV-15M COLUMN DB-1,HT
```

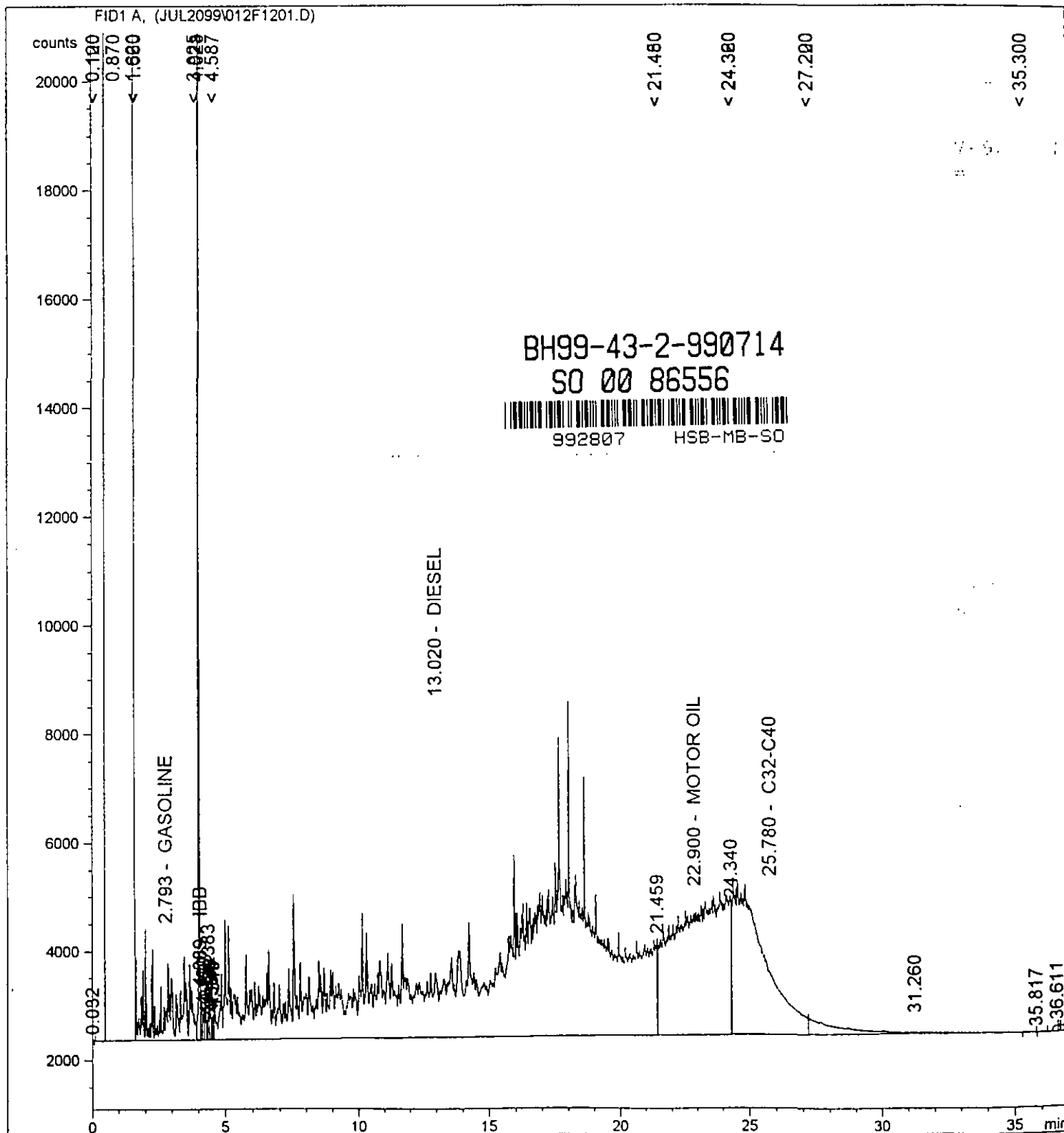


```

=====
Injection Date   : 07/21/1999 2:20:32 AM      Seq. Line   : 12
Sample Name     : 2807-98 10X                 Vial        : 12
Acq. Operator   : D. MCLEOD                   Inj         : 1
                                           Inj Volume  : 1 µl

Acq. Method     : C:\HPCHEM\2\METHODS\4TPHIFA.M
Last changed    : 07/20/1999 5:15:17 PM by D. MCLEOD
Analysis Method : C:\HPCHEM\2\METHODS\4TPHIFA.M
Last changed    : 07/20/1999 5:16:03 PM by D. MCLEOD
4TPHIF METHOD FOR FRONT CHANNEL ON FID IV-15M COLUMN DB-1, HT
=====
    
```

RF





Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: July 15/1999  
Date Reported: July 22/1999  
Lab Ref#: G992807  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084WstnYrd  
Client Ref#: W8140B  
Sampled By: JDT

### Certificate of Analysis

Analysis Performed: Particle Size Analysis(-10+200), wet sieving

Methodology: 1) Determination of particle size, by prescreening thru  
10 mesh sieve, followed by wet sieving thru 200 mesh  
screen. Expressed as % of total.  
Soil Sampling & Methods of Analysis 1978

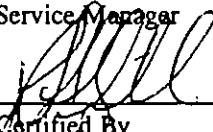
Instrumentation: 1) Wire Screen Sieves(10 mesh and 200 mesh)/Sartorius Research Balance

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

  
\_\_\_\_\_  
Certified By  
Elaine Grant  
Service Manager

  
\_\_\_\_\_  
Certified By  
for. N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

## Report of Analysis

Report Date: July 22/1999  
Lab Ref # : G992807  
Lab Quote #: 96-W238-VG  
Client PO#: EE98084WstnYrd  
Client Ref#: W8140B

### Analysis of Soil, expressed on a dry weight basis

[illegible]

Page 1 of 1



RECEIVED  
JUL 15 1999

Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: July 15/1999  
Date Reported: July 22/1999  
Lab Ref#: G992807  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084WstnYrd  
Client Ref#: W8140B  
Sampled By: JDT

### Certificate of Analysis

Analysis Performed: Mineral Oil and Grease(Gravimetric)

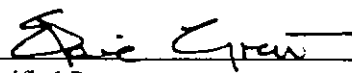
Methodology: 1) Analysis of Mineral Oil and Grease gravimetrically in soil.  
U.S. EPA Method No. 413.1

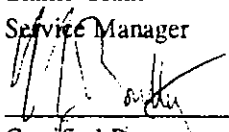
Instrumentation: 1) Sartorius Research Balance, Model R200D

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

  
\_\_\_\_\_  
Certified By  
Elaine Grant  
Service Manager

  
\_\_\_\_\_  
Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.



# Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.  
Contact: Alex Man

Date Reported: July 22/1999  
Lab Ref # : G992807  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084WstnYrd  
Client Ref#: W8140B

Analysis of Soil, expressed on a dry weight basis

| Parameter            | SAMPLE ID<br>(spike) | EQL | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|----------------------|----------------------|-----|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|                      |                      |     |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Mineral Oil & Grease | na                   | 100 | mg/kg | nd            | 200            | yes    | 96                 | 78             | 122            | yes    | na           | na     | na             | na             | na     | yes                         |

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence  
 \* = Unavailable due to dilution required for analysis  
 na = Not Applicable  
 ns = Insufficient Sample Submitted  
 nd = parameter not detected  
 TR = trace level less than EQL

## Report of Analysis

Report Date: July 22/1999  
Lab Ref # : G992807  
Lab Quote #: 96-W238-VG  
Client PO#: EE98084WstnYrd  
Client Ref#: W8140B

| Parameter            | EQL | Units | BH99-43-2-<br>990714<br>1999/07/14 | BH99-43-2-<br>990714<br>Replicate |  |  |  |
|----------------------|-----|-------|------------------------------------|-----------------------------------|--|--|--|
| Mineral Oil & Grease | 100 | mg/kg | 5010                               | 4920                              |  |  |  |

Page 1 of 1



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Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: Alex Man

Date Received: July 15/1999  
Date Reported: July 21/1999  
Lab Ref#: G992807  
Lab Quote#: 96-W238-VG  
Client PO#: EE98084WstnYrd  
Client Ref#: W8140B  
Sampled By: JDT

Attached are your results for PAH's

If you have any questions, please call Elaine Grant,  
your Service Manager at Philip Analytical Services Corp.



Client: Morrow Environmental Consultants Inc.  
Project Reference: W8140B  
Work Order Number: G992807B  
Matrix: Soil

**Polynuclear Aromatic Hydrocarbons (PAH's)**Units: Micrograms/gram ( $\mu\text{g/g}$ ) dry weight

Date: 21-Jul-99

| Compound               | EQL<br>$\mu\text{g/g}$ | BH99-48-1<br>990714<br>DF=4 |
|------------------------|------------------------|-----------------------------|
| Naphthalene            | 0.20                   | 0.31                        |
| 2-Methylnaphthalene    | 0.20                   | 0.41                        |
| 1-Methylnaphthalene    | 0.20                   | 0.25                        |
| Acenaphthylene         | 0.20                   | nd                          |
| Acenaphthene           | 0.20                   | nd                          |
| Fluorene               | 0.20                   | nd                          |
| Phenanthrene           | 0.20                   | 1.72                        |
| Anthracene             | 0.20                   | 0.37                        |
| Fluoranthene           | 0.20                   | 2.65                        |
| Pyrene                 | 0.20                   | 2.16                        |
| Benzo(a)anthracene     | 0.20                   | 1.28                        |
| Chrysene               | 0.20                   | 1.51                        |
| Benzo(b)fluoranthene   | 0.20                   | 1.60                        |
| Benzo(k)fluoranthene   | 0.20                   | 1.23                        |
| Benzo(a)pyrene         | 0.20                   | 1.34                        |
| Indeno(1,2,3-cd)pyrene | 0.20                   | 1.20                        |
| Dibenzo(a,h)anthracene | 0.20                   | 0.30                        |
| Benzo(ghi)perylene     | 0.20                   | 1.12                        |

**Surrogate Standard Recoveries (Control Limits)**

|                              |     |
|------------------------------|-----|
| Acenaphthene-d10 (25-125%)   | 65% |
| Anthracene-d10 (30-120%)     | 54% |
| Benzo(a)pyrene-d12 (35-120%) | 59% |



Client: Morrow Environmental Consultants Inc.  
 Project Reference: W8140B  
 Work Order Number: G992807B  
 Matrix: Soil

### Polynuclear Aromatic Hydrocarbons (PAH's)

Units: Micrograms/gram (µg/g) dry weight

Date: 21-Jul-99

| Compound                                       | EQL<br>µg/g | Method Blank |                |        | Spiked Method Blank |                |                |        |
|------------------------------------------------|-------------|--------------|----------------|--------|---------------------|----------------|----------------|--------|
|                                                |             | Result       | Upper<br>Limit | Accept | %<br>Recovery       | Lower<br>Limit | Upper<br>Limit | Accept |
| Naphthalene                                    | 0.05        | nd           | 0.05           | yes    | 81                  | 35             | 105            | yes    |
| 2-Methylnaphthalene                            | 0.05        | nd           | 0.05           | yes    | 85                  | 30             | 100            | yes    |
| 1-Methylnaphthalene                            | 0.05        | nd           | 0.05           | yes    | 83                  | 30             | 105            | yes    |
| Acenaphthylene                                 | 0.05        | nd           | 0.05           | yes    | 86                  | 35             | 110            | yes    |
| Acenaphthene                                   | 0.05        | nd           | 0.05           | yes    | 78                  | 35             | 105            | yes    |
| Fluorene                                       | 0.05        | nd           | 0.05           | yes    | 86                  | 40             | 110            | yes    |
| Phenanthrene                                   | 0.05        | nd           | 0.05           | yes    | 86                  | 50             | 110            | yes    |
| Anthracene                                     | 0.05        | nd           | 0.05           | yes    | 88                  | 50             | 110            | yes    |
| Fluoranthene                                   | 0.05        | nd           | 0.05           | yes    | 91                  | 50             | 120            | yes    |
| Pyrene                                         | 0.05        | nd           | 0.05           | yes    | 87                  | 50             | 120            | yes    |
| Benzo(a)anthracene                             | 0.05        | nd           | 0.05           | yes    | 90                  | 55             | 120            | yes    |
| Chrysene                                       | 0.05        | nd           | 0.05           | yes    | 90                  | 55             | 125            | yes    |
| Benzo(b)fluoranthene                           | 0.05        | nd           | 0.05           | yes    | 92                  | 50             | 125            | yes    |
| Benzo(k)fluoranthene                           | 0.05        | nd           | 0.05           | yes    | 90                  | 50             | 115            | yes    |
| Benzo(a)pyrene                                 | 0.05        | nd           | 0.05           | yes    | 88                  | 50             | 120            | yes    |
| Indeno(1,2,3-cd)pyrene                         | 0.05        | nd           | 0.05           | yes    | 94                  | 50             | 125            | yes    |
| Dibenzo(a,h)anthracene                         | 0.05        | nd           | 0.05           | yes    | 95                  | 50             | 125            | yes    |
| Benzo(ghi)perylene                             | 0.05        | nd           | 0.05           | yes    | 91                  | 50             | 125            | yes    |
| Surrogate Standard Recoveries (Control Limits) |             |              |                |        |                     |                |                |        |
| Acenaphthene-d10                               |             | 69%          |                |        | 69%                 | 25             | 125            | yes    |
| Anthracene-d10                                 |             | 64%          |                |        | 64%                 | 30             | 120            | yes    |
| Benzo(a)pyrene-d12                             |             | 79%          |                |        | 79%                 | 35             | 120            | yes    |



Client: Morrow Environmental Consultants Inc. **Polynuclear Aromatic Hydrocarbons (PAH's)**

Project Reference: W8140B

Work Order Number: G992807B

Matrix: Soil

Date: 21-Jul-99

Legend: EQL = Estimated Quantitation Limit  
nd = Not detected above EQL  
DF = Dilution Factor

Date received: July 15, 1999

Date extracted: July 19, 1999

Date analysed: July 21, 1999

#### ANALYTICAL METHOD:

The soil sample (10 grams wet weight) was mixed with sodium sulfate and extracted with a 1:1 mixture of dichloromethane/acetone. The extract was cleaned up using alumina column chromatography. Analysis was performed by gas chromatography/mass spectrometry using U.S. EPA Method 8270B (modified).

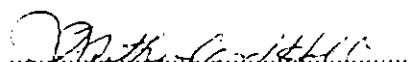
#### REPORT DISCUSSION:

The sample was run at a dilution factor due to elevated levels of nontarget compounds present which would cause contamination of the equipment if run undiluted. The quantitation limits for this sample are higher than the EQL's for undiluted samples as indicated above. The amounts reported have been corrected for the dilution factor that was used.

Note: Estimated quantitation limit is the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

*NOTE: All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analysis done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangement.*

JOB APPROVED BY:

  
Tasha Sutherland-Hill  
Chemist



Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: J. Derek Trinke

Date Received: July 17/1999  
Date Reported: October 26/1999  
Lab Ref#: G992864  
Lab Quote#: 96-W238-VG  
Client PO#: CP-WESTON  
Client Ref#: W8140B  
Sampled By: JDT

### Certificate of Analysis

Analysis Performed: Extractable Hydrocarbons(Manitoba Guidelines), C11-C32

Methodology: 1) The characterization of HydroCarbon in soil by GC  
analysis, following a solvent extraction.  
U.S. EPA Method No.8011(microextraction)

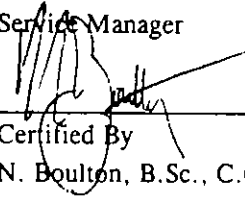
Instrumentation: 1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

  
Certified By  
Elaine Grant  
Service Manager

  
Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

# Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.  
Contact: J. Derek Trinke

Date Reported: October 26/1999  
Lab Ref # : G992864  
Lab Quote#: 96-W238-VG  
Client PO#: CP-WESTON  
Client Ref#: W8140B

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | SAMPLE ID<br>(spike) | EQL  | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|------------------------------------------|----------------------|------|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|                                          |                      |      |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Total SemiVolatile Hydrocarbons(C11-C32) | na                   | 10.0 | mg/kg | nd            | 20.0           | yes    | 101                | 70             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence  
 \* = Unavailable due to dilution required for analysis  
 na = Not Applicable  
 ns = Insufficient Sample Submitted  
 nd = parameter not detected  
 TR = trace level less than EQL

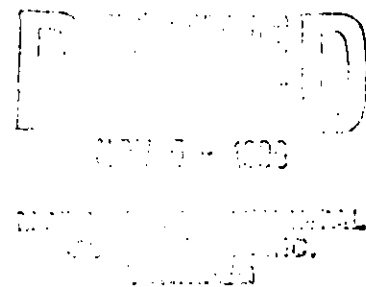
## Report of Analysis

Report Date: October 26/1999  
Lab Ref # : G992864  
Lab Quote #: 96-W238-VG  
Client PO#: CP-WESTON  
Client Ref#: W8140B

### Analysis of Soil, expressed on a dry weight basis

| Parameter                                | EQL  | Units | BH99-50-2-<br>990716<br>1999/07/16 | BH99-51-1-<br>990716<br>1999/07/16 | BH99-53-4-<br>990716<br>1999/07/16 | BH99-53-4-<br>990716<br>Replicate |  |
|------------------------------------------|------|-------|------------------------------------|------------------------------------|------------------------------------|-----------------------------------|--|
| Resemblance                              | na   | na    | EMO?                               | EKMO?                              | EMO?                               | -                                 |  |
| Total SemiVolatile Hydrocarbons(C11-C32) | 10.0 | mg/kg | 2110                               | 10300                              | 287                                | -                                 |  |

|       |                                                                                                      |
|-------|------------------------------------------------------------------------------------------------------|
| EQL   | Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence. |
| -     | Not Requested                                                                                        |
| EKMO? | Contaminant elutes across the kerosene/motor oil range but does not match our reference standards.   |
| EMO?  | Contaminant elutes in the motor oil range but does not match reference standard.                     |
| na    | Not Applicable                                                                                       |



Client: Morrow Environmental  
Project Reference: W8140B  
Work Order: G992864V  
Matrix: Soil

**VOLATILE ORGANIC COMPOUNDS**

Units: micrograms/gram (µg/g) dry weight

Date: 26-Oct-99

| Compound                               | EQL<br>µg/g | BH99-56-4-990716 | BH99-56-4-990716<br>Dup. | BH99-56-4-990716<br>Dup.2 |
|----------------------------------------|-------------|------------------|--------------------------|---------------------------|
| Chloromethane                          | 0.005       | nd               | nd                       | nd                        |
| Vinyl chloride                         | 0.003       | nd               | nd                       | nd                        |
| Bromomethane                           | 0.005       | nd               | nd                       | nd                        |
| Chloroethane                           | 0.005       | nd               | nd                       | nd                        |
| Trichlorofluoromethane                 | 0.005       | nd               | nd                       | nd                        |
| Acetone                                | 0.050       | nd               | nd                       | nd                        |
| 1,1-Dichloroethene                     | 0.002       | nd               | nd                       | nd                        |
| Dichloromethane (Methylene Chloride)   | 0.010       | nd               | nd                       | nd                        |
| trans-1,2-Dichloroethene               | 0.002       | nd               | nd                       | nd                        |
| Methyl-t-Butyl Ether                   | 0.002       | nd               | nd                       | nd                        |
| 1,1-Dichloroethane                     | 0.002       | nd               | nd                       | nd                        |
| Methyl Ethyl Ketone (MEK)              | 0.025       | nd               | nd                       | nd                        |
| cis-1,2-Dichloroethene                 | 0.002       | nd               | nd                       | nd                        |
| Chloroform                             | 0.002       | nd               | nd                       | nd                        |
| 1,2-Dichloroethane                     | 0.002       | nd               | nd                       | nd                        |
| 1,1,1-Trichloroethane                  | 0.002       | nd               | nd                       | nd                        |
| Carbon Tetrachloride                   | 0.002       | nd               | nd                       | nd                        |
| Benzene                                | 0.002       | nd               | nd                       | nd                        |
| 1,2-Dichloropropane                    | 0.002       | nd               | nd                       | nd                        |
| Trichloroethene                        | 0.002       | nd               | nd                       | nd                        |
| Bromodichloromethane                   | 0.002       | nd               | nd                       | nd                        |
| cis-1,3-Dichloropropene                | 0.002       | nd               | nd                       | nd                        |
| Methyl Isobutyl Ketone (MIBK)          | 0.025       | nd               | nd                       | nd                        |
| trans-1,3-Dichloropropene              | 0.002       | nd               | nd                       | nd                        |
| 1,1,2-Trichloroethane                  | 0.002       | nd               | nd                       | nd                        |
| Toluene                                | 0.002       | nd               | nd                       | nd                        |
| 2-Hexanone                             | 0.025       | nd               | nd                       | nd                        |
| Dibromochloromethane                   | 0.002       | nd               | nd                       | nd                        |
| 1,2-Dibromoethane (Ethylene dibromide) | 0.002       | nd               | nd                       | nd                        |
| Tetrachloroethene (Perchloroethylene)  | 0.002       | 0.046            | 0.113                    | 0.060                     |
| 1,1,1,2-Tetrachloroethane              | 0.002       | nd               | nd                       | nd                        |
| Chlorobenzene                          | 0.002       | nd               | nd                       | nd                        |
| Ethylbenzene                           | 0.002       | nd               | nd                       | nd                        |
| m-Xylene & p-Xylene                    | 0.002       | nd               | nd                       | nd                        |
| Bromoform                              | 0.002       | nd               | nd                       | nd                        |
| Styrene                                | 0.002       | nd               | nd                       | nd                        |
| 1,1,2,2-Tetrachloroethane              | 0.002       | nd               | nd                       | nd                        |
| o-Xylene                               | 0.002       | nd               | nd                       | nd                        |
| 1,3-Dichlorobenzene                    | 0.002       | nd               | nd                       | nd                        |
| 1,4-Dichlorobenzene                    | 0.002       | nd               | nd                       | nd                        |
| 1,2-Dichlorobenzene                    | 0.002       | nd               | nd                       | nd                        |

Surrogate Standard Recoveries:

Control Limits: 70-130%

|                      |      |      |      |
|----------------------|------|------|------|
| Dibromofluoromethane | 101% | 114% | 121% |
| Toluene-d8           | 102% | 103% | 101% |
| 4-Bromofluorobenzene | 93%  | 90%  | 84%  |

Client: Morrow Environmental  
Project Reference: W8140B  
Work Order: G992864V  
Matrix: Soil

# VOLATILE ORGANIC COMPOUNDS

Date: 26-Oct-99

Units: micrograms/gram (µg/g) dry weight

## Method Blank

## Spiked Method Blank

| Compound                               | EQL<br>µg/g | Result | Upper<br>Limit | Accept | %<br>Recovery | Lower<br>Limit | Upper<br>Limit | Accept |
|----------------------------------------|-------------|--------|----------------|--------|---------------|----------------|----------------|--------|
| Chloromethane                          | 0.005       | nd     | 0.005          | yes    | 91            | 70             | 130            | yes    |
| Vinyl chloride                         | 0.003       | nd     | 0.003          | yes    | 83            | 70             | 130            | yes    |
| Bromomethane                           | 0.005       | nd     | 0.005          | yes    | 97            | 70             | 130            | yes    |
| Chloroethane                           | 0.005       | nd     | 0.005          | yes    | 87            | 70             | 130            | yes    |
| Trichlorofluoromethane                 | 0.005       | nd     | 0.005          | yes    | 75            | 70             | 130            | yes    |
| Acetone                                | 0.050       | nd     | 0.050          | yes    | 88            | 60             | 140            | yes    |
| 1,1-Dichloroethene                     | 0.002       | nd     | 0.002          | yes    | 74            | 70             | 130            | yes    |
| Dichloromethane (Methylene Chloride)   | 0.010       | nd     | 0.010          | yes    | 97            | 70             | 130            | yes    |
| trans-1,2-Dichloroethene               | 0.002       | nd     | 0.002          | yes    | 84            | 70             | 130            | yes    |
| Methyl-t-Butyl Ether                   | 0.002       | nd     | 0.002          | yes    | 105           | 70             | 130            | yes    |
| 1,1-Dichloroethane                     | 0.002       | nd     | 0.002          | yes    | 91            | 70             | 130            | yes    |
| Methyl Ethyl Ketone (MEK)              | 0.025       | nd     | 0.025          | yes    | 97            | 60             | 140            | yes    |
| cis-1,2-Dichloroethene                 | 0.002       | nd     | 0.002          | yes    | 92            | 70             | 130            | yes    |
| Chloroform                             | 0.002       | nd     | 0.002          | yes    | 95            | 70             | 130            | yes    |
| 1,2-Dichloroethane                     | 0.002       | nd     | 0.002          | yes    | 108           | 70             | 130            | yes    |
| 1,1,1-Trichloroethane                  | 0.002       | nd     | 0.002          | yes    | 81            | 70             | 130            | yes    |
| Carbon Tetrachloride                   | 0.002       | nd     | 0.002          | yes    | 77            | 70             | 130            | yes    |
| Benzene                                | 0.002       | nd     | 0.002          | yes    | 83            | 70             | 130            | yes    |
| 1,2-Dichloropropane                    | 0.002       | nd     | 0.002          | yes    | 95            | 70             | 130            | yes    |
| Trichloroethene                        | 0.002       | nd     | 0.002          | yes    | 83            | 70             | 130            | yes    |
| Bromodichloromethane                   | 0.002       | nd     | 0.002          | yes    | 97            | 70             | 130            | yes    |
| cis-1,3-Dichloropropene                | 0.002       | nd     | 0.002          | yes    | 96            | 70             | 130            | yes    |
| Methyl Isobutyl Ketone (MIBK)          | 0.025       | nd     | 0.025          | yes    | 112           | 60             | 140            | yes    |
| trans-1,3-Dichloropropene              | 0.002       | nd     | 0.002          | yes    | 103           | 70             | 130            | yes    |
| 1,1,2-Trichloroethane                  | 0.002       | nd     | 0.002          | yes    | 104           | 70             | 130            | yes    |
| Toluene                                | 0.002       | nd     | 0.002          | yes    | 85            | 70             | 130            | yes    |
| 2-Hexanone                             | 0.025       | nd     | 0.025          | yes    | 103           | 60             | 140            | yes    |
| Dibromochloromethane                   | 0.002       | nd     | 0.002          | yes    | 104           | 70             | 130            | yes    |
| 1,2-Dibromoethane (Ethylene dibromide) | 0.002       | nd     | 0.002          | yes    | 104           | 70             | 130            | yes    |
| Tetrachloroethene (Perchloroethylene)  | 0.002       | nd     | 0.002          | yes    | 79            | 70             | 130            | yes    |
| 1,1,1,2-Tetrachloroethane              | 0.002       | nd     | 0.002          | yes    | 97            | 70             | 130            | yes    |
| Chlorobenzene                          | 0.002       | nd     | 0.002          | yes    | 93            | 70             | 130            | yes    |
| Ethylbenzene                           | 0.002       | nd     | 0.002          | yes    | 83            | 70             | 130            | yes    |
| m-Xylene & p-Xylene                    | 0.002       | nd     | 0.002          | yes    | 83            | 70             | 130            | yes    |
| Bromoform                              | 0.002       | nd     | 0.002          | yes    | 105           | 70             | 130            | yes    |
| Styrene                                | 0.002       | nd     | 0.002          | yes    | 92            | 70             | 130            | yes    |
| 1,1,2,2-Tetrachloroethane              | 0.002       | nd     | 0.002          | yes    | 105           | 70             | 130            | yes    |
| o-Xylene                               | 0.002       | nd     | 0.002          | yes    | 87            | 70             | 130            | yes    |
| 1,3-Dichlorobenzene                    | 0.002       | nd     | 0.002          | yes    | 94            | 70             | 130            | yes    |
| 1,4-Dichlorobenzene                    | 0.002       | nd     | 0.002          | yes    | 94            | 70             | 130            | yes    |
| 1,2-Dichlorobenzene                    | 0.002       | nd     | 0.002          | yes    | 97            | 70             | 130            | yes    |

## Surrogate Standard Recoveries:

|                      |      |     |     |    |     |     |
|----------------------|------|-----|-----|----|-----|-----|
| Dibromofluoromethane | 120% | yes | 102 | 70 | 130 | yes |
| Toluene-d8           | 105% | yes | 98  | 70 | 130 | yes |
| 4-Bromofluorobenzene | 87%  | yes | 102 | 70 | 130 | yes |



Client: Morrow Environmental  
Project Reference: W8140B  
Work Order: G992864V  
Matrix: Soil

**VOLATILE ORGANIC COMPOUNDS**

Date: 26-Oct-99

Legend: EQL = Estimated Quantitation Limit  
nd = Not Detected Above EQL  
Dup. = Duplicate

Date of sample receipt: July 17, 1999  
Date of sample analysis: July 19-20, 1999

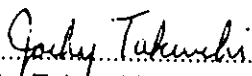
**Analytical Method:**

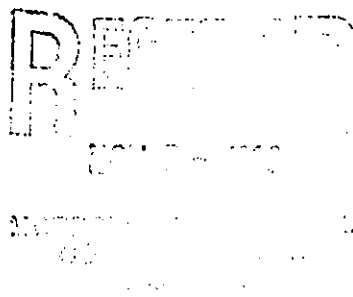
The soil samples were analysed by low level purge & trap (US EPA Method 5035) gas chromatography/ mass spectrometry using US EPA Method 8260B (modified).

Note: Estimated quantitation limit is the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

*NOTE: All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analysis done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangement.*

Job Approved By:

  
.....  
Jacky Takeuchi, B.A.Sc., C.Chem.  
Analytical Chemist



Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: J. Derek Trinke

Date Received: July 17/1999  
Date Reported: October 26/1999  
Lab Ref#: G992864  
Lab Quote#: 96-W238-VG  
Client PO#: CP-WESTON  
Client Ref#: W8140B  
Sampled By: JDT

### Certificate of Analysis

Analysis Performed: 17 Element ICP Scan  
ICP Alkaline Scan(Ca,Mg,Na,K,Sr), Digestion Required  
Particle Size Analysis(-10+200), wet sieving

Methodology: 1) Analysis of trace metals in soil by Inductively Coupled  
Plasma Spectrophotometry.  
U.S. EPA Method No. 6010  
(Ministry of Environment ELSCAN)  
2) Analysis of alkaline metals in soil by Inductively  
Coupled Plasma Spectrophotometry.  
U.S. EPA Method No. 6010  
(Ministry of Environment ELSCAN)  
3) Determination of particle size, by prescreening thru  
10 mesh sieve, followed by wet sieving thru 200 mesh  
screen. Expressed as % of total.  
Soil Sampling & Methods of Analysis 1978

Instrumentation: 1, 2) Thermo Jarrell Ash ICAP 61E Plasma Spectrophotometer  
3) Wire Screen Sieves(10 mesh and 200 mesh)/Sartorius Research Balance

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.



Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: J. Derek Trinke

Date Received: July 17/1999  
Date Reported: October 26/1999  
Lab Ref#: G992864  
Lab Quote#: 96-W238-VG  
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Client Ref#: W8140B  
Sampled By: JDT

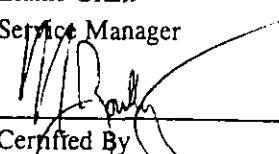
### Certificate of Analysis

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

  
\_\_\_\_\_  
Certified By  
Elaine Grant  
Service Manager

  
\_\_\_\_\_  
Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

# Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.  
Contact: J. Derek Trinke

Date Reported: October 26/1999  
Lab Ref # : G992864  
Lab Quote#: 96-W238-VG  
Client PO#: CP-WESTON  
Client Ref#: W8140B

Analysis of Soil, expressed on a dry weight basis

| Parameter  | SAMPLE ID<br>(spike) | EQL   | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|------------|----------------------|-------|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|            |                      |       |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Aluminum   | na                   | 20.0  | mg/kg | nd(b)         | 40.0           | yes    | 101                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Barium     | na                   | 5.0   | mg/kg | nd(b)         | 10.0           | yes    | 96                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Beryllium  | na                   | 0.2   | mg/kg | nd(b)         | 0.4            | yes    | 98                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Cadmium    | na                   | 0.3   | mg/kg | nd(b)         | 0.6            | yes    | 95                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Chromium   | na                   | 1.0   | mg/kg | nd(b)         | 2.0            | yes    | 95                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Cobalt     | na                   | 2.0   | mg/kg | nd(b)         | 4.0            | yes    | 99                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Copper     | na                   | 1.0   | mg/kg | nd(b)         | 4.0            | yes    | 100                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Iron       | na                   | 50.0  | mg/kg | nd(b)         | 100.0          | yes    | 96                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Lead       | na                   | 5.0   | mg/kg | nd(b)         | 10.0           | yes    | 96                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Manganese  | na                   | 1.0   | mg/kg | nd(b)         | 2.0            | yes    | 96                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Molybdenum | na                   | 3.0   | mg/kg | nd(b)         | 6.0            | yes    | 96                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Nickel     | na                   | 2.0   | mg/kg | nd(b)         | 4.0            | yes    | 101                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Phosphorus | na                   | 20.0  | mg/kg | nd(b)         | 40.0           | yes    | 102                | 70             | 130            | yes    | na           | na     | na             | na             | na     | yes                         |
| Silver     | na                   | 0.6   | mg/kg | nd(b)         | 1.2            | yes    | 95                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Titanium   | na                   | 1.0   | mg/kg | nd(b)         | 2.0            | yes    | 95                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Vanadium   | na                   | 1.0   | mg/kg | nd(b)         | 2.0            | yes    | 96                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Zinc       | na                   | 5.0   | mg/kg | nd(b)         | 10.0           | yes    | 99                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Calcium    | na                   | 50.0  | mg/kg | nd(b)         | 100.0          | yes    | 98                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Magnesium  | na                   | 20.0  | mg/kg | nd(b)         | 40.0           | yes    | 103                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Potassium  | na                   | 100.0 | mg/kg | 129(b)        | 200.0          | yes    | 87                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence

\* = Unavailable due to dilution required for analysis

na = Not Applicable

ns = Insufficient Sample Submitted

nd = parameter not detected

TR = trace level less than EQL

(b) = Analyte results on REPORT of ANALYSIS have been background corrected for the process blank.

Date Reported: October 26/1999  
Lab Ref # : G992864  
Lab Quote#: 96-W238-VG  
Client PO#: CP-WESTON  
Client Ref#: W8140B

[illegible]

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence  
 \* = Unavailable due to dilution required for analysis  
 na = Not Applicable  
 ns = Insufficient Sample Submitted  
 nd = parameter not detected  
 TR = trace level less than EQL

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.

Contact: J. Derek Trinke

Report Date: October 26/1999

Lab Ref # : G992864

Lab Quote #: 96-W238-VG

Client PO#: CP-WESTON

Client Ref#: W8140B

Analysis of Soil, expressed on a dry weight basis

| Parameter                          | EQL   | Units | BH99-50-2-<br>990716<br>1999/07/16 | BH99-51-1-<br>990716<br>1999/07/16 | BH99-53-4-<br>990716<br>1999/07/16 | BH99-53-4-<br>990716<br>Replicate | BH99-56-4-<br>990716<br>1999/07/16 |
|------------------------------------|-------|-------|------------------------------------|------------------------------------|------------------------------------|-----------------------------------|------------------------------------|
| Aluminum                           | 20.0  | mg/kg | 15900                              | 12600                              | 4270                               | 4290                              | -                                  |
| Barium                             | 5.0   | mg/kg | 151                                | 113                                | 40.5                               | 40.0                              | -                                  |
| Beryllium                          | 0.2   | mg/kg | 0.8                                | 0.6                                | nd                                 | 0.2                               | -                                  |
| Cadmium                            | 0.3   | mg/kg | 2.5                                | 0.4                                | nd                                 | nd                                | -                                  |
| Calcium                            | 50.0  | mg/kg | 19900                              | 67300                              | 119000                             | 118000                            | -                                  |
| Chromium                           | 1.0   | mg/kg | 38.3                               | 25.6                               | 9.7                                | 8.9                               | -                                  |
| Cobalt                             | 2.0   | mg/kg | 10.5                               | 5.8                                | 3.1                                | 3.1                               | -                                  |
| Copper                             | 1.0   | mg/kg | 357                                | 73.6                               | 16.2                               | 15.7                              | -                                  |
| Iron                               | 50.0  | mg/kg | 63400                              | 17500                              | 7690                               | 7590                              | -                                  |
| Lead                               | 5.0   | mg/kg | 1190                               | 258                                | nd                                 | nd                                | -                                  |
| Magnesium                          | 20.0  | mg/kg | 8070                               | 39500                              | 61200                              | 60300                             | -                                  |
| Manganese                          | 1.0   | mg/kg | 406                                | 208                                | 185                                | 182                               | -                                  |
| Molybdenum                         | 3.0   | mg/kg | nd                                 | nd                                 | nd                                 | nd                                | -                                  |
| Nickel                             | 2.0   | mg/kg | 81.7                               | 19.6                               | 7.9                                | 7.7                               | -                                  |
| Phosphorus                         | 20.0  | mg/kg | 593                                | 378                                | 241                                | 226                               | -                                  |
| Potassium                          | 100.0 | mg/kg | 3800                               | 2390                               | 1100                               | 1160                              | -                                  |
| Silver                             | 0.6   | mg/kg | nd                                 | nd                                 | nd                                 | nd                                | -                                  |
| Sodium                             | 50.0  | mg/kg | 255                                | 428                                | 213                                | 207                               | -                                  |
| Strontium                          | 0.3   | mg/kg | 119                                | 61.6                               | 46.2                               | 45.8                              | -                                  |
| Titanium                           | 1.0   | mg/kg | 135                                | 194                                | 213                                | 220                               | -                                  |
| Vanadium                           | 1.0   | mg/kg | 43.1                               | 33.4                               | 14.1                               | 14.4                              | -                                  |
| Zinc                               | 5.0   | mg/kg | 933                                | 67.5                               | 23.0                               | 22.6                              | -                                  |
| Percent passing 200 mesh           | 0.1   | %     | -                                  | -                                  | -                                  | -                                 | 83.8                               |
| Percent Retained on -10 + 200 mesh | 0.1   | %     | -                                  | -                                  | -                                  | -                                 | 16.2                               |

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

- Not Requested

nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
 Contact: J. Derek Trinke

Report Date: October 26/1999  
 Lab Ref # : G992864  
 Lab Quote #: 96-W238-VG  
 Client PO#: CP-WESTON  
 Client Ref#: W8140B

Analysis of Soil, expressed on a dry weight basis

| Parameter                          | EQL   | Units | BH99-56-4-<br>990716<br>Replicate |  |  |  |  |
|------------------------------------|-------|-------|-----------------------------------|--|--|--|--|
| Aluminum                           | 20.0  | mg/kg | -                                 |  |  |  |  |
| Barium                             | 5.0   | mg/kg | -                                 |  |  |  |  |
| Beryllium                          | 0.2   | mg/kg | -                                 |  |  |  |  |
| Cadmium                            | 0.3   | mg/kg | -                                 |  |  |  |  |
| Calcium                            | 50.0  | mg/kg | -                                 |  |  |  |  |
| Chromium                           | 1.0   | mg/kg | -                                 |  |  |  |  |
| Cobalt                             | 2.0   | mg/kg | -                                 |  |  |  |  |
| Copper                             | 1.0   | mg/kg | -                                 |  |  |  |  |
| Iron                               | 50.0  | mg/kg | -                                 |  |  |  |  |
| Lead                               | 5.0   | mg/kg | -                                 |  |  |  |  |
| Magnesium                          | 20.0  | mg/kg | -                                 |  |  |  |  |
| Manganese                          | 1.0   | mg/kg | -                                 |  |  |  |  |
| Molybdenum                         | 3.0   | mg/kg | -                                 |  |  |  |  |
| Nickel                             | 2.0   | mg/kg | -                                 |  |  |  |  |
| Phosphorus                         | 20.0  | mg/kg | -                                 |  |  |  |  |
| Potassium                          | 100.0 | mg/kg | -                                 |  |  |  |  |
| Silver                             | 0.6   | mg/kg | -                                 |  |  |  |  |
| Sodium                             | 50.0  | mg/kg | -                                 |  |  |  |  |
| Strontium                          | 0.3   | mg/kg | -                                 |  |  |  |  |
| Titanium                           | 1.0   | mg/kg | -                                 |  |  |  |  |
| Vanadium                           | 1.0   | mg/kg | -                                 |  |  |  |  |
| Zinc                               | 5.0   | mg/kg | -                                 |  |  |  |  |
| Percent passing 200 mesh           | 0.1   | %     | -                                 |  |  |  |  |
| Percent Retained on -10 + 200 mesh | 0.1   | %     | -                                 |  |  |  |  |

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

- Not Requested



RECEIVED  
OCT 28 1999

Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6  
  
Fax: 204-477-9194  
  
Attn: J. Derek Trinke

Date Received: July 21/1999  
Date Reported: October 28/1999  
Lab Ref#: G992914  
Lab Quote#: 96-W238-VG  
Client PO#: Wnnpg/Wstn Shps  
Client Ref#: W8140B  
Sampled By: JPT

### Certificate of Analysis

Analysis Performed: Extractable Hydrocarbons(Manitoba Guidelines), C11-C32  
Mineral Oil and Grease(Gravimetric)  
BTEX and Total Volatile Hydrocarbons(Manitoba Criteria)

Methodology:

- 1) The characterization of HydroCarbon in soil by GC analysis, following a solvent extraction.  
U.S. EPA Method No.8011(microextraction)
- 2) Analysis of Mineral Oil and Grease gravimetrically in soil.  
U.S. EPA Method No. 413.1
- 3) Analysis of Benzene, Toluene, Ethylbenzene, Xylenes & Volatile Hydrocarbons by Static Headspace Capillary GC-PID/FID. External std quantitation with Surrogate stds.  
U.S. EPA Method No. 3810(Modification)

Instrumentation:

- 1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S
- 2) Sartorius Research Balance, Model R200D
- 3) Varian 3400 GC PID/FID, Genesis Headspace Analyzer

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.





Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: J. Derek Trinke

Date Received: July 21/1999  
Date Reported: October 28/1999  
Lab Ref#: G992914  
Lab Quote#: 96-W238-VG  
Client PO#: Wnnpg/Wstn Shps  
Client Ref#: W8140B  
Sampled By: JPT

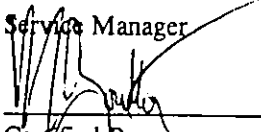
### Certificate of Analysis

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

  
\_\_\_\_\_  
Certified By  
Elaine Grant  
Service Manager

  
\_\_\_\_\_  
Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

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# Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.  
Contact: J. Derek Trinke

Date Reported: October 28/1999  
Lab Ref # : G992914  
Lab Quote#: 96-W238-VG  
Client PO#: Wnnpg/Wstn Shps  
Client Ref#: W8140B

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | SAMPLE ID<br>(spike) | EQL  | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|------------------------------------------|----------------------|------|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|                                          |                      |      |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Total SemiVolatile Hydrocarbons(C11-C32) | na                   | 10.0 | mg/kg | nd            | 20.0           | yes    | 99                 | 70             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Mineral Oil & Grease                     | na                   | 100  | mg/kg | nd            | 200            | yes    | 94                 | 78             | 122            | yes    | na           | na     | na             | na             | na     | yes                         |
| Benzene                                  | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 86                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Ethylbenzene                             | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 92                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Toluene                                  | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 94                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Total Volatile Hydrocarbons              | na                   | 10   | mg/kg | nd            | 10             | yes    | 100                | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Xylenes(Total)                           | na                   | 0.04 | mg/kg | nd            | 0.08           | yes    | 93                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence

\* = Unavailable due to dilution required for analysis

na = Not Applicable

ns = Insufficient Sample Submitted

nd = parameter not detected

TR = trace level less than EQL

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
 Contact: J. Derek Trinke

Report Date: October 28/1999  
 Lab Ref # : G992914  
 Lab Quote #: 96-W238-VG  
 Client PO#: Wnnpg/Wstn Shps  
 Client Ref#: W8140B

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | EQL  | Units | BH-99-58-3<br>990720<br>1999/07/21 | BH-99-58-3<br>990720<br>Replicate | BH-99-58-8<br>990720<br>1999/07/21 | BH99-57-2<br>990720<br>1999/07/21 | BH99-57-2<br>990720<br>Replicate |
|------------------------------------------|------|-------|------------------------------------|-----------------------------------|------------------------------------|-----------------------------------|----------------------------------|
| Resemblance                              | na   | na    | EGDMO?                             | -                                 | EGDMO?                             | EGDMO?                            | EGDMO?                           |
| Total SemiVolatile Hydrocarbons(C11-C32) | 10.0 | mg/kg | 6040                               | -                                 | 7550                               | 23200                             | 23000                            |
| Mineral Oil & Grease                     | 100  | mg/kg | 2310                               | 2790                              | -                                  | -                                 | -                                |
| Benzene                                  | 0.02 | mg/kg | nd                                 | -                                 | nd                                 | nd                                | nd                               |
| Ethylbenzene                             | 0.02 | mg/kg | 1.86                               | -                                 | 2.28                               | 2.64                              | 2.63                             |
| Toluene                                  | 0.02 | mg/kg | nd                                 | -                                 | nd                                 | nd                                | nd                               |
| Total Volatile Hydrocarbons              | 10   | mg/kg | 253                                | -                                 | 332                                | 275                               | 286                              |
| Xylenes(Total)                           | 0.04 | mg/kg | 8.11                               | -                                 | 10.9                               | 12.0                              | 12.2                             |

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

- Not Requested

EGDMO? Contaminant elutes across the gasoline/diesel/motor oil range but does not match our reference standards.

na Not Applicable

nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL



Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

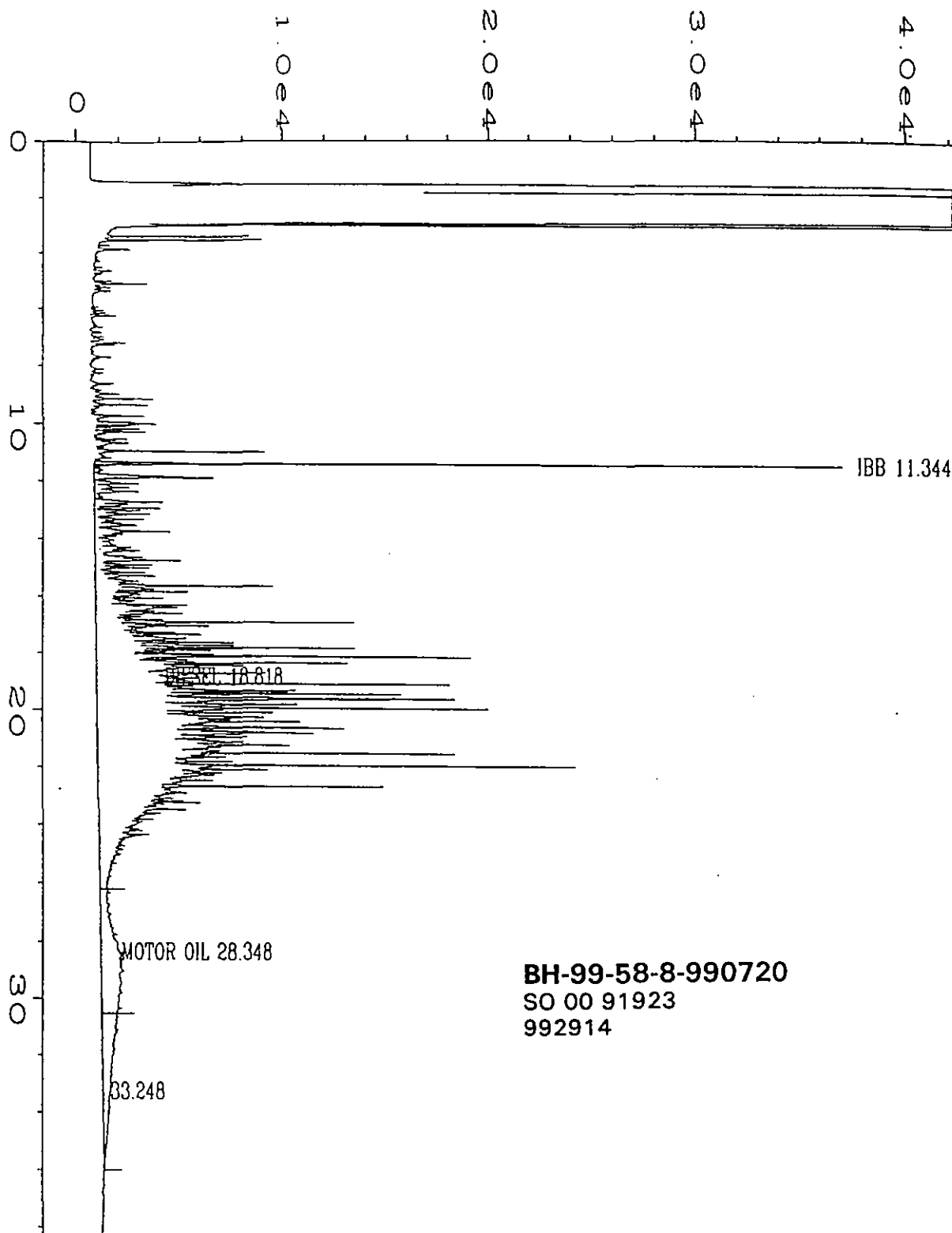
Attn: J. Derek Trinke

Date Received: July 21, 1999  
Date Reported: August 12, 1999  
Lab Ref#: G992914  
Lab Quote#: 96-W238-VG  
Client PO#: Wnnpg/Wstn Shps  
Client Ref#: W8140B  
Sampled By: JPT

**Attached are the chromatograms for your samples**

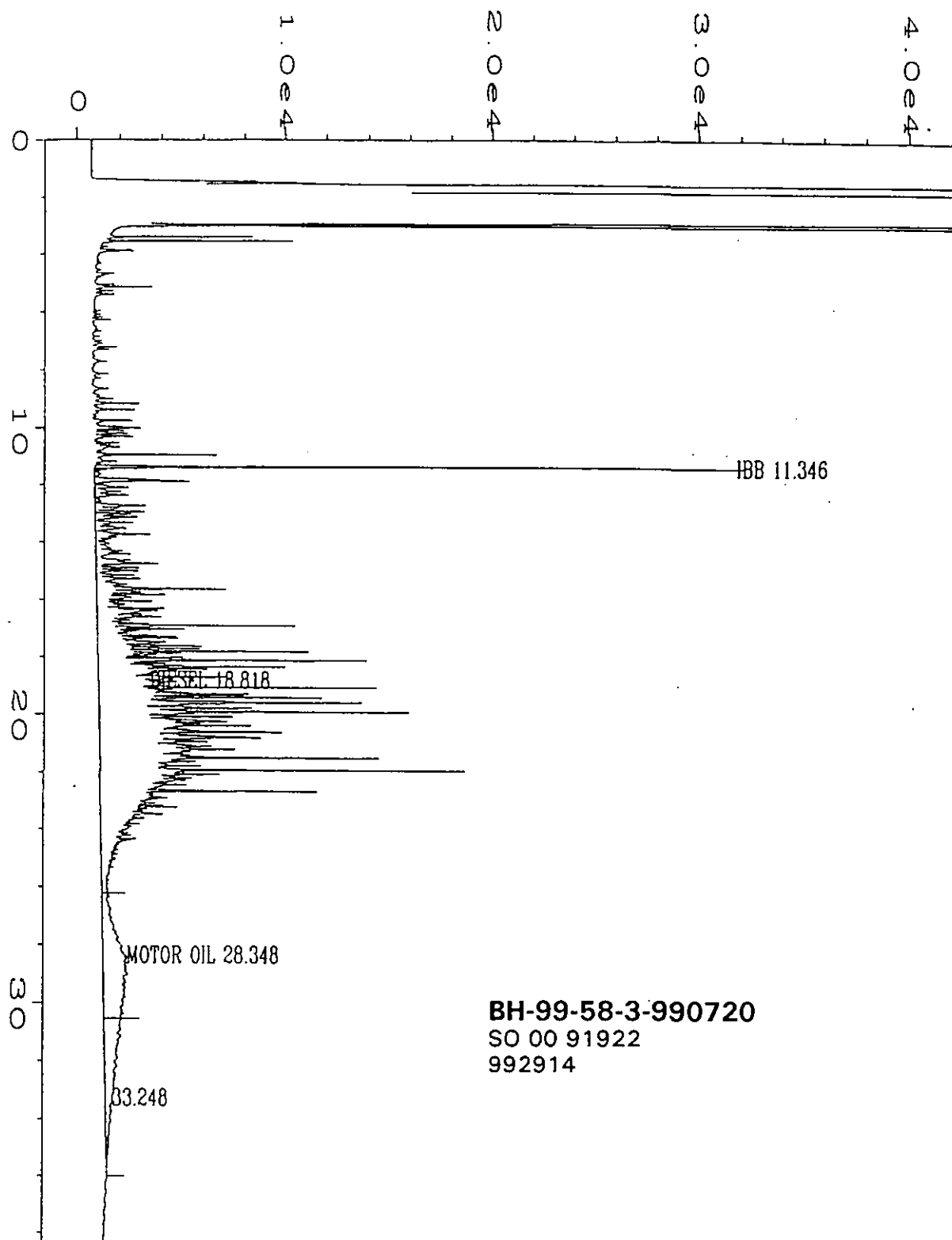
If you have any questions please call Elaine Grant,  
your Service Manager at Philip Analytical Services Corp.





**BH-99-58-8-990720**  
 SO 00 91923  
 992914

|                    |                                        |                   |            |
|--------------------|----------------------------------------|-------------------|------------|
| Data File Name     | : C:\HPCHEM\2\DATA\JULY2399\057R0101.D | Page Number       | : 1        |
| Operator           | : JEEVA                                | Vial Number       | : 57       |
| Instrument         | : INSTRUMEN                            | Injection Number  | : 1        |
| Sample Name        | : 2914-71DF10                          | Sequence Line     | : 1        |
| Run Time Bar Code: |                                        | Instrument Method | : 2DIF.MTH |
| Acquired on        | : 23 Jul 99 09:59 PM                   | Analysis Method   | : 2DIR.MTH |
| Report Created on: | 27 Jul 99 05:49 PM                     | Sample Amount     | : 0        |
| Last Recalib on    | : 08 JUL 99 09:58 AM                   | ISTD Amount       | :          |
| Multiplier         | : 1                                    |                   |            |

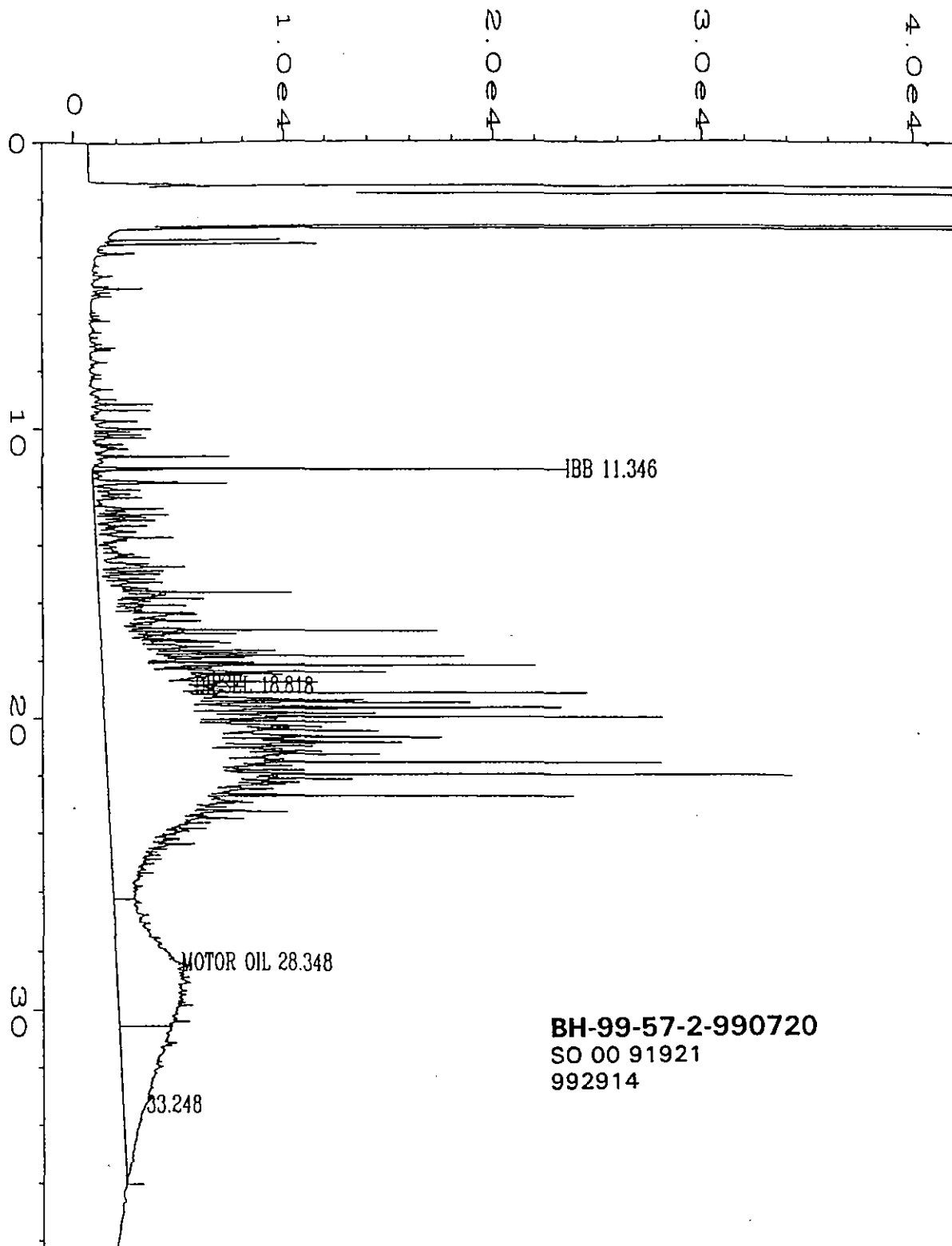


**BH-99-58-3-990720**

SO 00 91922

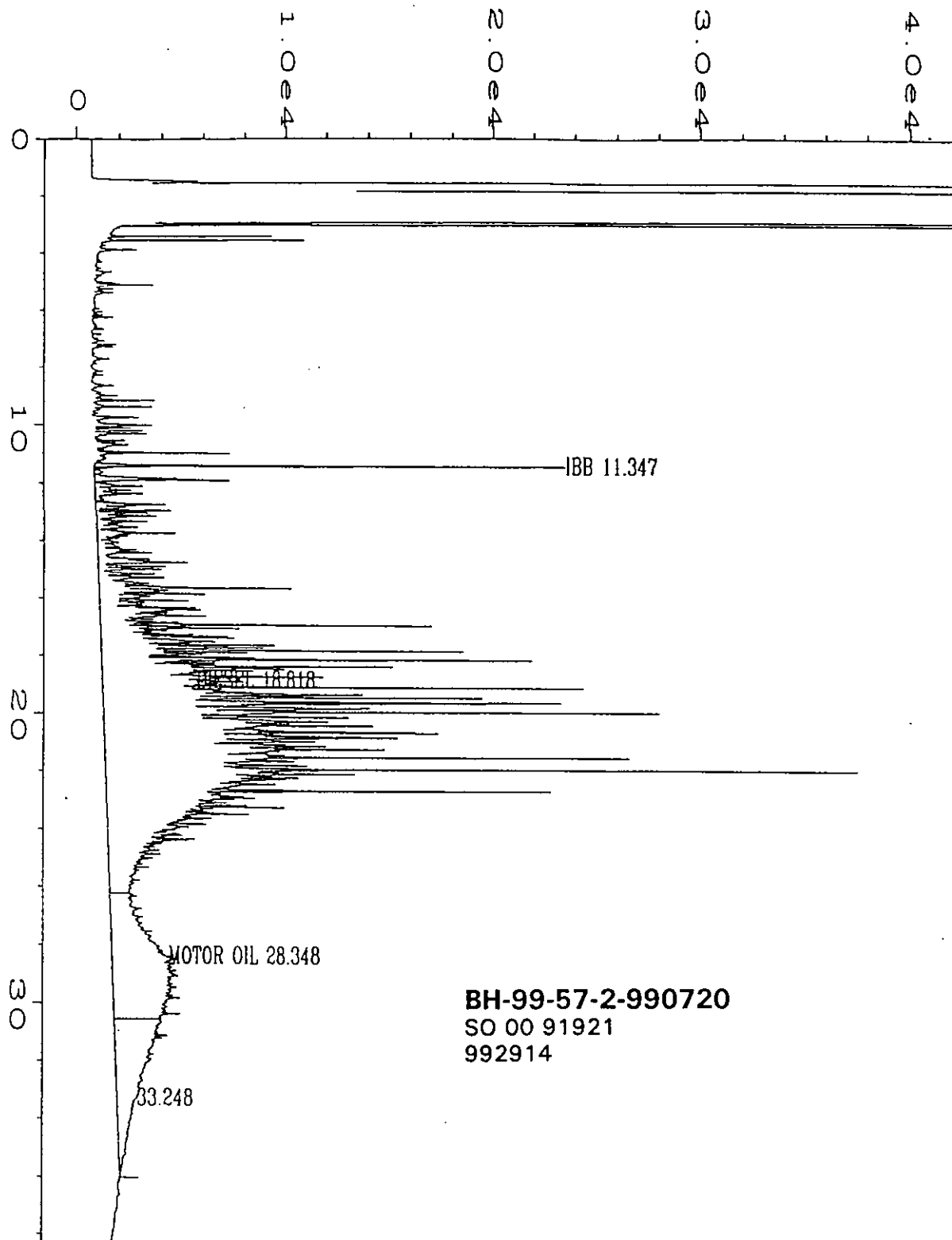
992914

|                    |                                        |                    |            |
|--------------------|----------------------------------------|--------------------|------------|
| Data File Name     | : C:\HPCHEM\2\DATA\JULY2399\056R0101.D | Page Number        | : 1        |
| Operator           | : JEEVA                                | Vial Number        | : 56       |
| Instrument         | : INSTRUMEN                            | Injection Number   | : 1        |
| Sample Name        | : 2914-69DF10                          | Sequence Line      | : 1        |
| In Time Bar Code:  |                                        | Instrument Method: | 2DIF.MTH   |
| Acquired on        | : 23 Jul 99 09:11 PM                   | Analysis Method    | : 2DIR.MTH |
| Report Created on: | 27 Jul 99 05:48 PM                     | Sample Amount      | : 0        |
| Last Recalib on    | : 08 JUL 99 09:58 AM                   | ISTD Amount        | :          |
| Multiplier         | : 1                                    |                    |            |



**BH-99-57-2-990720**  
 SO 00 91921  
 992914

|                    |                                        |                    |            |
|--------------------|----------------------------------------|--------------------|------------|
| Data File Name     | : C:\HPCHEM\2\DATA\JULY2399\055R0101.D | Page Number        | : 1        |
| Operator           | : JEEVA                                | Vial Number        | : 55       |
| Instrument         | : INSTRUMEN                            | Injection Number   | : 1        |
| Sample Name        | : 2914-68QCDF20                        | Sequence Line      | : 1        |
| Run Time Bar Code: |                                        | Instrument Method: | 2DIF.MTH   |
| Acquired on        | : 23 Jul 99 08:22 PM                   | Analysis Method    | : 2DIR.MTH |
| Report Created on: | 27 Jul 99 05:47 PM                     | Sample Amount      | : 0        |
| Last Recalib on    | : 08 JUL 99 09:58 AM                   | ISTD Amount        | :          |
| Multiplier         | : 1                                    |                    |            |



**BH-99-57-2-990720**  
 SO 00 91921  
 992914

|                    |                                        |                    |            |
|--------------------|----------------------------------------|--------------------|------------|
| Data File Name     | : C:\HPCHEM\2\DATA\JULY2399\054R0101.D | Page Number        | : 1        |
| Operator           | : JEEVA                                | Vial Number        | : 54       |
| Instrument         | : INSTRUMEN                            | Injection Number   | : 1        |
| Sample Name        | : 2914-67DF20                          | Sequence Line      | : 1        |
| Run Time Bar Code: |                                        | Instrument Method: | 2DIF.MTH   |
| Acquired on        | : 23 Jul 99 07:33 PM                   | Analysis Method    | : 2DIR.MTH |
| Report Created on: | 27 Jul 99 05:46 PM                     | Sample Amount      | : 0        |
| Last Recalib on    | : 08 JUL 99 09:58 AM                   | ISTD Amount        | :          |
| Multiplier         | : 1                                    |                    |            |



RECEIVED

NOV 5 - 1999

Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: J. Derek Trinke

MOBILITY UNIT AL  
GSC 100-100  
Date Received: July 21/1999  
Date Reported: October 28/1999  
Lab Ref#: G992914  
Lab Quote#: 96-W238-VG  
Client PO#: Wnnpg/Wstn Shps  
Client Ref#: W8140B  
Sampled By: JPT

### Certificate of Analysis

Analysis Performed: Particle Size Analysis(-10+200), wet sieving

Methodology: 1) Determination of particle size, by prescreening thru  
10 mesh sieve, followed by wet sieving thru 200 mesh  
screen. Expressed as % of total.  
Soil Sampling & Methods of Analysis 1978

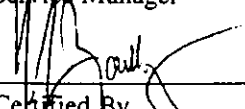
Instrumentation: 1) Wire Screen Sieves(10 mesh and 200 mesh)/Sartorius Research Balance

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

  
\_\_\_\_\_  
Certified By  
Elaine Grant  
Service Manager

  
\_\_\_\_\_  
Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
Contact: J. Derek Trinke

Report Date: October 28/1999  
Lab Ref # : G992914  
Lab Quote #: 96-W238-VG  
Client PO#: WnnpG/Wstn Shps  
Client Ref#: W8140B

Analysis of Soil, expressed on a dry weight basis

[illegible]

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.  
- Not Requested



Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: J. Derek Trinke

Date Received: July 21/1999  
Date Reported: December 17/1999  
Lab Ref#: G992914  
Lab Quote#: 96-W238-VG  
Client PO#: Wnnpg/Wstn Shps  
Client Ref#: W8140B  
Sampled By: JPT

### Certificate of Analysis

Analysis Performed: Mineral Oil and Grease(Gravimetric)

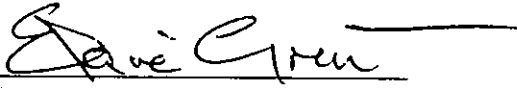
Methodology: 1) Analysis of Mineral Oil and Grease gravimetrically in soil.  
U.S. EPA Method No. 413.1

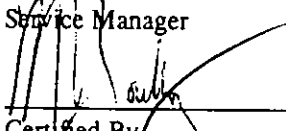
Instrumentation: 1) Sartorius Research Balance, Model R200D

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

  
Certified By  
Elaine Grant  
Service Manager

  
Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer/Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

# Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.  
Contact: J. Derek Trinke

Date Reported: December.17/1999  
Lab Ref # : G992914  
Lab Quote#: 96-W238-VG  
Client PO#: WnnpG/Wstn Shps  
Client Ref#: W8140B

Analysis of Soil, expressed on a dry weight basis

| Parameter            | SAMPLE ID<br>(spike) | EQL | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|----------------------|----------------------|-----|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|                      |                      |     |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Mineral Oil & Grease | na                   | 100 | mg/kg | nd            | 200            | yes    | 94                 | 78             | 122            | yes    | na           | na     | na             | na             | na     | yes                         |

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence

\* = Unavailable due to dilution required for analysis

na = Not Applicable

ns = Insufficient Sample Submitted

nd = parameter not detected

TR = trace level less than EQL

## Report of Analysis

Report Date: December 17/1999  
Lab Ref # : G992914  
Lab Quote #: 96-W238-VG  
Client PO#: Wnnpg/Wstn Shps  
Client Ref#: W8140B

Analysis of Soil, expressed on a dry weight basis

| Parameter            | EQL | Units | BH-99-58-3<br>990720<br>1999/07/21 | BH-99-58-3<br>990720<br>Replicate |  |  |  |
|----------------------|-----|-------|------------------------------------|-----------------------------------|--|--|--|
| Mineral Oil & Grease | 100 | mg/kg | 2310                               | 2790                              |  |  |  |

Page 1 of 1

Date: 26-Oct-99

**VOLATILE ORGANIC COMPOUNDS**

Client: Morrow Environmental  
Project Reference: W8140B  
Work Order: G992914V  
Matrix: Soil

Units: micrograms/gram (µg/g) dry weight

| Compound                               | EQL<br>µg/g | BH-99-59-4-990720 | BH-99-59-4-990720<br>Dup. | BH-99-61-3-990720 |
|----------------------------------------|-------------|-------------------|---------------------------|-------------------|
| Chloromethane                          | 1.0         | nd                | nd                        | nd                |
| Vinyl chloride                         | 0.5         | *0.3              | *0.3                      | nd                |
| Bromomethane                           | 1.0         | nd                | nd                        | nd                |
| Chloroethane                           | 1.0         | nd                | nd                        | nd                |
| Trichlorofluoromethane                 | 0.2         | nd                | nd                        | nd                |
| Acetone                                | 10.0        | nd                | nd                        | nd                |
| 1,1-Dichloroethene                     | 0.1         | nd                | nd                        | nd                |
| Dichloromethane (Methylene Chloride)   | 0.5         | nd                | nd                        | nd                |
| trans-1,2-Dichloroethene               | 0.1         | nd                | nd                        | nd                |
| Methyl-t-Butyl Ether                   | 0.1         | nd                | nd                        | nd                |
| 1,1-Dichloroethane                     | 0.1         | nd                | nd                        | nd                |
| Methyl Ethyl Ketone (MEK)              | 5.0         | nd                | nd                        | nd                |
| cis-1,2-Dichloroethene                 | 0.1         | 2.4               | 2.7                       | nd                |
| Chloroform                             | 0.1         | nd                | nd                        | nd                |
| 1,2-Dichloroethane                     | 0.1         | nd                | nd                        | nd                |
| 1,1,1-Trichloroethane                  | 0.1         | nd                | nd                        | nd                |
| Carbon Tetrachloride                   | 0.1         | nd                | nd                        | nd                |
| Benzene                                | 0.05        | nd                | nd                        | nd                |
| 1,2-Dichloropropane                    | 0.1         | nd                | nd                        | nd                |
| Trichloroethene                        | 0.1         | 0.1               | 0.1                       | 0.4               |
| 1,1-Dibromochloromethane               | 0.1         | nd                | nd                        | nd                |
| cis-1,3-Dichloropropene                | 0.1         | nd                | nd                        | nd                |
| Methyl Isobutyl Ketone (MIBK)          | 5.0         | nd                | nd                        | nd                |
| trans-1,3-Dichloropropene              | 0.1         | nd                | nd                        | nd                |
| 1,1,2-Trichloroethane                  | 0.1         | nd                | nd                        | nd                |
| Toluene                                | 0.1         | nd                | nd                        | nd                |
| Hexanone                               | 5.0         | nd                | nd                        | nd                |
| Bromochloromethane                     | 0.1         | nd                | nd                        | nd                |
| 1,2-Dibromoethane (Ethylene dibromide) | 0.1         | nd                | nd                        | nd                |
| Tetrachloroethene (Perchloroethylene)  | 0.1         | nd                | nd                        | 0.3               |
| 1,1,1,2-Tetrachloroethane              | 0.1         | nd                | nd                        | nd                |
| Chlorobenzene                          | 0.1         | nd                | nd                        | nd                |
| Ethylbenzene                           | 0.1         | nd                | nd                        | nd                |
| m-Xylene & p-Xylene                    | 0.1         | nd                | nd                        | nd                |
| Bromoform                              | 0.1         | nd                | nd                        | nd                |
| Styrene                                | 0.1         | nd                | nd                        | nd                |
| 1,2,2-Tetrachloroethane                | 0.1         | nd                | nd                        | nd                |
| m-Xylene                               | 0.1         | nd                | nd                        | nd                |
| 1,3-Dichlorobenzene                    | 0.1         | nd                | nd                        | nd                |
| 1,4-Dichlorobenzene                    | 0.1         | nd                | nd                        | nd                |
| 1,2-Dichlorobenzene                    | 0.1         | nd                | nd                        | nd                |

Surrogate Standard Recoveries: Control Limits: 70-130%

|                        |      |      |      |
|------------------------|------|------|------|
| Bromofluoromethane     | 100% | 101% | 100% |
| Toluene-d8             | 98%  | 95%  | 99%  |
| 1,4-Bromofluorobenzene | 99%  | 102% | 97%  |



Client: Morrow Environmental  
 Project Reference: W8140B  
 Work Order: G992914V  
 Matrix: Soil

## VOLATILE ORGANIC COMPOUNDS

Date: 26-Oct-99

Units: micrograms/gram ( $\mu\text{g/g}$ ) dry weight

| Compound                                               | Method Blank           |        |                |        | Spiked Method Blank |                |                |        |
|--------------------------------------------------------|------------------------|--------|----------------|--------|---------------------|----------------|----------------|--------|
|                                                        | EQL<br>$\mu\text{g/g}$ | Result | Upper<br>Limit | Accept | %<br>Recovery       | Lower<br>Limit | Upper<br>Limit | Accept |
| Chloromethane                                          | 1.0                    | nd     | 1.0            | yes    | 89                  | 60             | 140            | yes    |
| Vinyl chloride                                         | 0.5                    | nd     | 0.5            | yes    | 90                  | 60             | 140            | yes    |
| Bromomethane                                           | 1.0                    | nd     | 1.0            | yes    | 93                  | 60             | 140            | yes    |
| Chloroethane                                           | 1.0                    | nd     | 1.0            | yes    | 95                  | 60             | 140            | yes    |
| Trichlorofluoromethane                                 | 0.2                    | nd     | 0.2            | yes    | 100                 | 70             | 130            | yes    |
| Acetone                                                | 10.0                   | nd     | 10.0           | yes    | 99                  | 60             | 140            | yes    |
| 1,1-Dichloroethene                                     | 0.1                    | nd     | 0.1            | yes    | 98                  | 70             | 130            | yes    |
| Dichloromethane (Methylene Chloride)                   | 0.5                    | nd     | 0.5            | yes    | 98                  | 70             | 130            | yes    |
| trans-1,2-Dichloroethene                               | 0.1                    | nd     | 0.1            | yes    | 99                  | 70             | 130            | yes    |
| Methyl-t-Butyl Ether                                   | 0.1                    | nd     | 0.1            | yes    | 93                  | 70             | 130            | yes    |
| 1,1-Dichloroethane                                     | 0.1                    | nd     | 0.1            | yes    | 99                  | 70             | 130            | yes    |
| Methyl Ethyl Ketone (MEK)                              | 5.0                    | nd     | 5.0            | yes    | 97                  | 60             | 140            | yes    |
| cis-1,2-Dichloroethene                                 | 0.1                    | nd     | 0.1            | yes    | 97                  | 70             | 130            | yes    |
| Chloroform                                             | 0.1                    | nd     | 0.1            | yes    | 96                  | 70             | 130            | yes    |
| 1,2-Dichloroethane                                     | 0.1                    | nd     | 0.1            | yes    | 95                  | 70             | 130            | yes    |
| 1,1,1-Trichloroethane                                  | 0.1                    | nd     | 0.1            | yes    | 96                  | 70             | 130            | yes    |
| Carbon Tetrachloride                                   | 0.1                    | nd     | 0.1            | yes    | 97                  | 70             | 130            | yes    |
| Benzene                                                | 0.05                   | nd     | 0.05           | yes    | 95                  | 70             | 130            | yes    |
| 1,2-Dichloropropane                                    | 0.1                    | nd     | 0.1            | yes    | 94                  | 70             | 130            | yes    |
| Trichloroethene                                        | 0.1                    | nd     | 0.1            | yes    | 100                 | 70             | 130            | yes    |
| Bromodichloromethane                                   | 0.1                    | nd     | 0.1            | yes    | 94                  | 70             | 130            | yes    |
| cis-1,3-Dichloropropene                                | 0.1                    | nd     | 0.1            | yes    | 94                  | 70             | 130            | yes    |
| Methyl Isobutyl Ketone (MIBK)                          | 5.0                    | nd     | 5.0            | yes    | 96                  | 60             | 140            | yes    |
| trans-1,3-Dichloropropene                              | 0.1                    | nd     | 0.1            | yes    | 95                  | 70             | 130            | yes    |
| 1,1,2-Trichloroethane                                  | 0.1                    | nd     | 0.1            | yes    | 98                  | 70             | 130            | yes    |
| Toluene                                                | 0.1                    | nd     | 0.1            | yes    | 100                 | 70             | 130            | yes    |
| 2-Hexanone                                             | 5.0                    | nd     | 5.0            | yes    | 100                 | 60             | 140            | yes    |
| Dibromochloromethane                                   | 0.1                    | nd     | 0.1            | yes    | 99                  | 70             | 130            | yes    |
| 1,2-Dibromoethane (Ethylene dibromide)                 | 0.1                    | nd     | 0.1            | yes    | 99                  | 70             | 130            | yes    |
| Tetrachloroethene (Perchloroethylene)                  | 0.1                    | nd     | 0.1            | yes    | 101                 | 70             | 130            | yes    |
| 1,1,1,2-Tetrachloroethane                              | 0.1                    | nd     | 0.1            | yes    | 100                 | 70             | 130            | yes    |
| Chlorobenzene                                          | 0.1                    | nd     | 0.1            | yes    | 101                 | 70             | 130            | yes    |
| Ethylbenzene                                           | 0.1                    | nd     | 0.1            | yes    | 101                 | 70             | 130            | yes    |
| m-Xylene & p-Xylene                                    | 0.1                    | nd     | 0.1            | yes    | 105                 | 70             | 130            | yes    |
| Bromoform                                              | 0.1                    | nd     | 0.1            | yes    | 102                 | 70             | 130            | yes    |
| Styrene                                                | 0.1                    | nd     | 0.1            | yes    | 100                 | 70             | 130            | yes    |
| 1,1,2,2-Tetrachloroethane                              | 0.1                    | nd     | 0.1            | yes    | 95                  | 70             | 130            | yes    |
| o-Xylene                                               | 0.1                    | nd     | 0.1            | yes    | 104                 | 70             | 130            | yes    |
| 1,3-Dichlorobenzene                                    | 0.1                    | nd     | 0.1            | yes    | 107                 | 70             | 130            | yes    |
| 1,4-Dichlorobenzene                                    | 0.1                    | nd     | 0.1            | yes    | 106                 | 70             | 130            | yes    |
| 1,2-Dichlorobenzene                                    | 0.1                    | nd     | 0.1            | yes    | 107                 | 70             | 130            | yes    |
| Surrogate Standard Recoveries: Control Limits: 70-130% |                        |        |                |        |                     |                |                |        |
| Dibromofluoromethane                                   |                        | 105%   |                |        | 99                  | 70             | 130            | yes    |
| Toluene-d8                                             |                        | 101%   |                |        | 101                 | 70             | 130            | yes    |
| 4-Bromofluorobenzene                                   |                        | 100%   |                |        | 102                 | 70             | 130            | yes    |



Client: Morrow Environmental  
Project Reference: W8140B  
Work Order: G992914V  
Matrix: Soil

**VOLATILE ORGANIC COMPOUNDS**

**Date:** 26-Oct-99

Legend: EQL = Estimated Quantitation Limit  
nd = Not Detected Above EQL  
Dup. = Duplicate  
\* = Detected below EQL but passed compound identification criteria

Date of sample receipt: July 21, 1999  
Date of sample analysis: July 22, 1999

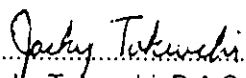
**Analytical Method:**

Due to a level of some target compounds beyond the appropriate range, the sample could not be analysed by the low level direct purge method. The sample was analysed by medium level purge & trap (US EPA Method 5035) gas chromatography/mass spectrometry using US EPA Method 8260B (modified).

Note: Estimated quantitation limit is the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

*NOTE: All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analysis done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangement.*

Job Approved By:

  
.....  
Jacky Takeuchi, B.A.Sc., C.Chem.  
Analytical Chemist



RECEIVED  
NOV 5 - 1999

Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6  
  
Fax: 204-477-9194  
  
Attn: J. Derek Trinke

MORROW ENVIRONMENTAL CONSULTANTS INC.  
CONTRACT NO. 96-030  
Date Received: July 22/1999  
Date Reported: October 28/1999  
Lab Ref#: G992948  
Lab Quote#: 96-W238-VG  
Client PO#: WestonYrd  
Client Ref#: W8140B  
Sampled By: JDT

### Certificate of Analysis

Analysis Performed: Extractable Hydrocarbons(Manitoba Guidelines), C11-C32  
Total Purgeable Hydrocarbon

Methodology:

- 1) The characterization of HydroCarbon in soil by GC analysis, following a solvent extraction.  
U.S. EPA Method No.8011(microextraction)
- 2) The analysis of Total Purgeable Hydrocarbons by static headspace capillary GC/PID/FID.  
U.S. EPA Method No. 3810(Modification)

Instrumentation:

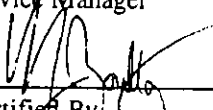
- 1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S
- 2) Varian 3400 GC PID/FID, Genesis Headspace Analyzer

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

  
\_\_\_\_\_  
Certified By  
Elaine Grant  
Service Manager

  
\_\_\_\_\_  
Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

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## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
 Contact: J. Derek Trinke

Report Date: October 28/1999  
 Lab Ref # : G992948  
 Lab Quote #: 96-W238-VG  
 Client PO#: WestonYrd  
 Client Ref#: W8140B

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | EQL  | Units | BH99 63-2<br>990721<br>1999/07/21 | BH99 63-2<br>990721<br>Replicate | BH99 64-3<br>990721<br>1999/07/21 | BH99 64-3<br>990721<br>Replicate | BH99 65-3<br>990721<br>1999/07/21 |
|------------------------------------------|------|-------|-----------------------------------|----------------------------------|-----------------------------------|----------------------------------|-----------------------------------|
| Resemblance                              | na   | na    | -                                 | -                                | EGD?                              | EGD?                             | EGD?                              |
| Total SemiVolatile Hydrocarbons(C11-C32) | 10.0 | mg/kg | -                                 | -                                | 1160                              | 1150                             | 590                               |
| Total Purgeable Hydrocarbon              | 10.0 | mg/kg | nd                                | nd                               | -                                 | -                                | -                                 |

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

- Not Requested

EGD? Contaminant elutes in the gasoline/diesel range but does not match our reference standards.

na Not Applicable

nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL



Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: J. Derek Trinke

|                |                 |
|----------------|-----------------|
| Date Received: | July 22, 1999   |
| Date Reported: | August 12, 1999 |
| Lab Ref#:      | G992948         |
| Lab Quote#:    | 96-W238-VG      |
| Client PO#:    | WestonYrd       |
| Client Ref#:   | W8140B          |
| Sampled By:    | JDT             |

**Attached are the chromatograms for your samples**

If you have any questions please call Elaine Grant,  
your Service Manager at Philip Analytical Services Corp.

Injection Date : 07/26/1999 6:30:54 PM

Seq. Line : 13

Sample Name : 2948-43

Vial : 13

Acq. Operator : D. MCLEOD

Inj : 1

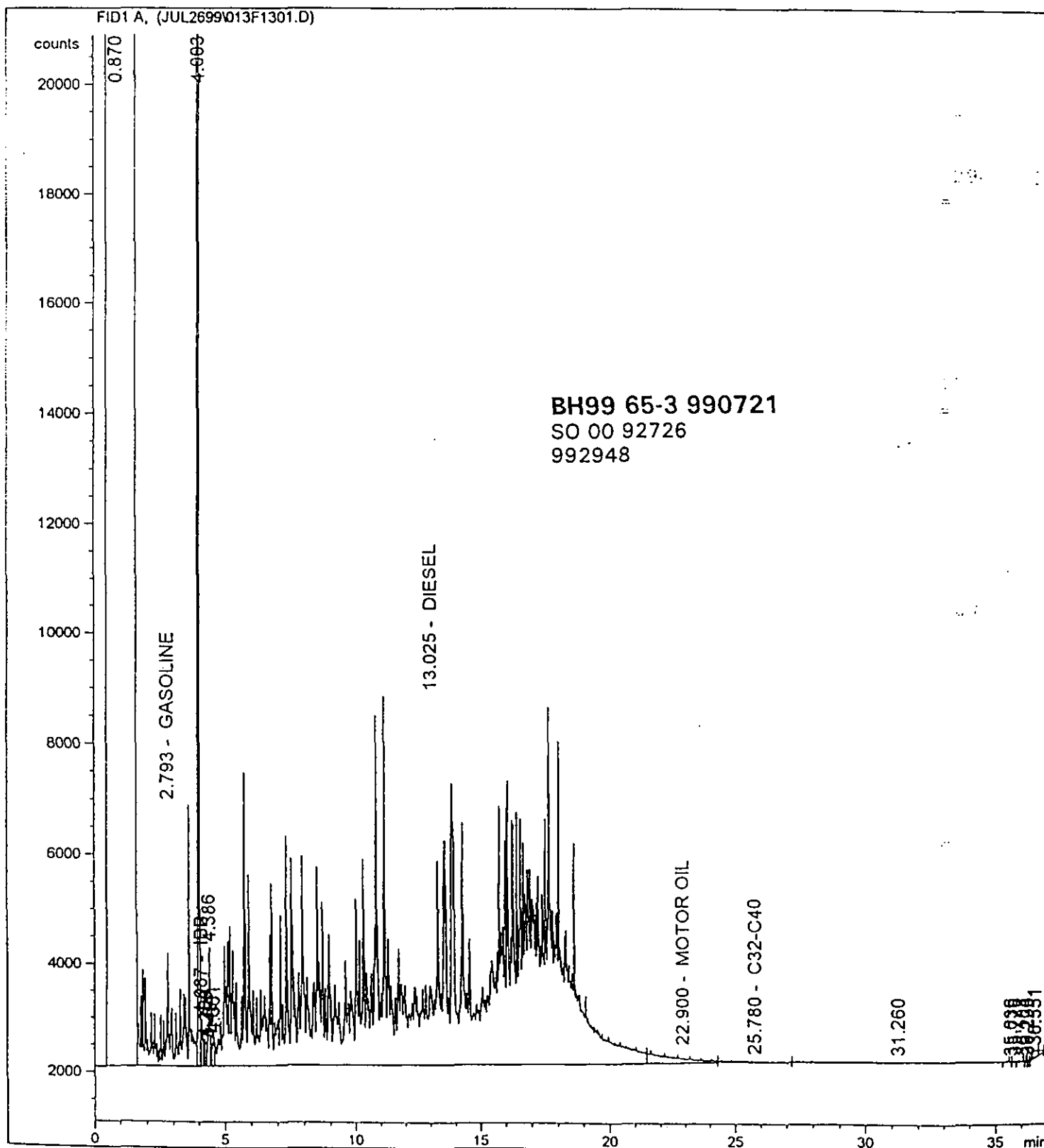
Inj Volume : 1  $\mu$ l

Sequence File : C:\HPCHEM\2\SEQUENCE\JUL2699.S

Method : C:\HPCHEM\2\METHODS\4TPHIFA.M

Last changed : 07/22/1999 10:11:13 AM by D. MCLEOD

4TPHIF METHOD FOR FRONT CHANNEL ON FID IV-15M COLUMN DB-1, HT



Injection Date : 07/26/1999 5:42:32 PM

Seq. Line : 12

Sample Name : 2948-42QC

Vial : 12

Acq. Operator : D. MCLEOD

Inj : 1

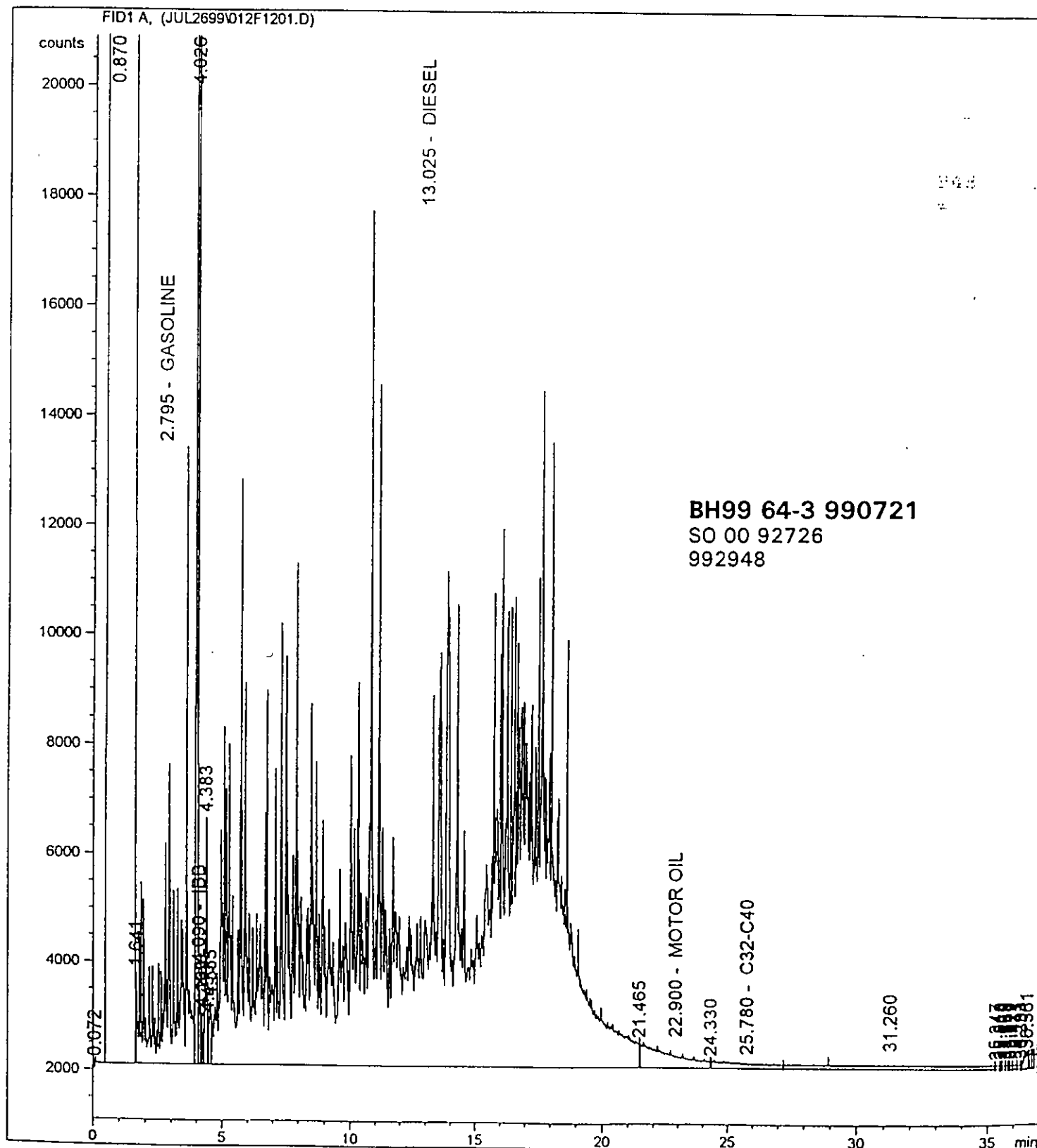
Inj Volume : 1 µl

Sequence File : C:\HPCHEM\2\SEQUENCE\JUL2699.S

Method : C:\HPCHEM\2\METHODS\4TPHIFA.M

Last changed : 07/22/1999 10:11:13 AM by D. MCLEOD

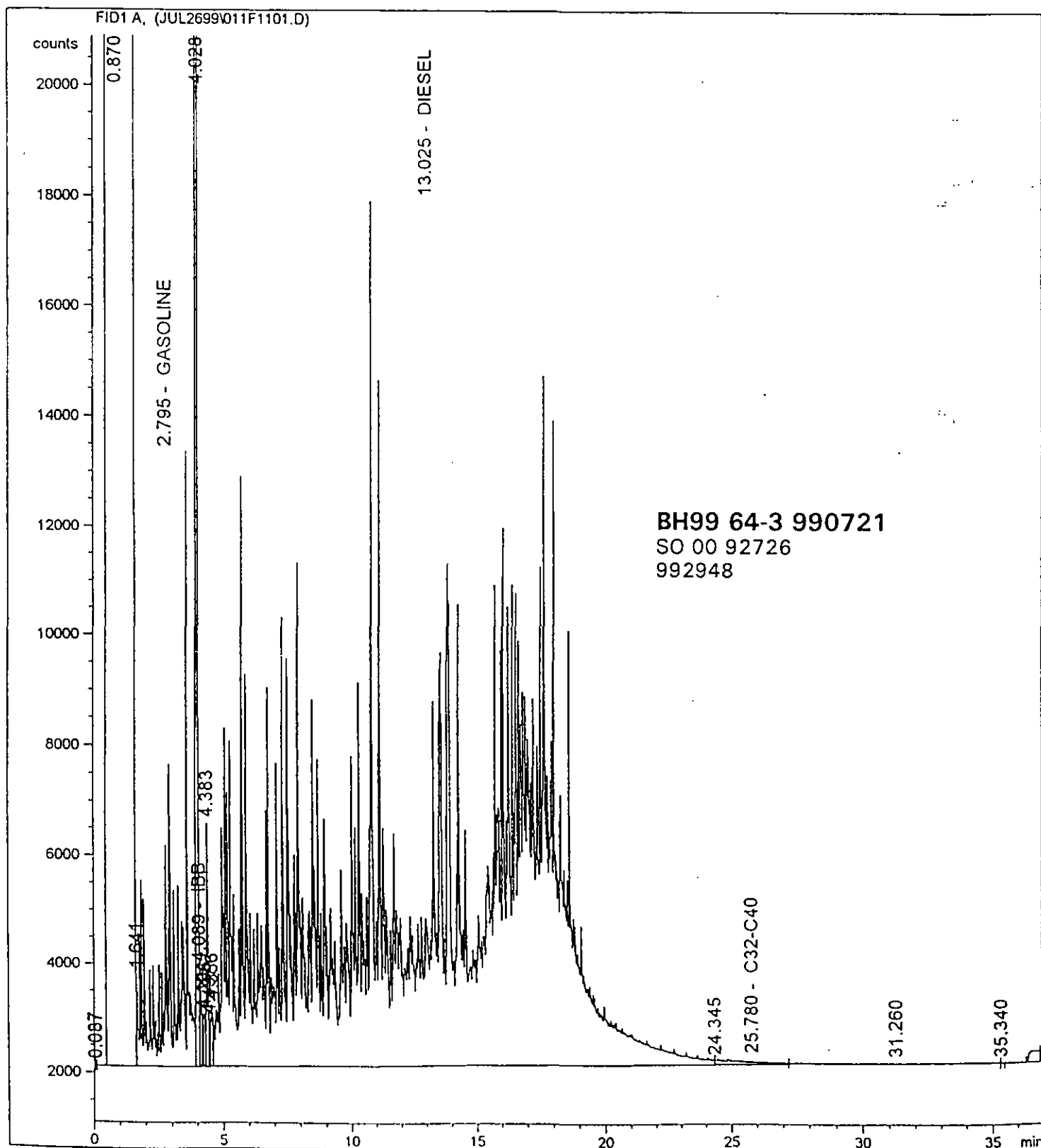
4TPHIF METHOD FOR FRONT CHANNEL ON FID IV-15M COLUMN DB-1,HT



Injection Date : 07/26/1999 4:54:11 PM  
Sample Name : 2948-41  
Acq. Operator : D. MCLEOD

Seq. Line : 11  
Vial : 11  
Inj : 1  
Inj Volume : 1  $\mu$ l

Sequence File : C:\HPCHEM\2\SEQUENCE\JUL2699.S  
Method : C:\HPCHEM\2\METHODS\4TPHIFA.M  
Last changed : 07/22/1999 10:11:13 AM by D. MCLEOD  
4TPHIF METHOD FOR FRONT CHANNEL ON FID IV-15M COLUMN DB-1, HT



Client: Morrow Environmental Consultants Inc.  
Project Reference: W8140B  
Work Order: G992948V  
Matrix: Soil

**VOLATILE ORGANIC COMPOUNDS**

Date: 26-Oct-99

Units: micrograms/gram (µg/g) dry weight

| Compound                               | EQL<br>µg/g | BH99-63-2-990721 | BH99-63-2-990721<br>Dup. |
|----------------------------------------|-------------|------------------|--------------------------|
| Chloromethane                          | 0.005       | nd               | nd                       |
| Vinyl chloride                         | 0.003       | 0.036            | 0.034                    |
| Bromomethane                           | 0.005       | nd               | nd                       |
| Chloroethane                           | 0.005       | 0.044            | 0.044                    |
| Trichlorofluoromethane                 | 0.005       | nd               | nd                       |
| Acetone                                | 0.050       | nd               | nd                       |
| 1,1-Dichloroethene                     | 0.002       | **0.2            | **0.2                    |
| Dichloromethane (Methylene Chloride)   | 0.010       | nd               | nd                       |
| trans-1,2-Dichloroethene               | 0.002       | 0.002            | 0.002                    |
| Methyl-t-Butyl Ether                   | 0.002       | nd               | nd                       |
| 1,1-Dichloroethane                     | 0.002       | **0.4            | **0.4                    |
| Methyl Ethyl Ketone (MEK)              | 0.025       | nd               | nd                       |
| cis-1,2-Dichloroethene                 | 0.002       | 0.085            | 0.101                    |
| Chloroform                             | 0.002       | nd               | nd                       |
| 1,2-Dichloroethane                     | 0.002       | 0.007            | 0.008                    |
| 1,1,1-Trichloroethane                  | 0.002       | **0.4            | **0.3                    |
| Carbon Tetrachloride                   | 0.002       | nd               | nd                       |
| Benzene                                | 0.002       | nd               | nd                       |
| 1,2-Dichloropropane                    | 0.002       | nd               | nd                       |
| Trichloroethene                        | 0.002       | 0.062            | 0.074                    |
| Bromodichloromethane                   | 0.002       | nd               | nd                       |
| cis-1,3-Dichloropropene                | 0.002       | nd               | nd                       |
| Methyl Isobutyl Ketone (MIBK)          | 0.025       | nd               | nd                       |
| trans-1,3-Dichloropropene              | 0.002       | nd               | nd                       |
| 1,1,2-Trichloroethane                  | 0.002       | nd               | nd                       |
| Toluene                                | 0.002       | nd               | nd                       |
| 2-Hexanone                             | 0.025       | nd               | nd                       |
| Dibromochloromethane                   | 0.002       | nd               | nd                       |
| 1,2-Dibromoethane (Ethylene dibromide) | 0.002       | nd               | nd                       |
| Tetrachloroethene (Perchloroethylene)  | 0.002       | 0.014            | 0.017                    |
| 1,1,1,2-Tetrachloroethane              | 0.002       | nd               | nd                       |
| Chlorobenzene                          | 0.002       | nd               | nd                       |
| Ethylbenzene                           | 0.002       | nd               | nd                       |
| m-Xylene & p-Xylene                    | 0.002       | nd               | nd                       |
| Bromoform                              | 0.002       | nd               | nd                       |
| Styrene                                | 0.002       | nd               | nd                       |
| 1,1,2,2-Tetrachloroethane              | 0.002       | nd               | nd                       |
| o-Xylene                               | 0.002       | nd               | nd                       |
| 1,3-Dichlorobenzene                    | 0.002       | nd               | nd                       |
| 1,4-Dichlorobenzene                    | 0.002       | nd               | nd                       |
| 1,2-Dichlorobenzene                    | 0.002       | nd               | nd                       |

Surrogate Standard Recoveries: Control Limits: 70-130%

|                      |      |      |
|----------------------|------|------|
| Dibromofluoromethane | 101% | 103% |
| Toluene-d8           | 99%  | 97%  |
| 4-Bromofluorobenzene | 101% | 100% |



Client: Morrow Environmental Consultants  
 Project Reference: W8140B  
 Work Order: G992948V  
 Matrix: Soil

**VOLATILE ORGANIC COMPOUNDS**

Date: 26-Oct-99

Units: micrograms/gram ( $\mu\text{g/g}$ ) dry weight

| Compound                               | EQL<br>$\mu\text{g/g}$ | Method Blank |                |        | Spiked Method Blank |                |                |        |
|----------------------------------------|------------------------|--------------|----------------|--------|---------------------|----------------|----------------|--------|
|                                        |                        | Result       | Upper<br>Limit | Accept | %<br>Recovery       | Lower<br>Limit | Upper<br>Limit | Accept |
| Chloromethane                          | 0.005                  | nd           | 0.005          | yes    | 84                  | 60             | 140            | yes    |
| Vinyl chloride                         | 0.003                  | nd           | 0.003          | yes    | 89                  | 60             | 140            | yes    |
| Bromomethane                           | 0.005                  | nd           | 0.005          | yes    | 96                  | 60             | 140            | yes    |
| Chloroethane                           | 0.005                  | nd           | 0.005          | yes    | 92                  | 60             | 140            | yes    |
| Trichlorofluoromethane                 | 0.005                  | nd           | 0.005          | yes    | 96                  | 70             | 130            | yes    |
| Acetone                                | 0.050                  | nd           | 0.050          | yes    | 95                  | 60             | 140            | yes    |
| 1,1-Dichloroethene                     | 0.002                  | nd           | 0.002          | yes    | 96                  | 70             | 130            | yes    |
| Dichloromethane (Methylene Chloride)   | 0.010                  | nd           | 0.010          | yes    | 97                  | 70             | 130            | yes    |
| trans-1,2-Dichloroethene               | 0.002                  | nd           | 0.002          | yes    | 100                 | 70             | 130            | yes    |
| Methyl-t-Butyl Ether                   | 0.002                  | nd           | 0.002          | yes    | 97                  | 70             | 130            | yes    |
| 1,1-Dichloroethane                     | 0.002                  | nd           | 0.002          | yes    | 98                  | 70             | 130            | yes    |
| Methyl Ethyl Ketone (MEK)              | 0.025                  | nd           | 0.025          | yes    | 96                  | 60             | 140            | yes    |
| cis-1,2-Dichloroethene                 | 0.002                  | nd           | 0.002          | yes    | 100                 | 70             | 130            | yes    |
| Chloroform                             | 0.002                  | nd           | 0.002          | yes    | 98                  | 70             | 130            | yes    |
| 1,2-Dichloroethane                     | 0.002                  | nd           | 0.002          | yes    | 96                  | 70             | 130            | yes    |
| 1,1,1-Trichloroethane                  | 0.002                  | nd           | 0.002          | yes    | 99                  | 70             | 130            | yes    |
| Carbon Tetrachloride                   | 0.002                  | nd           | 0.002          | yes    | 98                  | 70             | 130            | yes    |
| Benzene                                | 0.002                  | nd           | 0.002          | yes    | 100                 | 70             | 130            | yes    |
| 1,2-Dichloropropane                    | 0.002                  | nd           | 0.002          | yes    | 97                  | 70             | 130            | yes    |
| Trichloroethene                        | 0.002                  | nd           | 0.002          | yes    | 102                 | 70             | 130            | yes    |
| Bromodichloromethane                   | 0.002                  | nd           | 0.002          | yes    | 97                  | 70             | 130            | yes    |
| cis-1,3-Dichloropropene                | 0.002                  | nd           | 0.002          | yes    | 95                  | 70             | 130            | yes    |
| Methyl Isobutyl Ketone (MIBK)          | 0.025                  | nd           | 0.025          | yes    | 96                  | 60             | 140            | yes    |
| trans-1,3-Dichloropropene              | 0.002                  | nd           | 0.002          | yes    | 95                  | 70             | 130            | yes    |
| 1,1,2-Trichloroethane                  | 0.002                  | nd           | 0.002          | yes    | 97                  | 70             | 130            | yes    |
| Toluene                                | 0.002                  | nd           | 0.002          | yes    | 99                  | 70             | 130            | yes    |
| 2-Hexanone                             | 0.025                  | nd           | 0.025          | yes    | 98                  | 60             | 140            | yes    |
| Dibromochloromethane                   | 0.002                  | nd           | 0.002          | yes    | 96                  | 70             | 130            | yes    |
| 1,2-Dibromoethane (Ethylene dibromide) | 0.002                  | nd           | 0.002          | yes    | 99                  | 70             | 130            | yes    |
| Tetrachloroethene (Perchloroethylene)  | 0.002                  | nd           | 0.002          | yes    | 99                  | 70             | 130            | yes    |
| 1,1,1,2-Tetrachloroethane              | 0.002                  | nd           | 0.002          | yes    | 97                  | 70             | 130            | yes    |
| Chlorobenzene                          | 0.002                  | nd           | 0.002          | yes    | 98                  | 70             | 130            | yes    |
| Ethylbenzene                           | 0.002                  | nd           | 0.002          | yes    | 100                 | 70             | 130            | yes    |
| m-Xylene & p-Xylene                    | 0.002                  | nd           | 0.002          | yes    | 101                 | 70             | 130            | yes    |
| Bromoform                              | 0.002                  | nd           | 0.002          | yes    | 101                 | 70             | 130            | yes    |
| Styrene                                | 0.002                  | nd           | 0.002          | yes    | 100                 | 70             | 130            | yes    |
| 1,1,2,2-Tetrachloroethane              | 0.002                  | nd           | 0.002          | yes    | 96                  | 70             | 130            | yes    |
| o-Xylene                               | 0.002                  | nd           | 0.002          | yes    | 99                  | 70             | 130            | yes    |
| 1,3-Dichlorobenzene                    | 0.002                  | nd           | 0.002          | yes    | 105                 | 70             | 130            | yes    |
| 1,4-Dichlorobenzene                    | 0.002                  | nd           | 0.002          | yes    | 102                 | 70             | 130            | yes    |
| 1,2-Dichlorobenzene                    | 0.002                  | nd           | 0.002          | yes    | 101                 | 70             | 130            | yes    |

## Surrogate Standard Recoveries:

|                      |      |     |    |    |     |     |
|----------------------|------|-----|----|----|-----|-----|
| Dibromofluoromethane | 102% | yes | 96 | 70 | 130 | yes |
| Toluene-d8           | 96%  | yes | 97 | 70 | 130 | yes |
| 4-Bromofluorobenzene | 96%  | yes | 99 | 70 | 130 | yes |



Client: Morrow Environmental Consultants Inc.  
Project Reference: W8140B  
Work Order: G992948V  
Matrix: Soil

**VOLATILE ORGANIC COMPOUNDS**

Date: 26-Oct-99

Legend: EQL = Estimated Quantitation Limit  
nd = Not Detected Above EQL  
Dup. = Duplicate  
\*\* = Data obtained from medium level purge & trap

Date of sample receipt: July 22, 1999  
Date of sample analysis: July 25 & 26, 1999

**Analytical Method:**

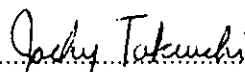
The soil samples were analysed by low level purge & trap (US EPA Method 5035) gas chromatography/ mass spectrometry using US EPA Method 8260B (modified).

The soil samples were also preextracted in methanol and the extracts analysed by medium level purge & trap (US EPA Method 5030A) gas chromatography/mass spectrometry using US EPA Method 8260B (modified).

Note: Estimated quantitation limit is the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

*NOTE: All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analysis done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangement.*

Job Approved By:

  
.....  
Jacky Takeuchi, B.A.Sc., C.Chem.  
Analytical Chemist



RECEIVED

Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: J. Derek Trinke

SEP 17 1999

ENVIRONMENTAL  
CONSULTANTS INC.  
WINNIPEG

Date Received: September 1/1999  
Date Reported: November 12/1999  
Lab Ref#: G993671  
Lab Quote#: 96-W238-VG  
Client PO#: EA301/Weston Yd  
Client Ref#: W8140B  
Sampled By: JDT/SAD

## REVISED REPORT

### Certificate of Analysis

Analysis Performed: HydroCarbon Characterization, FID

Methodology: 1) HydroCarbon characterization is done by GC analysis,  
following a solvent extraction.  
U.S. EPA Method No.8011(microextraction)

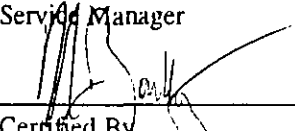
Instrumentation: 1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S

Sample Description: Oil/Gasoline/Fuel

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

  
Certified By  
Elaine Grant  
Service Manager

  
Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.



## Report of Analysis

Report Date: November 12/1999  
Lab Ref # : G993671  
Lab Quote #: 96-W238-VG  
Client PO#: EA301/Weston Yd  
Client Ref#: W8140B

## REVISED REPORT

### Analysis of Oil/Gasoline/Fuel

[illegible]

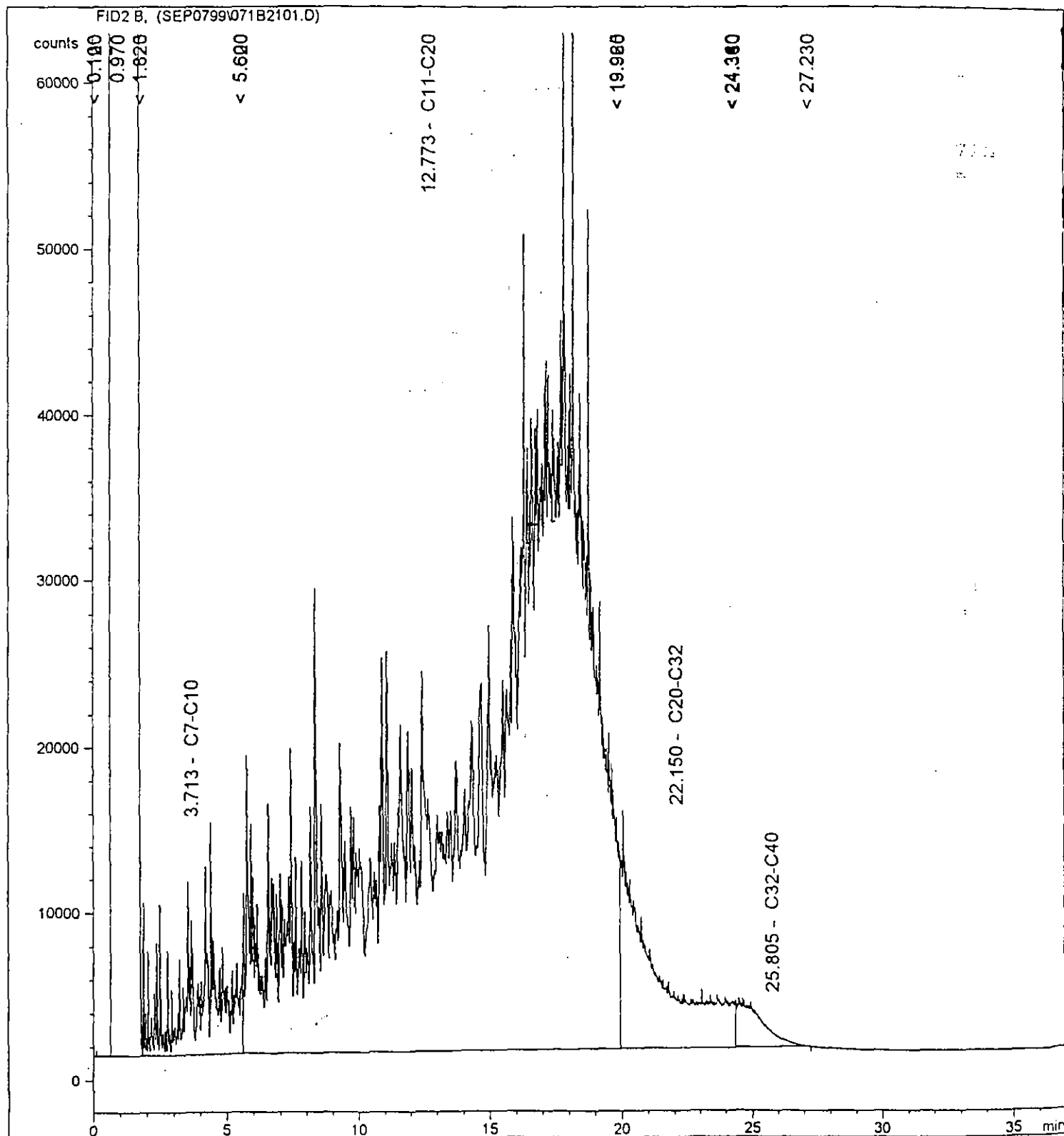
|     |                                                                                                      |
|-----|------------------------------------------------------------------------------------------------------|
| EQL | Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence. |
| -   | Not Requested                                                                                        |
| ED? | Contaminant elutes in the diesel range but does not match reference standard.                        |
| na  | Not Applicable                                                                                       |

=====

|                |                         |            |             |
|----------------|-------------------------|------------|-------------|
| Injection Date | : 09/08/1999 4:43:22 AM | Seq. Line  | : 21        |
| Sample Name    | : 3671LHC-13            | Vial       | : 71        |
| Acq. Operator  | : D MCLEOD              | Inj        | : 1         |
|                |                         | Inj Volume | : 1 $\mu$ l |

Acq. Method : C:\HPCHEM\2\METHODS\4TPHIFA.M  
Last changed : 09/03/1999 11:04:01 AM by D MCLEOD  
Analysis Method : C:\HPCHEM\2\METHODS\4HCCR.M  
Last changed : 09/09/1999 2:28:49 PM by D MCLEOD  
4TPHIR METHOD FOR REAR CHANNEL ON FID IV-15M,DB1-HT

=====



Injection Date : 09/08/1999 3:55:30 AM

Seq. Line : 20

Sample Name : 3671-LHC-10

Vial : 70

Acq. Operator : D MCLEOD

Inj : 1

Inj Volume : 1  $\mu$ l

Acq. Method : C:\HPCHEM\2\METHODS\4TPHIFA.M

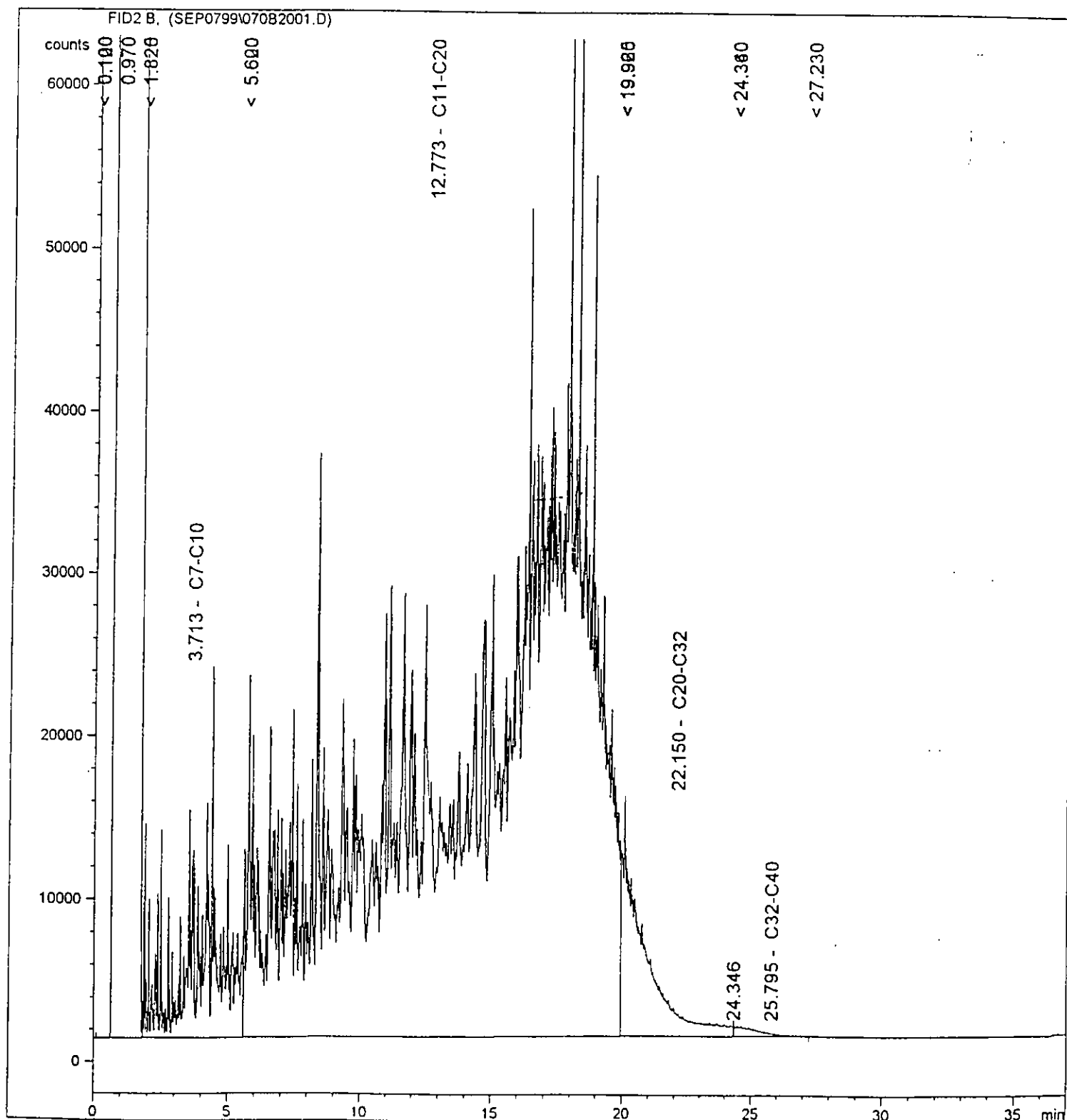
Last changed : 09/03/1999 11:04:01 AM by D MCLEOD

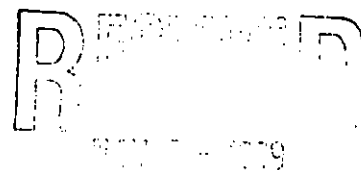
Analysis Method : C:\HPCHEM\2\METHODS\4HCCR.M

Last changed : 09/09/1999 2:24:57 PM by D MCLEOD

(modified after loading)

4TPHIR METHOD FOR REAR CHANNEL ON FID IV-15M,DB1-HT





Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: J. Derek Trinke

Date Received: September 15/1999  
Date Reported: October 26/1999  
Lab Ref#: G993888  
Lab Quote#: 96-W238-VG  
Client PO#: EA301/Weston Yd  
Client Ref#: W8140B  
Sampled By: JDT

### Certificate of Analysis

Analysis Performed: 30 Element ICP-MS Scan

Methodology: 1) Analysis of trace metals in water by Inductively Coupled Plasma Mass Spectrophotometry.  
U.S. EPA Method No. 200.8(Modification)

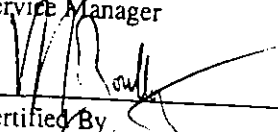
Instrumentation: 1) PE Sciex ELAN 6000 ICP-MS Spectrometer

Sample Description: Water

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

  
Certified By  
Elaine Grant  
Service Manager

  
Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

## Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.  
Contact: J. Derek Trinke

Date Reported: October 26/1999  
Lab Ref # : G993888  
Lab Quote#: 96-W238-VG  
Client PO#: EA301/Weston Yd  
Client Ref#: W8140B

## Analysis of Water

| Parameter  | SAMPLE ID<br>(spike) | EQL    | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|------------|----------------------|--------|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|            |                      |        |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Aluminum   | na                   | 0.005  | mg/L  | nd            | 0.01           | yes    | 94                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Antimony   | na                   | 0.0005 | mg/L  | nd            | 0.001          | yes    | 102                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Arsenic    | na                   | 0.002  | mg/L  | nd            | 0.004          | yes    | 99                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Barium     | na                   | 0.005  | mg/L  | nd            | 0.01           | yes    | 102                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Beryllium  | na                   | 0.001  | mg/L  | nd            | 0.002          | yes    | 96                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Bismuth    | na                   | 0.001  | mg/L  | nd            | 0.002          | yes    | 93                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Boron      | na                   | 0.005  | mg/L  | nd            | 0.02           | yes    | 93                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Cadmium    | na                   | 0.0001 | mg/L  | nd            | 0.0002         | yes    | 99                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Calcium    | na                   | 0.5    | mg/L  | nd            | 0.5            | yes    | 100                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Chromium   | na                   | 0.005  | mg/L  | nd            | 0.01           | yes    | 92                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Cobalt     | na                   | 0.0001 | mg/L  | nd            | 0.0002         | yes    | 99                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Copper     | na                   | 0.0005 | mg/L  | nd            | 0.001          | yes    | 91                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Iron       | na                   | 0.03   | mg/L  | nd            | 0.05           | yes    | 110                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Lead       | na                   | 0.0005 | mg/L  | nd            | 0.001          | yes    | 92                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Magnesium  | na                   | 0.05   | mg/L  | nd            | 0.1            | yes    | 109                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Manganese  | na                   | 0.005  | mg/L  | nd            | 0.01           | yes    | 97                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Molybdenum | na                   | 0.001  | mg/L  | nd            | 0.002          | yes    | 108                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Nickel     | na                   | 0.001  | mg/L  | nd            | 0.002          | yes    | 88                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Phosphorus | na                   | 0.05   | mg/L  | nd            | 0.1            | yes    | 106                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Potassium  | na                   | 0.1    | mg/L  | nd            | 0.2            | yes    | 100                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence  
 \* = Unavailable due to dilution required for analysis  
 na = Not Applicable  
 ns = Insufficient Sample Submitted  
 nd = parameter not detected  
 TR = trace level less than EQL

Philip Analytical Services Corp  
**Certificate of Quality Control**

Client : Morrow Environmental Consultants Inc.  
Contact: J. Derek Trinke

Date Reported: October 26/1999  
Lab Ref # : G993888  
Lab Quote#: 96-W238-VG  
Client PO#: EA301/Weston Yd  
Client Ref#: W8140B

Analysis of Water

| Parameter | SAMPLE ID<br>(spike) | EQL    | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|-----------|----------------------|--------|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|           |                      |        |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Selenium  | na                   | 0.002  | mg/L  | nd            | 0.004          | yes    | 96                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Silver    | na                   | 0.0001 | mg/L  | nd            | 0.0002         | yes    | 115                | 50             | 150            | yes    | na           | na     | na             | na             | na     | yes                         |
| Sodium    | na                   | 0.1    | mg/L  | nd            | 0.2            | yes    | 99                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Strontium | na                   | 0.001  | mg/L  | nd            | 0.002          | yes    | 101                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Thallium  | na                   | .00005 | mg/L  | nd            | 0.0001         | yes    | 95                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Tin       | na                   | 0.001  | mg/L  | nd            | 0.002          | yes    | 106                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Titanium  | na                   | 0.005  | mg/L  | nd            | 0.01           | yes    | 91                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Uranium   | na                   | 0.0001 | mg/L  | nd            | 0.0002         | yes    | 94                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Vanadium  | na                   | 0.0005 | mg/L  | nd            | 0.001          | yes    | 96                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Zinc      | na                   | 0.002  | mg/L  | nd            | 0.005          | yes    | 94                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence  
 \* = Unavailable due to dilution required for analysis  
 na = Not Applicable  
 ns = Insufficient Sample Submitted  
 nd = parameter not detected  
 TR = trace level less than EQL

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.

Contact: J. Derek Trinke

Report Date: October 26/1999

Lab Ref # : G993888

Lab Quote #: 96-W238-VG

Client PO#: EA301/Weston Yd

Client Ref#: W8140B

## Analysis of Water

| Parameter  | EQL    | Units | MW99-56-<br>990914<br>1999/09/14 | MW99-56-<br>990914<br>Replicate | MW99-59-<br>990914<br>1999/09/14 | MW99-61-<br>990914<br>1999/09/14 | MW99-63-<br>990914<br>1999/09/14 |
|------------|--------|-------|----------------------------------|---------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Aluminum   | 0.005  | mg/L  | nd                               | nd                              | 0.007                            | 0.005                            | nd                               |
| Antimony   | 0.0005 | mg/L  | 0.0091                           | 0.0094                          | 0.0075                           | 0.0041                           | 0.0079                           |
| Arsenic    | 0.002  | mg/L  | nd                               | nd                              | 0.008                            | 0.004                            | 0.003                            |
| Barium     | 0.005  | mg/L  | 1.36                             | 1.37                            | 0.564                            | 0.413                            | 0.578                            |
| Beryllium  | 0.001  | mg/L  | nd                               | nd                              | nd                               | nd                               | nd                               |
| Bismuth    | 0.001  | mg/L  | nd                               | nd                              | nd                               | nd                               | nd                               |
| Boron      | 0.005  | mg/L  | 0.450                            | 0.463                           | 0.312                            | 0.370                            | 0.529                            |
| Cadmium    | 0.0001 | mg/L  | nd                               | nd                              | nd                               | 0.0002                           | nd                               |
| Calcium    | 0.5    | mg/L  | 120                              | 123                             | 220                              | 344                              | 231                              |
| Chromium   | 0.005  | mg/L  | nd!(0.050)                       | nd!(0.050)                      | nd!(0.050)                       | nd!(0.050)                       | nd!(0.050)                       |
| Cobalt     | 0.0001 | mg/L  | 0.0001                           | 0.0001                          | 0.0037                           | 0.0012                           | 0.0027                           |
| Copper     | 0.0005 | mg/L  | 0.0020                           | 0.0025                          | 0.0005                           | 0.0062                           | 0.0044                           |
| Iron       | 0.03   | mg/L  | nd                               | nd                              | 6.81                             | 0.03                             | nd                               |
| Lead       | 0.0005 | mg/L  | nd                               | nd                              | nd                               | nd                               | nd                               |
| Magnesium  | 0.05   | mg/L  | 53.0                             | 52.6                            | 199                              | 517                              | 236                              |
| Manganese  | 0.005  | mg/L  | 0.131                            | 0.130                           | 1.95                             | 0.859                            | 0.860                            |
| Molybdenum | 0.001  | mg/L  | 0.009                            | 0.010                           | 0.004                            | 0.007                            | 0.014                            |
| Nickel     | 0.001  | mg/L  | 0.005                            | 0.005                           | 0.009                            | 0.016                            | 0.013                            |
| Phosphorus | 0.05   | mg/L  | nd                               | nd                              | 0.32                             | nd                               | nd                               |
| Potassium  | 0.1    | mg/L  | 7.3                              | 7.4                             | 8.3                              | 10.4                             | 11.8                             |
| Selenium   | 0.002  | mg/L  | nd                               | nd                              | nd                               | nd                               | 0.002                            |
| Silver     | 0.0001 | mg/L  | nd                               | nd                              | nd                               | nd                               | nd                               |
| Sodium     | 0.1    | mg/L  | 142                              | 144                             | 185                              | 463                              | 251                              |
| Strontium  | 0.001  | mg/L  | 0.882                            | 0.899                           | 1.22                             | 2.51                             | 1.37                             |
| Thallium   | 0.0005 | mg/L  | nd                               | nd                              | nd                               | nd                               | nd                               |
| Tin        | 0.001  | mg/L  | nd                               | nd                              | nd                               | nd                               | nd                               |
| Titanium   | 0.005  | mg/L  | nd                               | nd                              | nd                               | nd                               | nd                               |

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.  
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

## Report of Analysis

Client Ref#: W8140B

## Analysis of Water

[illegible]

**EQL** Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
 Contact: J. Derek Trinke

Report Date: October 26/1999  
 Lab Ref # : G993888  
 Lab Quote #: 96-W238-VG  
 Client PO#: EA301/Weston Yd  
 Client Ref#: W8140B

## Analysis of Water

| Parameter  | EQL    | Units | MW99-82-<br>990914<br>1999/09/14 |  |  |  |  |
|------------|--------|-------|----------------------------------|--|--|--|--|
| Aluminum   | 0.005  | mg/L  | 0.006                            |  |  |  |  |
| Antimony   | 0.0005 | mg/L  | 0.0037                           |  |  |  |  |
| Arsenic    | 0.002  | mg/L  | 0.008                            |  |  |  |  |
| Barium     | 0.005  | mg/L  | 0.359                            |  |  |  |  |
| Beryllium  | 0.001  | mg/L  | nd                               |  |  |  |  |
| Bismuth    | 0.001  | mg/L  | nd                               |  |  |  |  |
| Boron      | 0.005  | mg/L  | 0.242                            |  |  |  |  |
| Cadmium    | 0.0001 | mg/L  | nd                               |  |  |  |  |
| Calcium    | 0.5    | mg/L  | 212                              |  |  |  |  |
| Chromium   | 0.005  | mg/L  | nd!(0.050)                       |  |  |  |  |
| Cobalt     | 0.0001 | mg/L  | 0.0036                           |  |  |  |  |
| Copper     | 0.0005 | mg/L  | nd                               |  |  |  |  |
| Iron       | 0.03   | mg/L  | 6.41                             |  |  |  |  |
| Lead       | 0.0005 | mg/L  | nd                               |  |  |  |  |
| Magnesium  | 0.05   | mg/L  | 191                              |  |  |  |  |
| Manganese  | 0.005  | mg/L  | 1.89                             |  |  |  |  |
| Molybdenum | 0.001  | mg/L  | 0.004                            |  |  |  |  |
| Nickel     | 0.001  | mg/L  | 0.009                            |  |  |  |  |
| Phosphorus | 0.05   | mg/L  | 0.33                             |  |  |  |  |
| Potassium  | 0.1    | mg/L  | 8.4                              |  |  |  |  |
| Selenium   | 0.002  | mg/L  | nd                               |  |  |  |  |
| Silver     | 0.0001 | mg/L  | nd                               |  |  |  |  |
| Sodium     | 0.1    | mg/L  | 176                              |  |  |  |  |
| Strontium  | 0.001  | mg/L  | 1.16                             |  |  |  |  |
| Thallium   | .00005 | mg/L  | nd                               |  |  |  |  |
| Tin        | 0.001  | mg/L  | nd                               |  |  |  |  |
| Titanium   | 0.005  | mg/L  | nd                               |  |  |  |  |

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.  
 nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

## Report of Analysis

Report Date: October 26/1999  
Lab Ref # : G993888  
Lab Quote #: 96-W238-VG  
Client PO#: EA301/Weston Yd  
Client Ref#: W8140B

## Analysis of Water

[illegible]

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RECEIVED  
SEP 15 1999  
MORROW ENVIRONMENTAL CONSULTANTS INC.

Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: J. Derek Trinke

Date Received: September 15, 1999  
Date Reported: December 17, 1999  
Lab Ref#: G993888  
Lab Quote#: 96-W238-VG  
Client PO#: EA301/Weston Yd  
Client Ref#: W8140B  
Sampled By: JDT

**Attached are your results for VOC's**

If you have any questions please call Elaine Grant,  
your Service Manager at Philip Analytical Services Corp.

Client: Morrow Environmental  
Consultants Inc.  
Project Reference: EA301/Weston Yd

# VOLATILE ORGANIC COMPOUNDS

Date: 17-Dec-99

Units: micrograms/liter (µg/L)

Work Order: G993888V  
Matrix: Water

| Compound                               | EQL<br>µg/L | MW99-55<br>-990914 | EQL<br>µg/L | MW99-56<br>-990914<br>DF=10 | MW99-56<br>-990914<br>DF=10<br>Dup. | EQL<br>µg/L | MW99-59<br>-990914<br>DF=250 |
|----------------------------------------|-------------|--------------------|-------------|-----------------------------|-------------------------------------|-------------|------------------------------|
| Chloromethane                          | 1.0         | nd                 | 10.0        | nd                          | nd                                  | 250         | nd                           |
| Vinyl chloride                         | 0.5         | nd                 | 5.0         | nd                          | nd                                  | 125         | 1260                         |
| Bromomethane                           | 0.5         | nd                 | 5.0         | nd                          | nd                                  | 125         | nd                           |
| Chloroethane                           | 0.5         | nd                 | 5.0         | nd                          | nd                                  | 125         | nd                           |
| Trichlorofluoromethane                 | 0.5         | nd                 | 5.0         | nd                          | nd                                  | 125         | nd                           |
| Acetone                                | 10.0        | nd                 | 100         | nd                          | nd                                  | 2500        | nd                           |
| 1,1-Dichloroethene                     | 0.2         | nd                 | 2.0         | nd                          | nd                                  | 50          | nd                           |
| Dichloromethane (Methylene Chloride)   | 1.0         | nd                 | 10.0        | nd                          | nd                                  | 250         | nd                           |
| trans-1,2-Dichloroethene               | 0.2         | nd                 | 2.0         | nd                          | nd                                  | 50          | *48                          |
| Methyl-t-Butyl Ether                   | 0.2         | nd                 | 2.0         | nd                          | nd                                  | 50          | nd                           |
| 1,1-Dichloroethane                     | 0.2         | nd                 | 2.0         | 2.6                         | 2.3                                 | 50          | nd                           |
| Methyl Ethyl Ketone (MEK)              | 5.0         | nd                 | 50.0        | nd                          | nd                                  | 1250        | nd                           |
| cis-1,2-Dichloroethene                 | 0.2         | nd                 | 2.0         | 1.8                         | 2.5                                 | 50          | 16200                        |
| Chloroform                             | 0.2         | nd                 | 2.0         | nd                          | nd                                  | 50          | nd                           |
| 1,2-Dichloroethane                     | 0.2         | nd                 | 2.0         | nd                          | nd                                  | 50          | nd                           |
| 1,1,1-Trichloroethane                  | 0.2         | nd                 | 2.0         | 6.7                         | 5.8                                 | 50          | nd                           |
| Carbon Tetrachloride                   | 0.2         | nd                 | 2.0         | nd                          | nd                                  | 50          | nd                           |
| Benzene                                | 0.1         | nd                 | 1.0         | nd                          | nd                                  | 25          | nd                           |
| 1,2-Dichloropropane                    | 0.2         | nd                 | 2.0         | nd                          | nd                                  | 50          | nd                           |
| Trichloroethene                        | 0.2         | nd                 | 2.0         | 5.2                         | 4.5                                 | 50          | *46                          |
| Bromodichloromethane                   | 0.2         | nd                 | 2.0         | nd                          | nd                                  | 50          | nd                           |
| cis-1,3-Dichloropropene                | 0.2         | nd                 | 2.0         | nd                          | nd                                  | 50          | nd                           |
| Methyl Isobutyl Ketone (MIBK)          | 5.0         | nd                 | 50.0        | nd                          | nd                                  | 1250        | nd                           |
| trans-1,3-Dichloropropene              | 0.2         | nd                 | 2.0         | nd                          | nd                                  | 50          | nd                           |
| 1,1,2-Trichloroethane                  | 0.2         | nd                 | 2.0         | nd                          | nd                                  | 50          | nd                           |
| Toluene                                | 0.2         | nd                 | 2.0         | nd                          | nd                                  | 50          | nd                           |
| 2-Hexanone                             | 5.0         | nd                 | 50.0        | nd                          | nd                                  | 1250        | nd                           |
| Dibromochloromethane                   | 0.2         | nd                 | 2.0         | nd                          | nd                                  | 50          | nd                           |
| 1,2-Dibromoethane (Ethylene Dibromide) | 0.2         | nd                 | 2.0         | nd                          | nd                                  | 50          | nd                           |
| Tetrachloroethene (Perchloroethylene)  | 0.2         | nd                 | 2.0         | 101                         | 93.3                                | 50          | nd                           |
| 1,1,1,2-Tetrachloroethane              | 0.2         | nd                 | 2.0         | nd                          | nd                                  | 50          | nd                           |
| Chlorobenzene                          | 0.2         | nd                 | 2.0         | nd                          | nd                                  | 50          | nd                           |
| Ethylbenzene                           | 0.2         | nd                 | 2.0         | nd                          | nd                                  | 50          | nd                           |
| m-Xylene & p-Xylene                    | 0.2         | nd                 | 2.0         | nd                          | nd                                  | 50          | nd                           |
| Bromoform                              | 0.2         | nd                 | 2.0         | nd                          | nd                                  | 50          | nd                           |
| Styrene                                | 0.2         | nd                 | 2.0         | nd                          | nd                                  | 50          | nd                           |
| 1,1,2,2-Tetrachloroethane              | 0.2         | nd                 | 2.0         | nd                          | nd                                  | 50          | nd                           |
| o-Xylene                               | 0.2         | nd                 | 2.0         | nd                          | nd                                  | 50          | nd                           |
| 1,3-Dichlorobenzene                    | 0.2         | nd                 | 2.0         | nd                          | nd                                  | 50          | nd                           |
| 1,4-Dichlorobenzene                    | 0.2         | nd                 | 2.0         | nd                          | nd                                  | 50          | nd                           |
| 1,2-Dichlorobenzene                    | 0.2         | nd                 | 2.0         | nd                          | nd                                  | 50          | nd                           |

Surrogate Standard Recoveries: Control Limits: 70-130%

|                      |      |      |      |      |
|----------------------|------|------|------|------|
| Dibromofluoromethane | 105% | 113% | 109% | 105% |
| Toluene-d8           | 101% | 95%  | 97%  | 99%  |
| 4-Bromofluorobenzene | 94%  | 94%  | 90%  | 93%  |

Client: Morrow Environmental  
Consultants Inc.  
Project Reference: EA301/Weston Yd

# VOLATILE ORGANIC COMPOUNDS

Date: 17-Dec-99

Work Order: G993888V  
Matrix: Water

Units: micrograms/liter (µg/L)

| Compound                               | EQL<br>µg/L | MW99-60<br>-990914 | EQL<br>µg/L | MW99-61<br>-990914<br>DF=25 | EQL<br>µg/L | MW99-63<br>-990914<br>DF=100 | MW99-83<br>-990914<br>DF=100 |
|----------------------------------------|-------------|--------------------|-------------|-----------------------------|-------------|------------------------------|------------------------------|
| Chloromethane                          | 1.0         | nd                 | 25.0        | nd                          | 100         | nd                           | nd                           |
| Vinyl chloride                         | 0.5         | 21.5               | 12.5        | nd                          | 50          | *32                          | *34                          |
| Bromomethane                           | 0.5         | nd                 | 12.5        | nd                          | 50          | nd                           | nd                           |
| Chloroethane                           | 0.5         | *0.3               | 12.5        | nd                          | 50          | 88                           | 88                           |
| Trichlorofluoromethane                 | 0.5         | nd                 | 12.5        | nd                          | 50          | nd                           | nd                           |
| Acetone                                | 10.0        | nd                 | 250         | nd                          | 1000        | nd                           | nd                           |
| 1,1-Dichloroethene                     | 0.2         | 0.3                | 5.0         | 88.6                        | 20          | 445                          | 466                          |
| Dichloromethane (Methylene Chloride)   | 1.0         | nd                 | 25.0        | nd                          | 100         | nd                           | nd                           |
| trans-1,2-Dichloroethene               | 0.2         | 2.2                | 5.0         | nd                          | 20          | nd                           | nd                           |
| Methyl-t-Butyl Ether                   | 0.2         | nd                 | 5.0         | nd                          | 20          | nd                           | nd                           |
| 1,1-Dichloroethane                     | 0.2         | 19.1               | 5.0         | 19.2                        | 20          | 720                          | 742                          |
| Methyl Ethyl Ketone (MEK)              | 5.0         | nd                 | 125         | nd                          | 500         | nd                           | nd                           |
| cis-1,2-Dichloroethene                 | 0.2         | 26.6               | 5.0         | 7.4                         | 20          | 207                          | 214                          |
| Chloroform                             | 0.2         | nd                 | 5.0         | 8.8                         | 20          | nd                           | nd                           |
| 1,2-Dichloroethane                     | 0.2         | nd                 | 5.0         | nd                          | 20          | 20                           | 20                           |
| 1,1,1-Trichloroethane                  | 0.2         | *0.1               | 5.0         | 33.9                        | 20          | 905                          | 957                          |
| Carbon Tetrachloride                   | 0.2         | nd                 | 5.0         | nd                          | 20          | nd                           | nd                           |
| Benzene                                | 0.1         | nd                 | 2.5         | nd                          | 10          | nd                           | nd                           |
| 1,2-Dichloropropane                    | 0.2         | nd                 | 5.0         | nd                          | 20          | nd                           | nd                           |
| Trichloroethene                        | 0.2         | 2.2                | 5.0         | 307                         | 20          | 111                          | 114                          |
| Bromodichloromethane                   | 0.2         | nd                 | 5.0         | nd                          | 20          | nd                           | nd                           |
| cis-1,3-Dichloropropene                | 0.2         | nd                 | 5.0         | nd                          | 20          | nd                           | nd                           |
| Methyl Isobutyl Ketone (MIBK)          | 5.0         | nd                 | 125         | nd                          | 500         | nd                           | nd                           |
| trans-1,3-Dichloropropene              | 0.2         | nd                 | 5.0         | nd                          | 20          | nd                           | nd                           |
| 1,1,2-Trichloroethane                  | 0.2         | nd                 | 5.0         | nd                          | 20          | nd                           | nd                           |
| Toluene                                | 0.2         | 0.2                | 5.0         | nd                          | 20          | nd                           | nd                           |
| 2-Hexanone                             | 5.0         | nd                 | 125         | nd                          | 500         | nd                           | nd                           |
| Dibromochloromethane                   | 0.2         | nd                 | 5.0         | nd                          | 20          | nd                           | nd                           |
| 1,2-Dibromoethane (Ethylene Dibromide) | 0.2         | nd                 | 5.0         | nd                          | 20          | nd                           | nd                           |
| Tetrachloroethene (Perchloroethylene)  | 0.2         | *0.1               | 5.0         | 49.1                        | 20          | nd                           | nd                           |
| 1,1,1,2-Tetrachloroethane              | 0.2         | nd                 | 5.0         | nd                          | 20          | nd                           | nd                           |
| Chlorobenzene                          | 0.2         | nd                 | 5.0         | nd                          | 20          | nd                           | nd                           |
| Ethylbenzene                           | 0.2         | nd                 | 5.0         | nd                          | 20          | nd                           | nd                           |
| m-Xylene & p-Xylene                    | 0.2         | nd                 | 5.0         | nd                          | 20          | nd                           | nd                           |
| Bromoform                              | 0.2         | nd                 | 5.0         | nd                          | 20          | nd                           | nd                           |
| Styrene                                | 0.2         | nd                 | 5.0         | nd                          | 20          | nd                           | nd                           |
| 1,1,2,2-Tetrachloroethane              | 0.2         | nd                 | 5.0         | nd                          | 20          | nd                           | nd                           |
| o-Xylene                               | 0.2         | nd                 | 5.0         | nd                          | 20          | nd                           | nd                           |
| 1,3-Dichlorobenzene                    | 0.2         | nd                 | 5.0         | nd                          | 20          | nd                           | nd                           |
| 1,4-Dichlorobenzene                    | 0.2         | nd                 | 5.0         | nd                          | 20          | nd                           | nd                           |
| 1,2-Dichlorobenzene                    | 0.2         | nd                 | 5.0         | nd                          | 20          | nd                           | nd                           |

Surrogate Standard Recoveries: Control Limits: 70-130%

|                      |      |      |      |      |
|----------------------|------|------|------|------|
| Dibromofluoromethane | 101% | 109% | 109% | 111% |
| Toluene-d8           | 105% | 96%  | 96%  | 95%  |
| 4-Bromofluorobenzene | 104% | 92%  | 90%  | 94%  |

Client: Morrow Environmental  
Consultants Inc.  
Project Reference: EA301/Weston Yd

# VOLATILE ORGANIC COMPOUNDS

Date: 17-Dec-99

Work Order: G993888V  
Matrix: Water

Units: micrograms/liter (µg/L)

| Compound                               | EQL<br>µg/L | Method Blank |                |        | Spiked Method Blank |                |                |        |
|----------------------------------------|-------------|--------------|----------------|--------|---------------------|----------------|----------------|--------|
|                                        |             | Result       | Upper<br>Limit | Accept | %<br>Recovery       | Lower<br>Limit | Upper<br>Limit | Accept |
| Chloromethane                          | 1.0         | nd           | 1.0            | yes    | 97                  | 60             | 140            | yes    |
| Vinyl chloride                         | 0.5         | nd           | 0.5            | yes    | 100                 | 60             | 140            | yes    |
| Bromomethane                           | 0.5         | nd           | 0.5            | yes    | 98                  | 60             | 140            | yes    |
| Chloroethane                           | 0.5         | nd           | 0.5            | yes    | 98                  | 60             | 140            | yes    |
| Trichlorofluoromethane                 | 0.5         | nd           | 0.5            | yes    | 102                 | 70             | 130            | yes    |
| Acetone                                | 10.0        | nd           | 10.0           | yes    | 99                  | 60             | 140            | yes    |
| 1,1-Dichloroethene                     | 0.2         | nd           | 0.2            | yes    | 101                 | 70             | 130            | yes    |
| Dichloromethane (Methylene Chloride)   | 1.0         | nd           | 1.0            | yes    | 97                  | 70             | 130            | yes    |
| trans-1,2-Dichloroethene               | 0.2         | nd           | 0.2            | yes    | 98                  | 70             | 130            | yes    |
| Methyl-t-Butyl Ether                   | 0.2         | nd           | 0.2            | yes    | 98                  | 70             | 130            | yes    |
| 1,1-Dichloroethane                     | 0.2         | nd           | 0.2            | yes    | 97                  | 70             | 130            | yes    |
| Methyl Ethyl Ketone (MEK)              | 5.0         | nd           | 5.0            | yes    | 99                  | 60             | 140            | yes    |
| cis-1,2-Dichloroethene                 | 0.2         | nd           | 0.2            | yes    | 98                  | 70             | 130            | yes    |
| Chloroform                             | 0.2         | nd           | 0.2            | yes    | 98                  | 70             | 130            | yes    |
| 1,2-Dichloroethane                     | 0.2         | nd           | 0.2            | yes    | 99                  | 70             | 130            | yes    |
| 1,1,1-Trichloroethane                  | 0.2         | nd           | 0.2            | yes    | 100                 | 70             | 130            | yes    |
| Carbon Tetrachloride                   | 0.2         | nd           | 0.2            | yes    | 101                 | 70             | 130            | yes    |
| Benzene                                | 0.1         | nd           | 0.1            | yes    | 98                  | 70             | 130            | yes    |
| 1,2-Dichloropropane                    | 0.2         | nd           | 0.2            | yes    | 99                  | 70             | 130            | yes    |
| Trichloroethene                        | 0.2         | nd           | 0.2            | yes    | 98                  | 70             | 130            | yes    |
| Bromodichloromethane                   | 0.2         | nd           | 0.2            | yes    | 97                  | 70             | 130            | yes    |
| cis-1,3-Dichloropropene                | 0.2         | nd           | 0.2            | yes    | 96                  | 70             | 130            | yes    |
| Methyl Isobutyl Ketone (MIBK)          | 5.0         | nd           | 5.0            | yes    | 97                  | 60             | 140            | yes    |
| trans-1,3-Dichloropropene              | 0.2         | nd           | 0.2            | yes    | 97                  | 70             | 130            | yes    |
| 1,1,2-Trichloroethane                  | 0.2         | nd           | 0.2            | yes    | 97                  | 70             | 130            | yes    |
| Toluene                                | 0.2         | nd           | 0.2            | yes    | 97                  | 70             | 130            | yes    |
| 2-Hexanone                             | 5.0         | nd           | 5.0            | yes    | 100                 | 60             | 140            | yes    |
| Dibromochloromethane                   | 0.2         | nd           | 0.2            | yes    | 96                  | 70             | 130            | yes    |
| 1,2-Dibromoethane (Ethylene Dibromide) | 0.2         | nd           | 0.2            | yes    | 96                  | 70             | 130            | yes    |
| Tetrachloroethene (Perchloroethylene)  | 0.2         | nd           | 0.2            | yes    | 100                 | 70             | 130            | yes    |
| 1,1,1,2-Tetrachloroethane              | 0.2         | nd           | 0.2            | yes    | 97                  | 70             | 130            | yes    |
| Chlorobenzene                          | 0.2         | nd           | 0.2            | yes    | 96                  | 70             | 130            | yes    |
| Ethylbenzene                           | 0.2         | nd           | 0.2            | yes    | 99                  | 70             | 130            | yes    |
| m-Xylene & p-Xylene                    | 0.2         | nd           | 0.2            | yes    | 100                 | 70             | 130            | yes    |
| Bromoform                              | 0.2         | nd           | 0.2            | yes    | 96                  | 70             | 130            | yes    |
| Styrene                                | 0.2         | nd           | 0.2            | yes    | 99                  | 70             | 130            | yes    |
| 1,1,2,2-Tetrachloroethane              | 0.2         | nd           | 0.2            | yes    | 96                  | 70             | 130            | yes    |
| o-Xylene                               | 0.2         | nd           | 0.2            | yes    | 99                  | 70             | 130            | yes    |
| 1,3-Dichlorobenzene                    | 0.2         | nd           | 0.2            | yes    | 102                 | 70             | 130            | yes    |
| 1,4-Dichlorobenzene                    | 0.2         | nd           | 0.2            | yes    | 101                 | 70             | 130            | yes    |
| 1,2-Dichlorobenzene                    | 0.2         | nd           | 0.2            | yes    | 101                 | 70             | 130            | yes    |

## Surrogate Standard Recoveries:

|                      |      |     |     |    |     |     |
|----------------------|------|-----|-----|----|-----|-----|
| Dibromofluoromethane | 86%  | yes | 99  | 70 | 130 | yes |
| Toluene-d8           | 116% | yes | 100 | 70 | 130 | yes |
| 4-Bromofluorobenzene | 72%  | yes | 100 | 70 | 130 | yes |

Client: Morrow Environmental  
Consultants Inc.  
Project Reference: EA301/Weston Yd

# VOLATILE ORGANIC COMPOUNDS

Date: 17-Dec-99

Work Order: G993888V  
Matrix: Water

Units: micrograms/liter (µg/L)

## Spiked Sample

| Compound                               | EQL<br>µg/L | Sample<br>ID | Amount<br>Spiked | %<br>Recovery | Lower<br>Limit | Upper<br>Limit | Accept |
|----------------------------------------|-------------|--------------|------------------|---------------|----------------|----------------|--------|
| Chloromethane                          | 1.0         | MW99-55      | 10.0             | 104           | 60             | 140            | yes    |
| Vinyl chloride                         | 0.5         | MW99-55      | 10.0             | 112           | 60             | 140            | yes    |
| Bromomethane                           | 0.5         | MW99-55      | 10.0             | 114           | 60             | 140            | yes    |
| Chloroethane                           | 0.5         | MW99-55      | 10.0             | 111           | 60             | 140            | yes    |
| Trichlorofluoromethane                 | 0.5         | MW99-55      | 10.0             | 113           | 70             | 130            | yes    |
| Acetone                                | 10.0        | MW99-55      | 50.0             | 121           | 60             | 140            | yes    |
| 1,1-Dichloroethene                     | 0.2         | MW99-55      | 5.0              | 113           | 70             | 130            | yes    |
| Dichloromethane (Methylene Chloride)   | 1.0         | MW99-55      | 10.0             | 104           | 70             | 130            | yes    |
| trans-1,2-Dichloroethene               | 0.2         | MW99-55      | 5.0              | 115           | 70             | 130            | yes    |
| Methyl-t-Butyl Ether                   | 0.2         | MW99-55      | 5.0              | 110           | 70             | 130            | yes    |
| 1,1-Dichloroethane                     | 0.2         | MW99-55      | 5.0              | 112           | 70             | 130            | yes    |
| Methyl Ethyl Ketone (MEK)              | 5.0         | MW99-55      | 50.0             | 117           | 60             | 140            | yes    |
| cis-1,2-Dichloroethene                 | 0.2         | MW99-55      | 5.0              | 113           | 70             | 130            | yes    |
| Chloroform                             | 0.2         | MW99-55      | 5.0              | 111           | 70             | 130            | yes    |
| 1,2-Dichloroethane                     | 0.2         | MW99-55      | 5.0              | 120           | 70             | 130            | yes    |
| 1,1,1-Trichloroethane                  | 0.2         | MW99-55      | 5.0              | 114           | 70             | 130            | yes    |
| Carbon Tetrachloride                   | 0.2         | MW99-55      | 5.0              | 114           | 70             | 130            | yes    |
| Benzene                                | 0.1         | MW99-55      | 2.0              | 114           | 70             | 130            | yes    |
| 1,2-Dichloropropane                    | 0.2         | MW99-55      | 5.0              | 112           | 70             | 130            | yes    |
| Trichloroethene                        | 0.2         | MW99-55      | 5.0              | 113           | 70             | 130            | yes    |
| Bromodichloromethane                   | 0.2         | MW99-55      | 5.0              | 110           | 70             | 130            | yes    |
| cis-1,3-Dichloropropene                | 0.2         | MW99-55      | 5.0              | 111           | 70             | 130            | yes    |
| Methyl Isobutyl Ketone (MIBK)          | 5.0         | MW99-55      | 50.0             | 111           | 60             | 140            | yes    |
| trans-1,3-Dichloropropene              | 0.2         | MW99-55      | 5.0              | 110           | 70             | 130            | yes    |
| 1,1,2-Trichloroethane                  | 0.2         | MW99-55      | 5.0              | 111           | 70             | 130            | yes    |
| Toluene                                | 0.2         | MW99-55      | 2.0              | 120           | 70             | 130            | yes    |
| 2-Hexanone                             | 5.0         | MW99-55      | 50.0             | 118           | 60             | 140            | yes    |
| Dibromochloromethane                   | 0.2         | MW99-55      | 5.0              | 113           | 70             | 130            | yes    |
| 1,2-Dibromoethane (Ethylene Dibromide) | 0.2         | MW99-55      | 5.0              | 112           | 70             | 130            | yes    |
| Tetrachloroethene (Perchloroethylene)  | 0.2         | MW99-55      | 5.0              | 115           | 70             | 130            | yes    |
| 1,1,1,2-Tetrachloroethane              | 0.2         | MW99-55      | 5.0              | 114           | 70             | 130            | yes    |
| Chlorobenzene                          | 0.2         | MW99-55      | 2.0              | 112           | 70             | 130            | yes    |
| Ethylbenzene                           | 0.2         | MW99-55      | 2.0              | 116           | 70             | 130            | yes    |
| m-Xylene & p-Xylene                    | 0.2         | MW99-55      | 4.0              | 123           | 70             | 130            | yes    |
| Bromoform                              | 0.2         | MW99-55      | 5.0              | 113           | 70             | 130            | yes    |
| Styrene                                | 0.2         | MW99-55      | 2.0              | 118           | 70             | 130            | yes    |
| 1,1,2,2-Tetrachloroethane              | 0.2         | MW99-55      | 5.0              | 115           | 70             | 130            | yes    |
| o-Xylene                               | 0.2         | MW99-55      | 2.0              | 118           | 70             | 130            | yes    |
| 1,3-Dichlorobenzene                    | 0.2         | MW99-55      | 5.0              | 120           | 70             | 130            | yes    |
| 1,4-Dichlorobenzene                    | 0.2         | MW99-55      | 5.0              | 120           | 70             | 130            | yes    |
| 1,2-Dichlorobenzene                    | 0.2         | MW99-55      | 5.0              | 121           | 70             | 130            | yes    |

## Surrogate Standard Recoveries:

|                      |     |     |    |     |     |
|----------------------|-----|-----|----|-----|-----|
| Dibromofluoromethane | 8.0 | 97  | 70 | 130 | yes |
| Toluene-d8           | 4.0 | 100 | 70 | 130 | yes |
| 4-Bromofluorobenzene | 8.0 | 99  | 70 | 130 | yes |

Client: Morrow Environmental  
Consultants Inc.

**VOLATILE ORGANIC COMPOUNDS**

Date: 17-Dec-99

Project Reference: EA301/Weston Yd

Work Order: G993888V

Matrix: Water

Legend: EQL = Estimated Quantitation Limit  
nd = Not Detected Above EQL  
Dup. = Duplicate  
DF = Dilution Factor  
\* = Detected below EQL but passed compound identification criteria

Date of sample receipt: September 15, 1999

Date of sample analysis: September 21 & 22, 1999

**Analytical Method:**

The water samples were analysed by purge & trap gas chromatography/mass spectrometry using US EPA Method 8260B (modified).

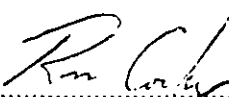
**Report Discussion:**

Since some target compounds present were at a level above the calibration range of the instrument, some of the samples were run at a dilution factor to avoid exceeding the calibration range and causing excessive contamination of the purge & trap equipment. The quantitation limits for these samples are higher than the EQL's for undiluted samples as indicated above. The amounts reported have been corrected for the dilution factors that were used.

Note: Estimated quantitation limit is the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

*NOTE: All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analysis done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangement.*

Job Approved By:

  
.....  
Ron Corkum, M.Sc., C.Chem.  
Manager, Mass Spectrometry Services



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NOV 2 - 1999

Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6  
  
Fax: 204-477-9194  
  
Attn: J. Derek Trinke

MORROW ENVIRONMENTAL  
CONSULTANTS INC.  
Winnipeg  
Date Received: October 8/1999  
Date Reported: October 15/1999  
Lab Ref#: G994324  
Lab Quote#: 96-W238-VG  
Client PO#: EA301 Weston  
Client Ref#: W8140B  
Sampled By: JDT

### Certificate of Analysis

Analysis Performed: Extractable Hydrocarbons(Manitoba Guidelines), C11-C32  
BTEX and Total Volatile Hydrocarbons(Manitoba Criteria)

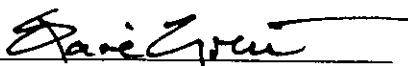
Methodology: 1) The characterization of HydroCarbon in soil by GC  
analysis, following a solvent extraction.  
U.S. EPA Method No.8011(microextraction)  
2) Analysis of Benzene, Toluene, Ethylbenzene, Xylenes &  
Volatile Hydrocarbons by Static Headspace Capillary GC-P  
ID/FID. External std quantitation with Surrogate stds.  
U.S. EPA Method No. 3810(Modification)

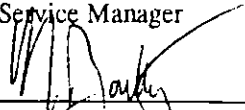
Instrumentation: 1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S  
2) Varian 3400 GC PID/FID, Genesis Headspace Analyzer

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

  
\_\_\_\_\_  
Certified By  
Elaine Grant  
Service Manager

  
\_\_\_\_\_  
Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

# Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.  
Contact: J. Derek Trinke

Date Reported: October 15/1999  
Lab Ref # : G994324  
Lab Quote#: 96-W238-VG  
Client PO#: EA301 Weston  
Client Ref#: W8140B

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | SAMPLE ID<br>(spike) | EQL  | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|------------------------------------------|----------------------|------|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|                                          |                      |      |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Total SemiVolatile Hydrocarbons(C11-C32) | na                   | 10.0 | mg/kg | nd            | 20.0           | yes    | 91                 | 70             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Benzene                                  | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 98                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Ethylbenzene                             | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 104                | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Toluene                                  | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 84                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Total Volatile Hydrocarbons              | na                   | 10   | mg/kg | nd            | 10             | yes    | 120                | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Xylenes(Total)                           | na                   | 0.04 | mg/kg | nd            | 0.08           | yes    | 102                | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence  
 \* = Unavailable due to dilution required for analysis  
 na = Not Applicable  
 ns = Insufficient Sample Submitted  
 nd = parameter not detected  
 TR = trace level less than EQL

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
 Contact: J. Derek Trinke

Report Date: October 15/1999  
 Lab Ref # : G994324  
 Lab Quote #: 96-W238-VG  
 Client PO#: EA301 Weston  
 Client Ref#: W8140B

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | EQL  | Units | TP99-12-3-<br>991007<br>1999/10/07 | TP99-14-4-<br>991007<br>1999/10/07 | TP99-16-1-<br>991007<br>1999/10/07 | TP99-19-2-<br>991007<br>1999/10/07 | TP99-20-3-<br>991007<br>1999/10/07 |
|------------------------------------------|------|-------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| Resemblance                              | na   | na    | EGD?                               | EGD?                               | EMO?                               | EMO?                               | EGDMO?                             |
| Total SemiVolatile Hydrocarbons(C11-C32) | 10.0 | mg/kg | 3880                               | 4580                               | 238                                | 542                                | 8540                               |
| Benzene                                  | 0.02 | mg/kg | 0.36                               | 0.04                               | -                                  | -                                  | nd                                 |
| Ethylbenzene                             | 0.02 | mg/kg | 1.59                               | 8.74                               | -                                  | -                                  | 3.42                               |
| Toluene                                  | 0.02 | mg/kg | nd                                 | 0.29                               | -                                  | -                                  | 0.02                               |
| Total Volatile Hydrocarbons              | 10   | mg/kg | 246                                | 730                                | -                                  | -                                  | 429                                |
| Xylenes(Total)                           | 0.04 | mg/kg | 2.66                               | 26.4                               | -                                  | -                                  | 4.70                               |

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

- Not Requested

EGD? Contaminant elutes in the gasoline/diesel range but does not match our reference standards.

EGDMO? Contaminant elutes across the gasoline/diesel/motor oil range but does not match our reference standards.

EMO? Contaminant elutes in the motor oil range but does not match reference standard.

na Not Applicable

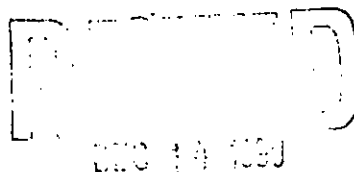
nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

## Report of Analysis

Report Date: October 15/1999  
Lab Ref # : G994324  
Lab Quote #: 96-W238-VG  
Client PO#: EA301 Weston  
Client Ref#: W8140B

Client Ref#: W8140B

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.  
 EGDMO? Contaminant elutes across the gasoline/diesel/motor oil range but does not match our reference standards.  
 na Not Applicable  
 nd parameter not detected != EQL higher than listed due to dilution ( ) Adjusted EQL



Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: J. Derek Trinke

**MORROW ENVIRONMENTAL**  
**CONSULTANTS INC.**

|                |                 |
|----------------|-----------------|
| Date Received: | October 8/1999  |
| Date Reported: | December 9/1999 |
| Lab Ref#:      | G994324         |
| Lab Quote#:    | 96-W238-VG      |
| Client PO#:    | EA301 Weston    |
| Client Ref#:   | W8140B          |
| Sampled By:    | JDT             |

Attached are the chromatograms for your samples.

If you have any questions, please call Elaine Grant,  
your Service Manager at Philip Analytical Services Corp.

Injection Date : 10/11/1999 7:02:11 AM

Seq. Line : 31

Sample Name : 4324-100 10X

Vial : 87

Acq. Operator : D MCLEOD

Inj : 1

Inj Volume : 1 µl

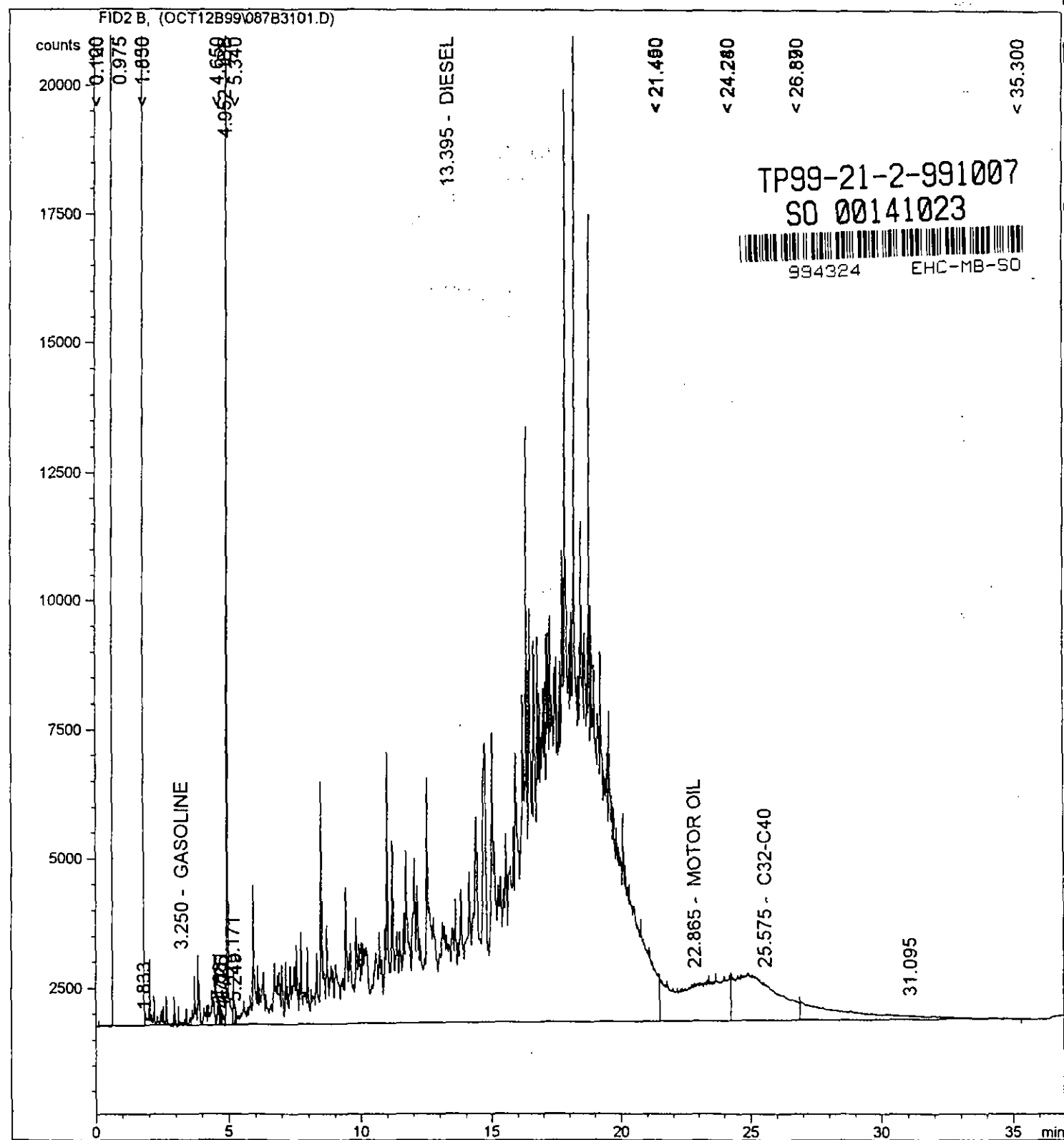
Acq. Method : C:\HPCHEM\2\METHODS\4TPHIFB.M

Last changed : 10/12/1999 12:33:07 PM by D MCLEOD

Analysis Method : C:\HPCHEM\2\METHODS\4TPHIRA.M

Last changed : 10/12/1999 12:37:29 PM by D MCLEOD

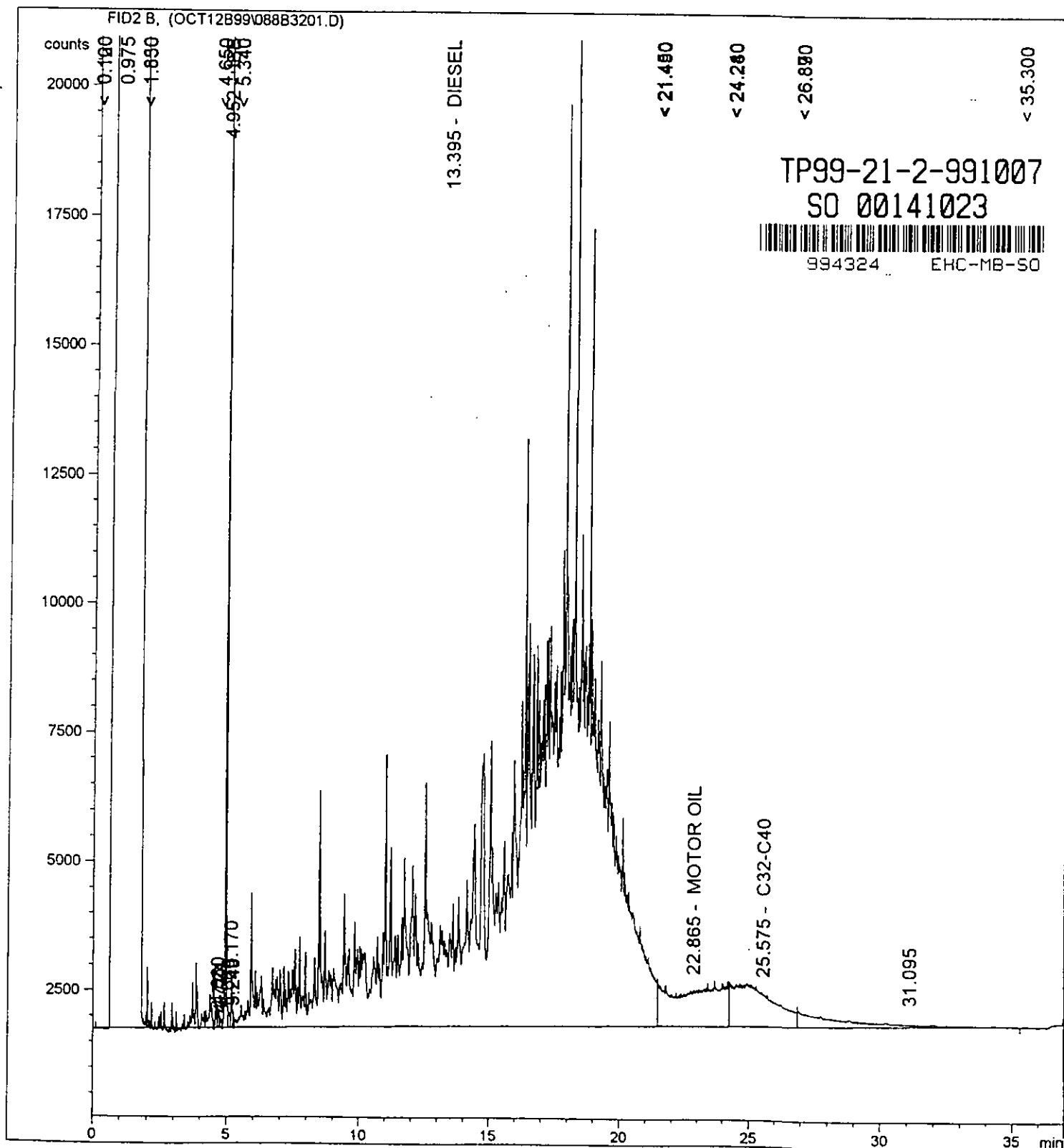
4TPHIRA METHOD FOR REAR CHANNEL ON FID IV-15M COLUMN DB-1, HT



Injection Date : 10/11/1999 7:49:03 AM  
Sample Name : 4324-101 10X  
Acq. Operator : D MCLEOD

Acq. Line : 32  
Vial : 88  
Inj : 1  
Inj Volume : 1  $\mu$ l

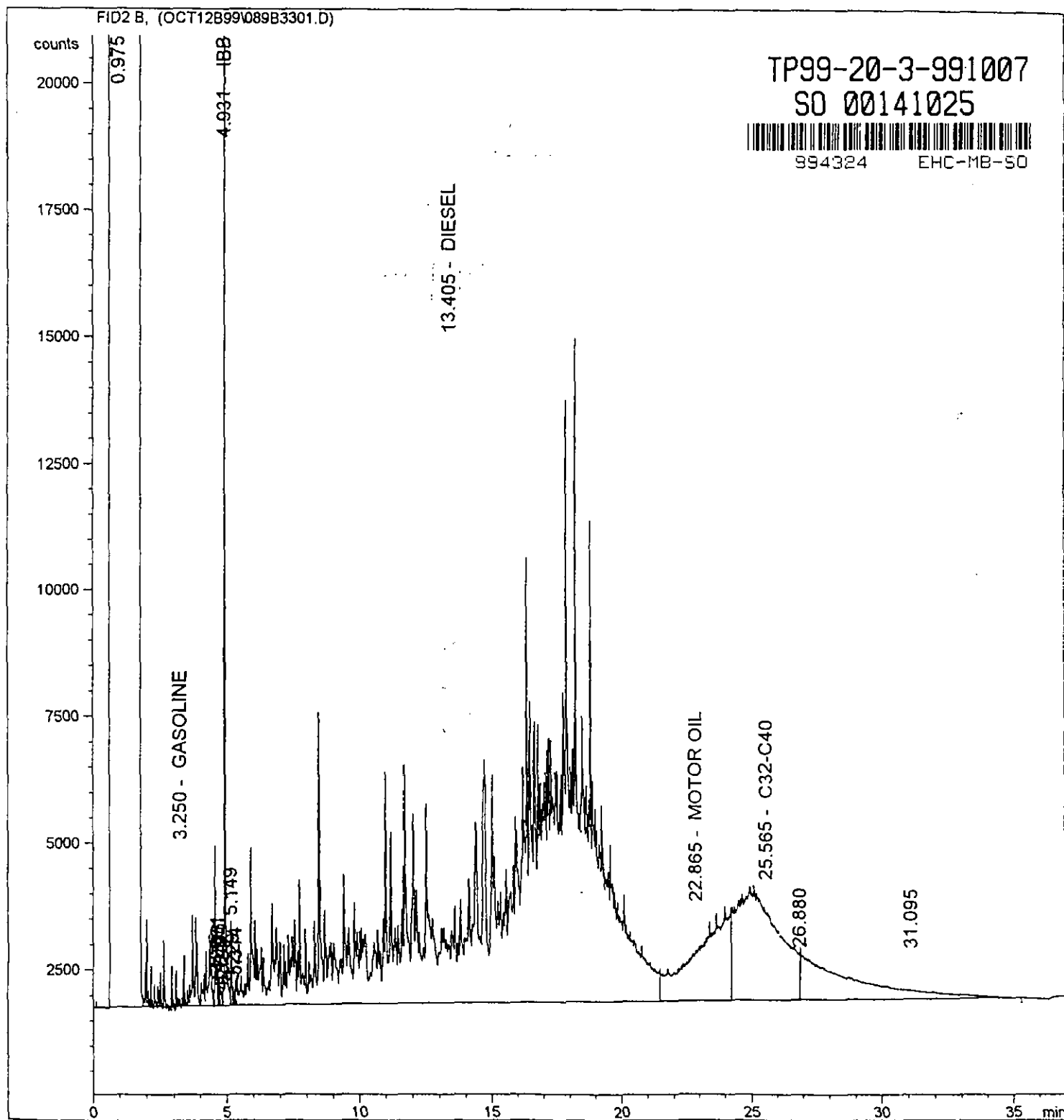
Acq. Method : C:\HPCHEM\2\METHODS\4TPHIFB.M  
Last changed : 10/12/1999 12:33:07 PM by D MCLEOD  
Analysis Method : C:\HPCHEM\2\METHODS\4TPHIRA.M  
Last changed : 10/12/1999 12:37:29 PM by D MCLEOD  
4TPHIRA METHOD FOR REAR CHANNEL ON FID IV-15M COLUMN DB-1, HT



Injection Date : 10/12/1999 8:35:54 AM  
Sample Name : 4324-102 10X  
Acq. Operator : D MCLEOD

Acq. Line : 33  
Vial : 89  
Inj : 1  
Inj Volume : 1  $\mu$ l

Sequence File : C:\HPCHEM\2\SEQUENCE\OCT12B99.S  
Acq. Method : C:\HPCHEM\2\METHODS\4TPHIFB.M  
Last changed : 10/12/1999 12:33:07 PM by D MCLEOD  
Analysis Method : C:\HPCHEM\2\METHODS\4TPHIRA.M  
Last changed : 10/12/1999 12:34:57 PM by D MCLEOD  
4TPHIF METHOD FOR FRONT CHANNEL ON FID IV-15M COLUMN DB-1,HT



Injection Date : 10/14/1999 9:23:21 AM

Acq. Line : 34

Sample Name : 4324-103 10X

Vial : 90

Acq. Operator : D MCLEOD

Inj : 1

Inj Volume : 1 µl

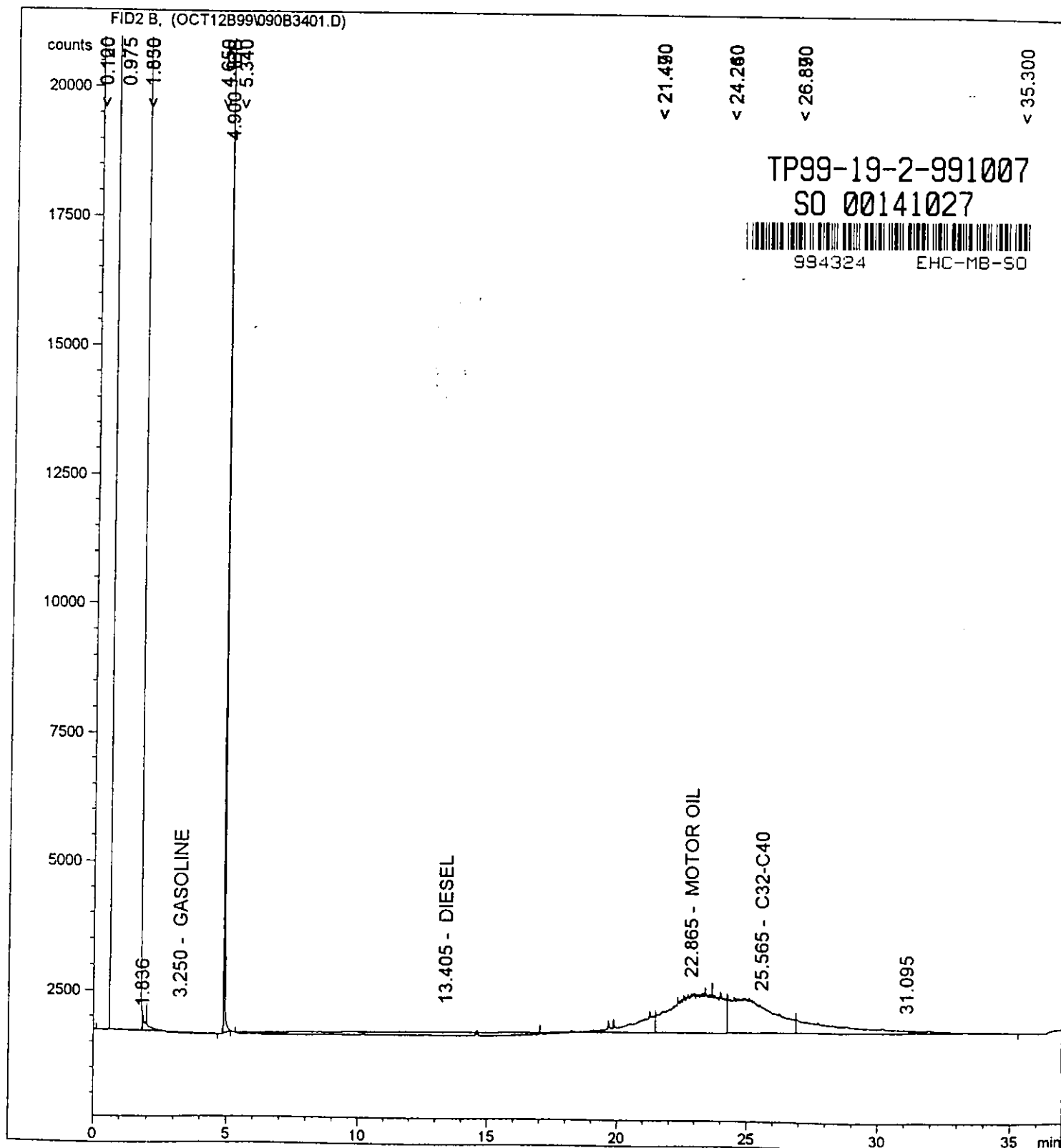
Acq. Method : C:\HPCHEM\2\METHODS\4TPHIFB.M

Last changed : 10/12/1999 12:33:07 PM by D MCLEOD

Analysis Method : C:\HPCHEM\2\METHODS\4TPHIRA.M

Last changed : 10/12/1999 12:37:29 PM by D MCLEOD

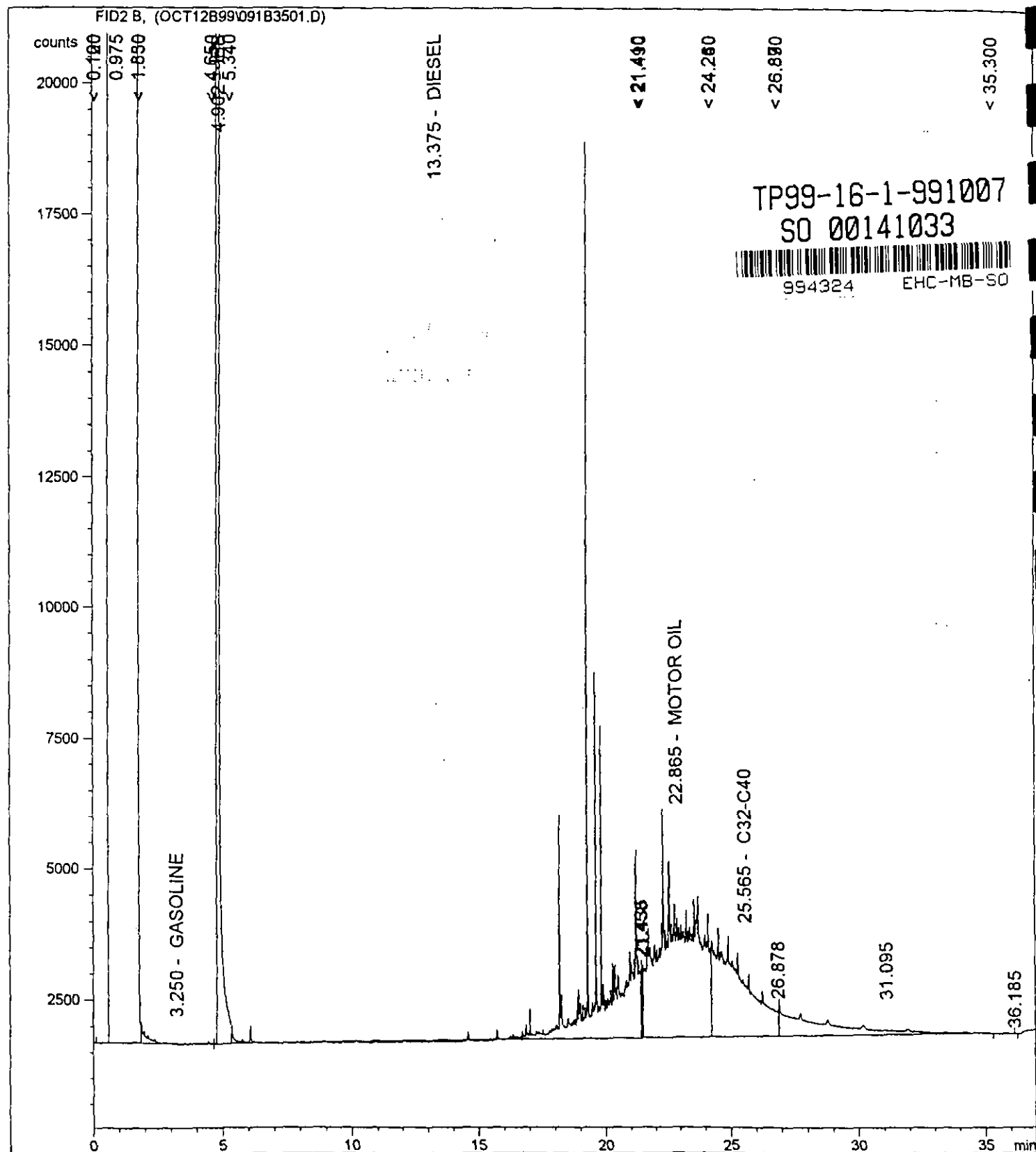
4TPHIRA METHOD FOR REAR CHANNEL ON FID IV-15M COLUMN DB-1, HT



Injection Date : 10/14/1999 10:10:59 AM  
Sample Name : 4324-104  
Acq. Operator : D MCLEOD

Seq. Line : 35  
Vial : 91  
Inj : 1  
Inj Volume : 1  $\mu$ l

Method : C:\HPCHEM\2\METHODS\4TPHIRA.M  
Last changed : 10/12/1999 12:37:29 PM by D MCLEOD  
4TPHIRA METHOD FOR REAR CHANNEL ON FID IV-15M COLUMN DB-1, HT



Injection Date : 10/14/1999 10:58:55 AM

Seq. Line : 36

Sample Name : 4324-105

Vial : 92

Acq. Operator : D MCLEOD

Inj : 1

Inj Volume : 1 µl

Acq. Method : C:\HPCHEM\2\METHODS\4TPHIFB.M

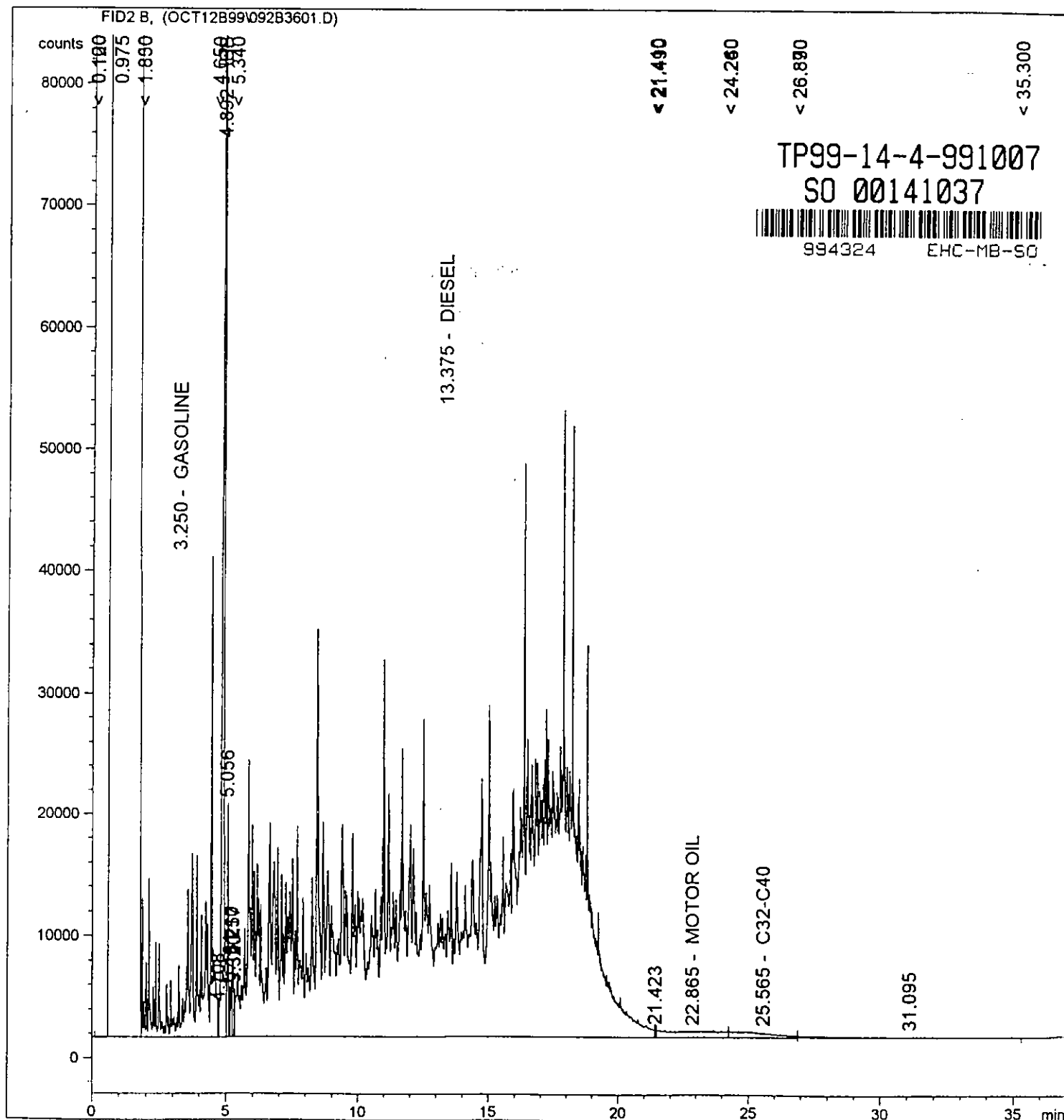
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Analysis Method : C:\HPCHEM\2\METHODS\4TPHIRA.M

Last changed : 10/15/1999 11:36:51 AM by D MCLEOD

(modified after loading)

4TPHIRA METHOD FOR REAR CHANNEL ON FID IV-15M COLUMN DB-1, HT

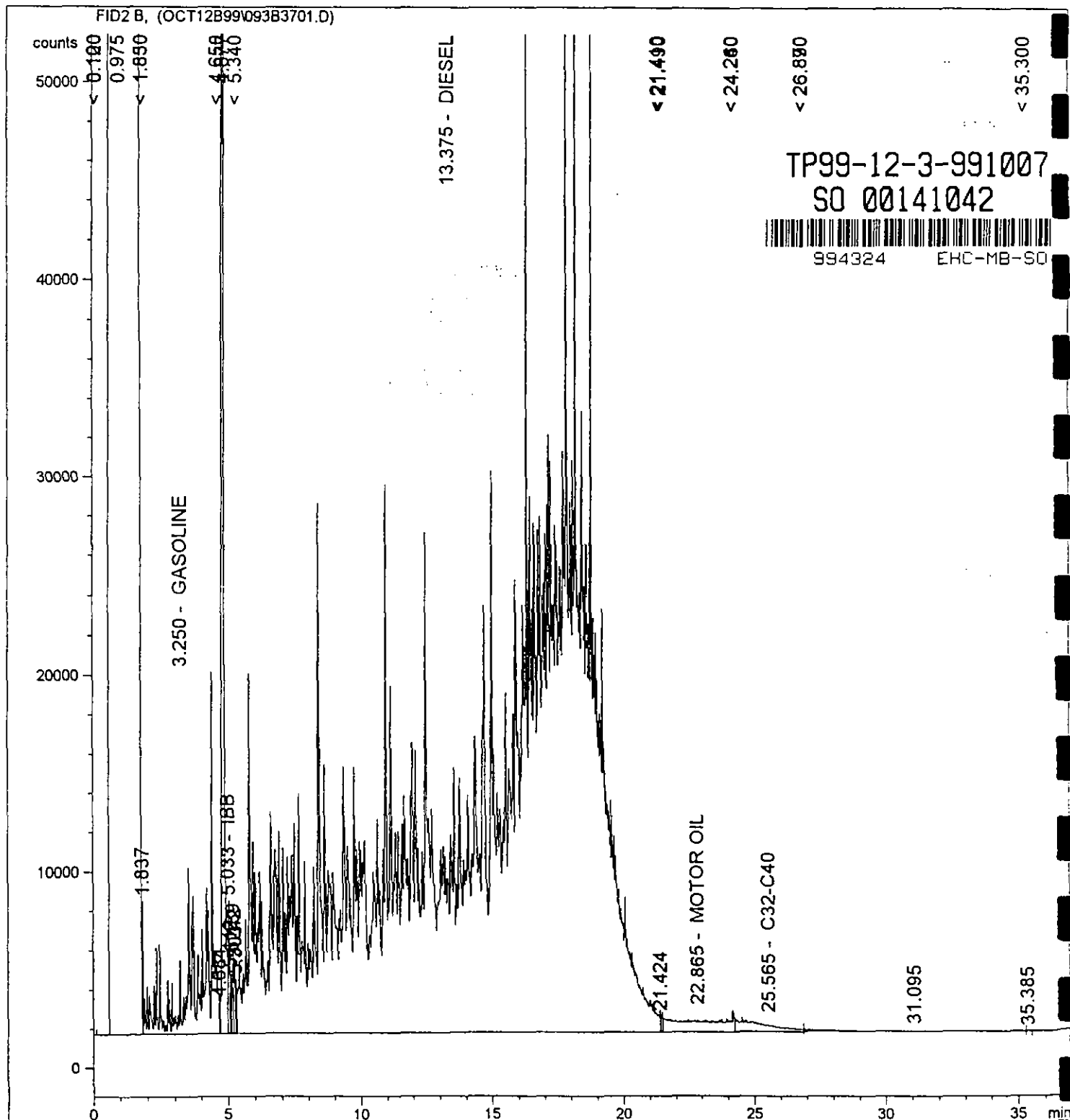


=====

|                |                          |            |        |
|----------------|--------------------------|------------|--------|
| Injection Date | : 10/14/1999 11:47:01 AM | Seq. Line  | : 37   |
| Sample Name    | : 4324-106               | Vial       | : 93   |
| Acq. Operator  | : D MCLEOD               | Inj        | : 1    |
|                |                          | Inj Volume | : 1 µl |

Acq. Method : C:\HPCHEM\2\METHODS\4TPHIFB.M  
Last changed : 10/12/1999 12:33:52 PM by D MCLEOD  
Analysis Method : C:\HPCHEM\2\METHODS\4TPHIRA.M  
Last changed : 10/15/1999 11:38:35 AM by D MCLEOD  
(modified after loading)

4TPHIRA METHOD FOR REAR CHANNEL ON FID IV-15M COLUMN DB-1, HT





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Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6  
  
Fax: 204-477-9194  
  
Attn: J. Derek Trinke

Date Received: October 30/1999  
Date Reported: November 9/1999  
Lab Ref#: G994851  
Lab Quote#: 96-W238-VG  
Client PO#: EA301/WestonYrd  
Client Ref#: W8140B  
Sampled By: JDT

### Certificate of Analysis

Analysis Performed: Thallium, Graphite Furnace, Digestion Required  
Arsenic, Hydride Generation AA  
Antimony, Hydride Generation, Digestion Required  
Selenium, Hydride Generation  
17 Element ICP Scan  
ICP Alkaline Scan(Ca,Mg,Na,K,Sr), Digestion Required

Methodology:

- 1) Analysis of thallium in soil by Graphite Furnace Atomic Absorption.  
U.S. EPA Method No. 7841
- 2) Analysis of arsenic in soil by Hydride Generation Atomic Absorption.  
U.S. EPA Method No. 7061(Modifications)
- 3) Analysis of antimony in soil by hydride generation.  
U.S. EPA Method No. 7042
- 4) Analysis of selenium in soil by hydride generation.  
U.S. EPA Method No. 7741(Modification)
- 5) Analysis of trace metals in soil by Inductively Coupled Plasma Spectrophotometry.  
U.S. EPA Method No. 6010  
(Ministry of Environment ELSCAN)

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.





Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: J. Derek Trinke

Date Received: October 30/1999  
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Lab Ref#: G994851  
Lab Quote#: 96-W238-VG  
Client PO#: EA301/WestonYrd  
Client Ref#: W8140B  
Sampled By: JDT

### Certificate of Analysis

Methodology: (Cont'd)

6) Analysis of alkaline metals in soil by Inductively  
Coupled Plasma Spectrophotometry.  
U.S. EPA Method No. 6010  
(Ministry of Environment ELSCAN)

Instrumentation:

1) Varian Spectro AA 400/Zeeman Graphite Tube Atomizer  
2, 3, 4) Thermo Jarrell Ash Smith-Hieftje 22 AA/Varian VGA 76  
5, 6) Thermo Jarrell Ash ICAP 61E Plasma Spectrophotometer

Sample Description:

Soil

QA/QC:

Refer to CERTIFICATE OF QUALITY CONTROL report.

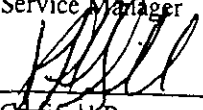
Results:

Refer to REPORT of ANALYSIS attached.

  
Certified By

Elaine Grant

Service Manager

  
Certified By

to: N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

# Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.  
Contact: J. Derek Trinke

Date Reported: November 9/1999  
Lab Ref # : G994851  
Lab Quote#: 96-W238-VG  
Client PO#: EA301/WestonYrd  
Client Ref#: W8140B

Analysis of Soil, expressed on a dry weight basis

| Parameter  | SAMPLE ID<br>(spike) | EQL  | Units | Process Blank * |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|------------|----------------------|------|-------|-----------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|            |                      |      |       | Result          | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Thallium   | na                   | 1.0  | mg/kg | nd              | 2.0            | yes    | 100                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Arsenic    | na                   | 0.5  | mg/kg | nd              | 2.0            | yes    | 97                 | 60             | 140            | yes    | na           | na     | na             | na             | na     | yes                         |
| Antimony   | na                   | 0.5  | mg/kg | nd              | 1.0            | yes    | 100                | 60             | 140            | yes    | na           | na     | na             | na             | na     | yes                         |
| Selenium   | na                   | 0.2  | mg/kg | nd              | 0.8            | yes    | 120                | 60             | 140            | yes    | na           | na     | na             | na             | na     | yes                         |
| Aluminum   | na                   | 20.0 | mg/kg | nd              | 40.0           | yes    | 105                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Barium     | na                   | 5.0  | mg/kg | nd              | 10.0           | yes    | 103                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Beryllium  | na                   | 0.2  | mg/kg | nd              | 0.4            | yes    | 100                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Cadmium    | na                   | 0.3  | mg/kg | nd              | 0.6            | yes    | 102                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Chromium   | na                   | 1.0  | mg/kg | nd              | 2.0            | yes    | 105                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Cobalt     | na                   | 2.0  | mg/kg | nd              | 4.0            | yes    | 102                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Copper     | na                   | 1.0  | mg/kg | nd              | 4.0            | yes    | 104                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Iron       | na                   | 50.0 | mg/kg | nd              | 100.0          | yes    | 100                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Lead       | na                   | 5.0  | mg/kg | nd              | 10.0           | yes    | 103                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Manganese  | na                   | 1.0  | mg/kg | nd              | 2.0            | yes    | 101                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Molybdenum | na                   | 3.0  | mg/kg | nd              | 6.0            | yes    | 104                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Nickel     | na                   | 2.0  | mg/kg | nd              | 4.0            | yes    | 103                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Phosphorus | na                   | 20.0 | mg/kg | nd              | 40.0           | yes    | 99                 | 70             | 130            | yes    | na           | na     | na             | na             | na     | yes                         |
| Silver     | na                   | 0.6  | mg/kg | nd              | 1.2            | yes    | 98                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Titanium   | na                   | 1.0  | mg/kg | nd              | 2.0            | yes    | 100                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Vanadium   | na                   | 1.0  | mg/kg | nd              | 2.0            | yes    | 103                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence

\* = Unavailable due to dilution required for analysis

na = Not Applicable

ns = Insufficient Sample Submitted

nd = parameter not detected

TR = trace level less than EQL

# Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.

Contact: J. Derek Trinke

Date Reported: November 9/1999

Lab Ref # : G994851

Lab Quote#: 96-W238-VG

Client PO#: EA301/WestonYrd

Client Ref#: W8140B

Analysis of Soil, expressed on a dry weight basis

| Parameter | SAMPLE ID<br>(spike) | EQL   | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|-----------|----------------------|-------|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|           |                      |       |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Zinc      | na                   | 5.0   | mg/kg | nd            | 10.0           | yes    | 100                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Calcium   | na                   | 50.0  | mg/kg | nd            | 100.0          | yes    | 103                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Magnesium | na                   | 20.0  | mg/kg | nd            | 40.0           | yes    | 103                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Potassium | na                   | 100.0 | mg/kg | nd            | 200.0          | yes    | 108                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Sodium    | na                   | 50.0  | mg/kg | nd            | 100.0          | yes    | 96                 | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Strontium | na                   | 0.3   | mg/kg | nd            | 1.2            | yes    | 105                | 80             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence

\* = Unavailable due to dilution required for analysis

na = Not Applicable

ns = Insufficient Sample Submitted

nd = parameter not detected

TR = trace level less than EQL

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
 Contact: J. Derek Trinke

Report Date: November 9/1999  
 Lab Ref # : G994851  
 Lab Quote #: 96-W238-VG  
 Client PO#: EA301/WestonYrd  
 Client Ref#: W8140B

Analysis of Soil, expressed on a dry weight basis

| Parameter  | EQL   | Units | TP99-28-4-<br>991028<br>1999/10/28 | TP99-28-4-<br>991028<br>Replicate | TP99-29-1-<br>991028<br>1999/10/28 |  |  |
|------------|-------|-------|------------------------------------|-----------------------------------|------------------------------------|--|--|
| Thallium   | 1.0   | mg/kg | nd                                 | nd                                | nd                                 |  |  |
| Antimony   | 0.5   | mg/kg | 3.9                                | 4.2                               | 29.4                               |  |  |
| Arsenic    | 0.5   | mg/kg | 9.0                                | 8.1                               | 25.7                               |  |  |
| Selenium   | 0.2   | mg/kg | 0.6                                | 0.6                               | 2.0                                |  |  |
| Aluminum   | 20.0  | mg/kg | 1480                               | 1620                              | 10700                              |  |  |
| Barium     | 5.0   | mg/kg | 294                                | 252                               | 403                                |  |  |
| Beryllium  | 0.2   | mg/kg | nd                                 | nd                                | 0.6                                |  |  |
| Cadmium    | 0.3   | mg/kg | 1.0                                | 1.6                               | 7.0                                |  |  |
| Calcium    | 50.0  | mg/kg | 32300                              | 31900                             | 42100                              |  |  |
| Chromium   | 1.0   | mg/kg | 11.3                               | 10.2                              | 44.8                               |  |  |
| Cobalt     | 2.0   | mg/kg | 3.1                                | 3.2                               | 13.7                               |  |  |
| Copper     | 1.0   | mg/kg | 42.1                               | 48.8                              | 633                                |  |  |
| Iron       | 50.0  | mg/kg | 113000                             | 122000                            | 76100                              |  |  |
| Lead       | 5.0   | mg/kg | 4100                               | 4650                              | 1830                               |  |  |
| Magnesium  | 20.0  | mg/kg | 18100                              | 18500                             | 15400                              |  |  |
| Manganese  | 1.0   | mg/kg | 482                                | 491                               | 647                                |  |  |
| Molybdenum | 3.0   | mg/kg | 3.2                                | 3.4                               | 4.0                                |  |  |
| Nickel     | 2.0   | mg/kg | 12.5                               | 11.6                              | 115                                |  |  |
| Phosphorus | 20.0  | mg/kg | 471                                | 503                               | 1840                               |  |  |
| Potassium  | 100.0 | mg/kg | 825                                | 720                               | 2680                               |  |  |
| Silver     | 0.6   | mg/kg | nd                                 | nd                                | 4.5                                |  |  |
| Sodium     | 50.0  | mg/kg | 222                                | 239                               | 1670                               |  |  |
| Strontium  | 0.3   | mg/kg | 64.1                               | 68.1                              | 154                                |  |  |
| Titanium   | 1.0   | mg/kg | 46.7                               | 57.0                              | 162                                |  |  |
| Vanadium   | 1.0   | mg/kg | 17.1                               | 17.7                              | 33.0                               |  |  |
| Zinc       | 5.0   | mg/kg | 239                                | 277                               | 2040                               |  |  |

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.  
 nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL

**MOBILE ENVIRONMENTAL  
CONTROL LABS  
WINNIPEG**  
**VOLATILE ORGANIC COMPOUNDS**

Client: Morrow Environmental  
Project Reference: W8140B  
Work Order: G994851V  
Matrix: Soil

Date: 08-Nov-99

Units: micrograms/gram (µg/g) dry weight

| Compound                               | EQL<br>µg/g             | TP99-28-4-991028<br>DF=25 | TP99-28-4-991028<br>DF=25<br>Dup. |
|----------------------------------------|-------------------------|---------------------------|-----------------------------------|
| Chloromethane                          | 25.0                    | nd                        | nd                                |
| Vinyl chloride                         | 12.5                    | nd                        | nd                                |
| Bromomethane                           | 25.0                    | nd                        | nd                                |
| Chloroethane                           | 25.0                    | nd                        | nd                                |
| Trichlorofluoromethane                 | 5.0                     | nd                        | nd                                |
| Acetone                                | 250                     | nd                        | nd                                |
| 1,1-Dichloroethene                     | 2.5                     | nd                        | nd                                |
| Dichloromethane (Methylene Chloride)   | 12.5                    | nd                        | nd                                |
| trans-1,2-Dichloroethene               | 2.5                     | nd                        | nd                                |
| Methyl-t-Butyl Ether                   | 2.5                     | nd                        | nd                                |
| 1,1-Dichloroethane                     | 2.5                     | nd                        | nd                                |
| Methyl Ethyl Ketone (MEK)              | 125                     | nd                        | nd                                |
| cis-1,2-Dichloroethene                 | 2.5                     | nd                        | nd                                |
| Chloroform                             | 2.5                     | nd                        | nd                                |
| 1,2-Dichloroethane                     | 2.5                     | nd                        | nd                                |
| 1,1,1-Trichloroethane                  | 2.5                     | nd                        | nd                                |
| Carbon Tetrachloride                   | 2.5                     | nd                        | nd                                |
| Benzene                                | 1.3                     | nd                        | nd                                |
| 1,2-Dichloropropane                    | 2.5                     | nd                        | nd                                |
| Trichloroethene                        | 2.5                     | nd                        | nd                                |
| Bromodichloromethane                   | 2.5                     | nd                        | nd                                |
| cis-1,3-Dichloropropene                | 2.5                     | nd                        | nd                                |
| Methyl Isobutyl Ketone (MIBK)          | 125                     | nd                        | nd                                |
| trans-1,3-Dichloropropene              | 2.5                     | nd                        | nd                                |
| 1,1,2-Trichloroethane                  | 2.5                     | nd                        | nd                                |
| Toluene                                | 2.5                     | nd                        | nd                                |
| 2-Hexanone                             | 125                     | nd                        | nd                                |
| Dibromochloromethane                   | 2.5                     | nd                        | nd                                |
| 1,2-Dibromoethane (Ethylene dibromide) | 2.5                     | nd                        | nd                                |
| Tetrachloroethene (Perchloroethylene)  | 2.5                     | nd                        | nd                                |
| 1,1,1,2-Tetrachloroethane              | 2.5                     | nd                        | nd                                |
| Chlorobenzene                          | 2.5                     | nd                        | nd                                |
| Ethylbenzene                           | 2.5                     | 2.5                       | 2.3                               |
| m-Xylene & p-Xylene                    | 2.5                     | 14.0                      | 13.3                              |
| Bromoform                              | 2.5                     | nd                        | nd                                |
| Styrene                                | 2.5                     | nd                        | nd                                |
| 1,1,2,2-Tetrachloroethane              | 2.5                     | nd                        | nd                                |
| o-Xylene                               | 2.5                     | 12.4                      | 11.2                              |
| 1,3-Dichlorobenzene                    | 2.5                     | nd                        | nd                                |
| 1,4-Dichlorobenzene                    | 2.5                     | nd                        | nd                                |
| 1,2-Dichlorobenzene                    | 2.5                     | nd                        | nd                                |
| Surrogate Standard Recoveries:         | Control Limits: 70-130% |                           |                                   |
| Dibromofluoromethane                   |                         | 113%                      | 113%                              |
| Toluene-d8                             |                         | 96%                       | 96%                               |
| 4-Bromofluorobenzene                   |                         | 115%                      | 114%                              |

Client: Morrow Environmental  
Project Reference: W8140B  
Work Order: G994851V  
Matrix: Soil

**VOLATILE ORGANIC COMPOUNDS**

Date: 08-Nov-99

Units: micrograms/gram (µg/g) dry weight

| Compound                               | Method Blank |        |                |        | Spiked Method Blank |                |                |        |
|----------------------------------------|--------------|--------|----------------|--------|---------------------|----------------|----------------|--------|
|                                        | EQL<br>µg/g  | Result | Upper<br>Limit | Accept | %<br>Recovery       | Lower<br>Limit | Upper<br>Limit | Accept |
| Chloromethane                          | 1.0          | nd     | 1.0            | yes    | 112                 | 60             | 140            | yes    |
| Vinyl chloride                         | 0.5          | nd     | 0.5            | yes    | 112                 | 60             | 140            | yes    |
| Bromomethane                           | 1.0          | nd     | 1.0            | yes    | 114                 | 60             | 140            | yes    |
| Chloroethane                           | 1.0          | nd     | 1.0            | yes    | 110                 | 60             | 140            | yes    |
| Trichlorofluoromethane                 | 0.2          | nd     | 0.2            | yes    | 111                 | 70             | 130            | yes    |
| Acetone                                | 10.0         | nd     | 10.0           | yes    | 111                 | 60             | 140            | yes    |
| 1,1-Dichloroethene                     | 0.1          | nd     | 0.1            | yes    | 111                 | 70             | 130            | yes    |
| Dichloromethane (Methylene Chloride)   | 0.5          | nd     | 0.5            | yes    | 110                 | 70             | 130            | yes    |
| trans-1,2-Dichloroethene               | 0.1          | nd     | 0.1            | yes    | 108                 | 70             | 130            | yes    |
| Methyl-t-Butyl Ether                   | 0.1          | nd     | 0.1            | yes    | 107                 | 70             | 130            | yes    |
| 1,1-Dichloroethane                     | 0.1          | nd     | 0.1            | yes    | 111                 | 70             | 130            | yes    |
| Methyl Ethyl Ketone (MEK)              | 5.0          | nd     | 5.0            | yes    | 110                 | 60             | 140            | yes    |
| cis-1,2-Dichloroethene                 | 0.1          | nd     | 0.1            | yes    | 114                 | 70             | 130            | yes    |
| Chloroform                             | 0.1          | nd     | 0.1            | yes    | 112                 | 70             | 130            | yes    |
| 1,2-Dichloroethane                     | 0.1          | nd     | 0.1            | yes    | 110                 | 70             | 130            | yes    |
| 1,1,1-Trichloroethane                  | 0.1          | nd     | 0.1            | yes    | 111                 | 70             | 130            | yes    |
| Carbon Tetrachloride                   | 0.1          | nd     | 0.1            | yes    | 112                 | 70             | 130            | yes    |
| Benzene                                | 0.05         | nd     | 0.05           | yes    | 112                 | 70             | 130            | yes    |
| 1,2-Dichloropropane                    | 0.1          | nd     | 0.1            | yes    | 107                 | 70             | 130            | yes    |
| Trichloroethene                        | 0.1          | nd     | 0.1            | yes    | 110                 | 70             | 130            | yes    |
| Bromodichloromethane                   | 0.1          | nd     | 0.1            | yes    | 108                 | 70             | 130            | yes    |
| cis-1,3-Dichloropropene                | 0.1          | nd     | 0.1            | yes    | 107                 | 70             | 130            | yes    |
| Methyl Isobutyl Ketone (MIBK)          | 5.0          | nd     | 5.0            | yes    | 110                 | 60             | 140            | yes    |
| trans-1,3-Dichloropropene              | 0.1          | nd     | 0.1            | yes    | 108                 | 70             | 130            | yes    |
| 1,1,2-Trichloroethane                  | 0.1          | nd     | 0.1            | yes    | 114                 | 70             | 130            | yes    |
| Toluene                                | 0.1          | nd     | 0.1            | yes    | 113                 | 70             | 130            | yes    |
| 2-Hexanone                             | 5.0          | nd     | 5.0            | yes    | 110                 | 60             | 140            | yes    |
| Dibromochloromethane                   | 0.1          | nd     | 0.1            | yes    | 112                 | 70             | 130            | yes    |
| 1,2-Dibromoethane (Ethylene dibromide) | 0.1          | nd     | 0.1            | yes    | 111                 | 70             | 130            | yes    |
| Tetrachloroethene (Perchloroethylene)  | 0.1          | nd     | 0.1            | yes    | 112                 | 70             | 130            | yes    |
| 1,1,1,2-Tetrachloroethane              | 0.1          | nd     | 0.1            | yes    | 109                 | 70             | 130            | yes    |
| Chlorobenzene                          | 0.1          | nd     | 0.1            | yes    | 111                 | 70             | 130            | yes    |
| Ethylbenzene                           | 0.1          | nd     | 0.1            | yes    | 111                 | 70             | 130            | yes    |
| m-Xylene & p-Xylene                    | 0.1          | nd     | 0.1            | yes    | 113                 | 70             | 130            | yes    |
| Bromoform                              | 0.1          | nd     | 0.1            | yes    | 110                 | 70             | 130            | yes    |
| Styrene                                | 0.1          | nd     | 0.1            | yes    | 112                 | 70             | 130            | yes    |
| 1,1,2,2-Tetrachloroethane              | 0.1          | nd     | 0.1            | yes    | 108                 | 70             | 130            | yes    |
| p-Xylene                               | 0.1          | nd     | 0.1            | yes    | 110                 | 70             | 130            | yes    |
| 1,3-Dichlorobenzene                    | 0.1          | nd     | 0.1            | yes    | 113                 | 70             | 130            | yes    |
| 1,4-Dichlorobenzene                    | 0.1          | nd     | 0.1            | yes    | 113                 | 70             | 130            | yes    |
| 1,2-Dichlorobenzene                    | 0.1          | nd     | 0.1            | yes    | 113                 | 70             | 130            | yes    |

Surrogate Standard Recoveries: Control Limits: 70-130%

|                      |      |     |    |     |     |
|----------------------|------|-----|----|-----|-----|
| Dibromofluoromethane | 102% | 100 | 70 | 130 | yes |
| Toluene-d8           | 103% | 102 | 70 | 130 | yes |
| 4-Bromofluorobenzene | 98%  | 102 | 70 | 130 | yes |

Client: Morrow Environmental  
Project Reference: W8140B  
Work Order: G994851V  
Matrix: Soil

**VOLATILE ORGANIC COMPOUNDS**

Date: 08-Nov-99

Legend: EQL = Estimated Quantitation Limit  
nd = Not Detected Above EQL  
Dup. = Duplicate  
DF = Dilution Factor

Date of sample receipt: October 30, 1999  
Date of sample analysis: November 4, 1999

Analytical Method:

Due to a level of petroleum hydrocarbon compounds beyond the appropriate range, the sample could not be analysed by the low level direct purge method. The sample was preextracted in methanol and the extract analysed by medium level purge & trap (US EPA Method 5035) gas chromatography/mass spectrometry using US EPA Method 8260B (modified).

Report Discussion:

Since some target compounds were present at a level above the calibration range of the instrument, the sample was run at a dilution factor to avoid exceeding the calibration range and causing excessive contamination of the purge & trap equipment. The quantitation limits for this sample are higher than the EQL's for undiluted samples as indicated above. The amounts reported have been corrected for the dilution factors that were used.

Note: Estimated quantitation limit is the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

*NOTE: All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analysis done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangement.*

Job Approved By:

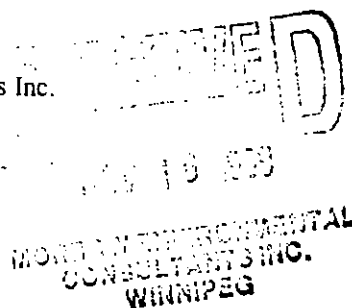
  
.....  
Ron Corkum, M.Sc., C.Chem.  
Manager, Mass Spectrometry Services



Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: J. Derek Trinke



Date Received: October 30/1999  
Date Reported: November 8/1999  
Lab Ref#: G994851  
Lab Quote#: 96-W238-VG  
Client PO#: EA301/WestonYrd  
Client Ref#: W8140B  
Sampled By: JDT

### Certificate of Analysis

Analysis Performed:

Extractable Hydrocarbons(Manitoba Guidelines), C11-C32  
BTEX and Total Volatile Hydrocarbons(Manitoba Criteria)  
Total Purgeable Hydrocarbons

Methodology:

- 1) The characterization of HydroCarbon in soil by GC analysis, following a solvent extraction.  
U.S. EPA Method No.8011(microextraction)
- 2) Analysis of Benzene, Toluene, Ethylbenzene, Xylenes & Volatile Hydrocarbons by Static Headspace Capillary GC-PID/FID. External std quantitation with Surrogate stds.  
U.S. EPA Method No. 3810(Modification)
- 3) Purge & Trap capillary GC/MS analysis of Soil samples for Total Purgeables.  
U.S. EPA Method No. 5030

Instrumentation:

- 1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S
- 2) Varian 3400 GC PID/FID, Genesis Headspace Analyzer
- 3) Purge & Trap-GC/MS

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.





Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: J. Derek Trinke

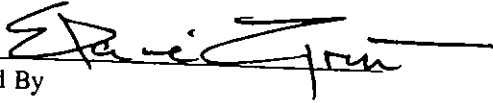
Date Received: October 30/1999  
Date Reported: November 8/1999  
Lab Ref#: G994851  
Lab Quote#: 96-W238-VG  
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Sampled By: JDT

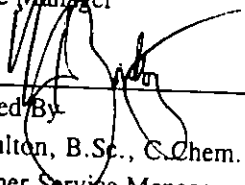
### Certificate of Analysis

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

  
Certified By  
Elaine Grant  
Service Manager

  
Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

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# Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.  
Contact: J. Derek Trinke

Date Reported: November 8/1999  
Lab Ref # : G994851  
Lab Quote#: 96-W238-VG  
Client PO#: EA301/WestonYrd  
Client Ref#: W8140B

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | SAMPLE ID<br>(spike) | EQL  | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|------------------------------------------|----------------------|------|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|                                          |                      |      |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Total SemiVolatile Hydrocarbons(C11-C32) | na                   | 10.0 | mg/kg | nd            | 20.0           | yes    | 92                 | 70             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Benzene                                  | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 88                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Ethylbenzene                             | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 90                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Toluene                                  | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 87                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Total Volatile Hydrocarbons              | na                   | 10   | mg/kg | nd            | 10             | yes    | 102                | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Xylenes(Total)                           | na                   | 0.04 | mg/kg | nd            | 0.08           | yes    | 89                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Total Purgeable Hydrocarbons             | na                   | 10   | ug/g  | nd            | 20             | yes    | na                 | na             | na             | na     | na           | na     | na             | na             | na     | yes                         |
|                                          |                      |      |       |               |                |        |                    |                |                |        |              |        |                |                |        | yes                         |

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence  
 \* = Unavailable due to dilution required for analysis  
 na = Not Applicable  
 ns = Insufficient Sample Submitted  
 nd = parameter not detected  
 TR = trace level less than EQL

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
 Contact: J. Derek Trinke

Report Date: November 8/1999  
 Lab Ref # : G994851  
 Lab Quote #: 96-W238-VG  
 Client PO#: EA301/WestonYrd  
 Client Ref#: W8140B

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | EQL  | Units | TP99-24-1-<br>991028<br>1999/10/28 | TP99-24-1-<br>991028<br>Replicate | TP99-25-1-<br>991028<br>1999/10/28 | TP99-26-2-<br>991028<br>1999/10/28 | TP99-27-3-<br>991028<br>1999/10/28 |
|------------------------------------------|------|-------|------------------------------------|-----------------------------------|------------------------------------|------------------------------------|------------------------------------|
| Resemblance                              | na   | na    | EDMO?                              | EDMO?                             | PMOD                               | PMOD                               | EDMO?                              |
| Total SemiVolatile Hydrocarbons(C11-C32) | 10.0 | mg/kg | 17300                              | 16900                             | 22700                              | 7540                               | 10600                              |
| Benzene                                  | 0.02 | mg/kg | nd                                 | nd                                | 0.06                               | nd                                 | nd                                 |
| Ethylbenzene                             | 0.02 | mg/kg | 0.56                               | 0.58                              | 0.92                               | 1.20                               | 2.17                               |
| Toluene                                  | 0.02 | mg/kg | 0.13                               | 0.11                              | 0.16                               | 0.09                               | 0.05                               |
| Total Volatile Hydrocarbons              | 10   | mg/kg | 68                                 | 70                                | 305                                | 170                                | 334                                |
| Xylenes(Total)                           | 0.04 | mg/kg | 1.02                               | 1.02                              | 3.32                               | 1.67                               | 3.16                               |
| Total Purgeable Hydrocarbons             | 10   | ug/g  | -                                  | -                                 | -                                  | -                                  | -                                  |

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.  
 - Not Requested  
 EDMO? Contaminant elutes across the diesel/motor oil range but does not match reference standards.  
 na Not Applicable  
 nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL  
 PMOD Predominantly motor oil with some diesel.

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
 Contact: J. Derek Trinke

Report Date: November 8/1999  
 Lab Ref # : G994851  
 Lab Quote #: 96-W238-VG  
 Client PO#: EA301/WestonYrd  
 Client Ref#: W8140B

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | EQL  | Units | TP99-28-4-<br>991028<br>1999/10/28 | TP99-28-4-<br>991028<br>Replicate | TP99-29-1-<br>991028<br>1999/10/28 |  |  |
|------------------------------------------|------|-------|------------------------------------|-----------------------------------|------------------------------------|--|--|
| Resemblance                              | na   | na    | EGMO?                              | -                                 | EMO?                               |  |  |
| Total SemiVolatile Hydrocarbons(C11-C32) | 10.0 | mg/kg | 16500                              | -                                 | 3430                               |  |  |
| Benzene                                  | 0.02 | mg/kg | -                                  | -                                 | -                                  |  |  |
| Ethylbenzene                             | 0.02 | mg/kg | -                                  | -                                 | -                                  |  |  |
| Toluene                                  | 0.02 | mg/kg | -                                  | -                                 | -                                  |  |  |
| Total Volatile Hydrocarbons              | 10   | mg/kg | -                                  | -                                 | -                                  |  |  |
| Xylenes(Total)                           | 0.04 | mg/kg | -                                  | -                                 | -                                  |  |  |
| Total Purgeable Hydrocarbons             | 10   | ug/g  | 2000                               | 2200                              | -                                  |  |  |

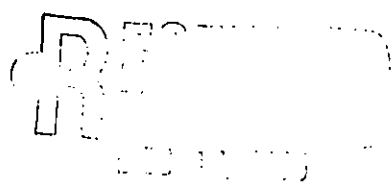
EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

- Not Requested

EGMO? Contaminant elutes across the gasoline/motor oil range but does not match our reference standards.

EMO? Contaminant elutes in the motor oil range but does not match reference standard.

na Not Applicable



MORROW ENVIRONMENTAL  
CONSULTANTS INC.  
WINNIPEG

Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

Fax: 204-477-9194

Attn: J. Derek Trinke

Date Received: October 30/1999  
Date Reported: December 9/1999  
Lab Ref#: G994851  
Lab Quote#: 96-W238-VG  
Client PO#: EA301/WestonYrd  
Client Ref#: W8140B  
Sampled By: JDT

Attached are the chromatograms for your samples.

If you have any questions, please call Elaine Grant,  
your Service Manager at Philip Analytical Services Corp.

Injection Date : 11/04/1999 5:51:12 PM

Seq. Line : 12

Sample Name : 4851-26 10X

Vial : 12

Acq. Operator : D. MCLEOD

Inj : 1

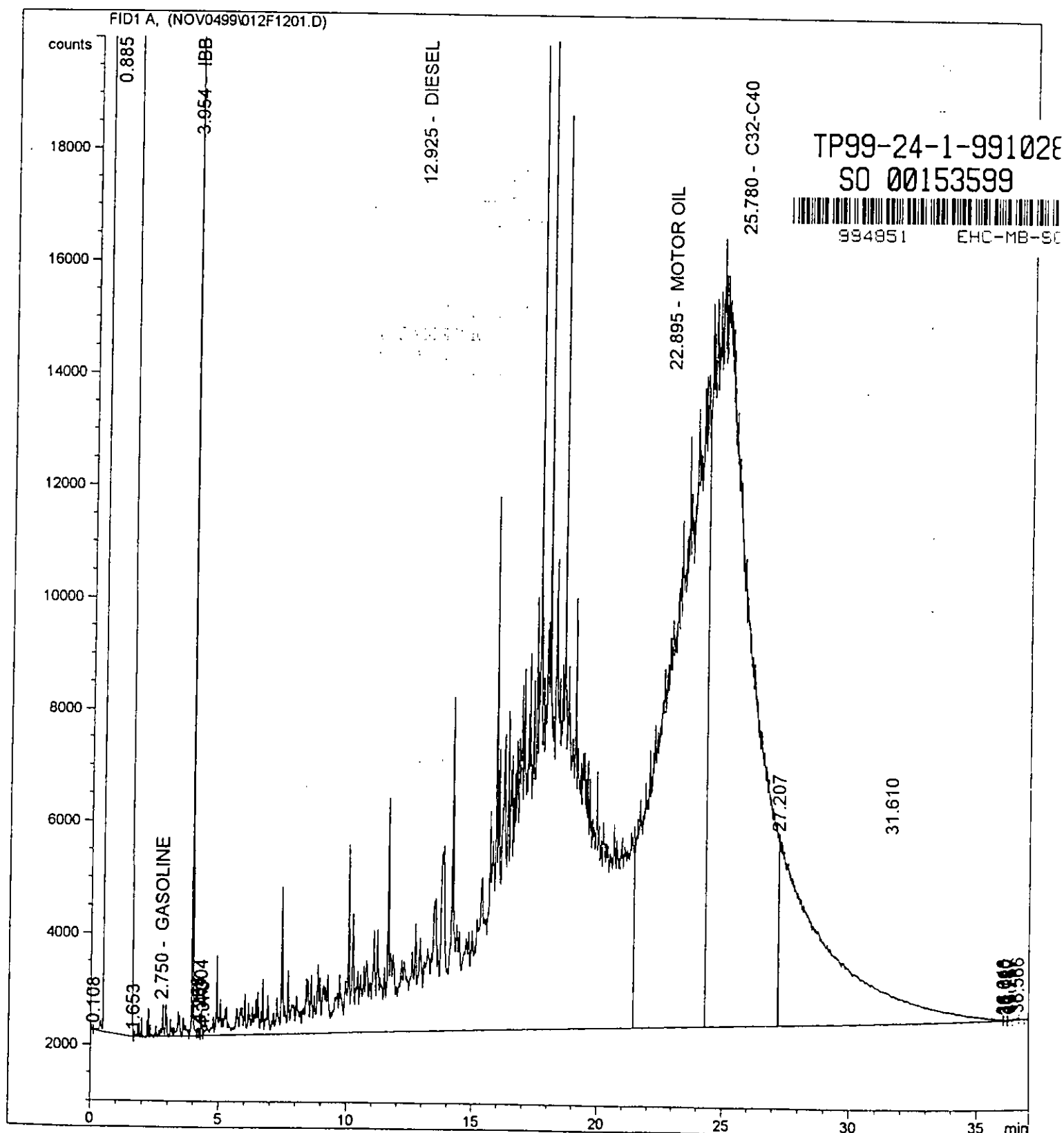
Inj Volume : 1  $\mu$ l

Sequence File : C:\HPCHEM\2\SEQUENCE\NOV0499.S

Method : C:\HPCHEM\2\METHODS\4TPHIFB.M

Last changed : 11/03/1999 2:41:23 PM by D. MCLEOD

4TPHIF METHOD FOR FRONT CHANNEL ON FID IV-15M COLUMN DB-1, HT



Injection Date : 11/04/1999 6:38:45 PM

Seq. Line : 13

Sample Name : 4851-27 10X

Vial : 13

Acq. Operator : D. MCLEOD

Inj : 1

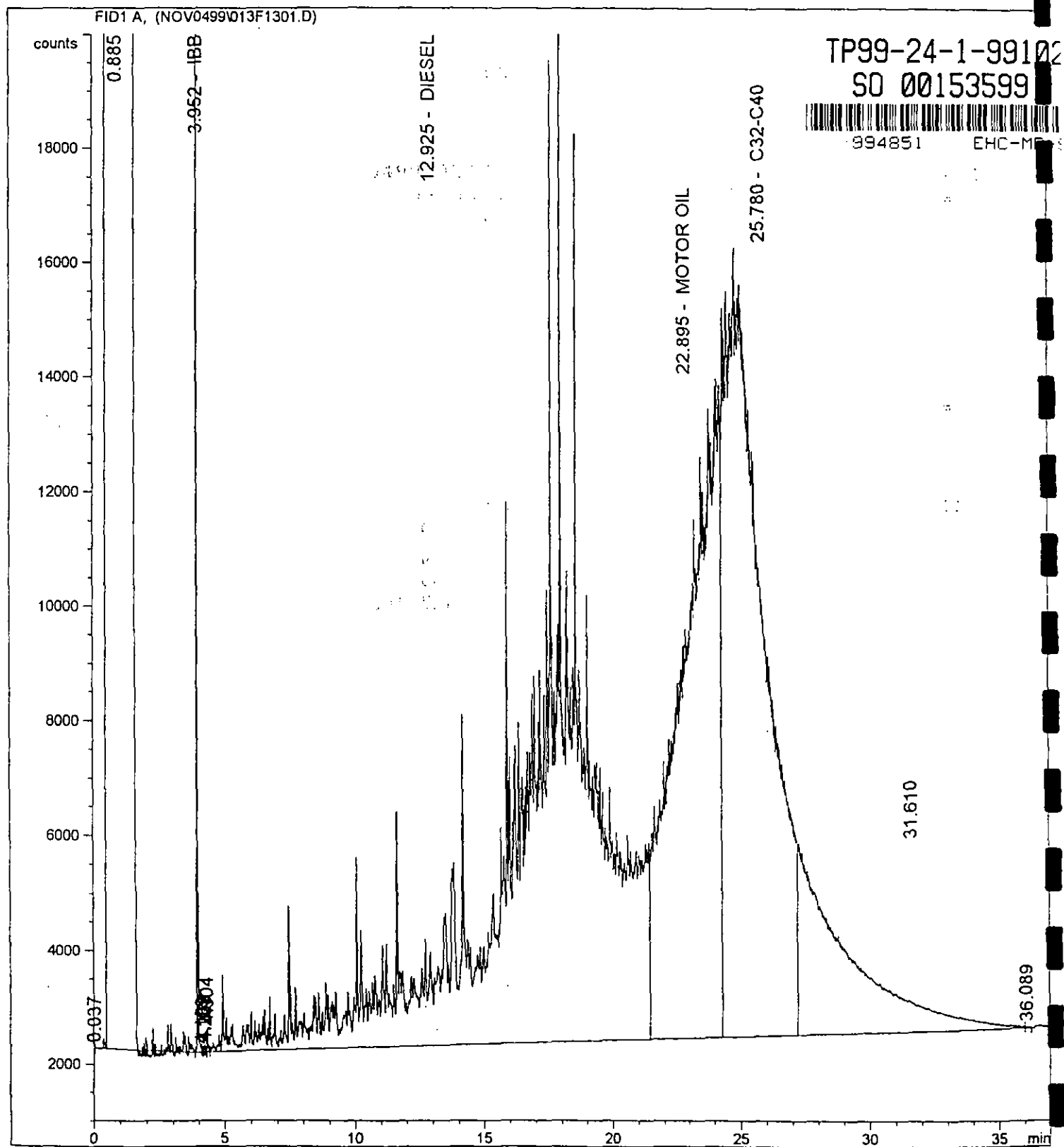
Inj Volume : 1 µl

Sequence File : C:\HPCHEM\2\SEQUENCE\NOV0499.S

Method : C:\HPCHEM\2\METHODS\4TPHIFB.M

Last changed : 11/03/1999 2:41:23 PM by D. MCLEOD

4TPHIF METHOD FOR FRONT CHANNEL ON FID IV-15M COLUMN DB-1, HT



Injection Date : 11/05/1999 12:48:00 PM

Sample Name : 4851-28 10X

Acq. Operator : D. MCLEOD

Seq. Line : 36

Vial : 38

Inj : 1

Inj Volume : 1 µl

Acq. Method : C:\HPCHEM\2\METHODS\4TPHIFB.M

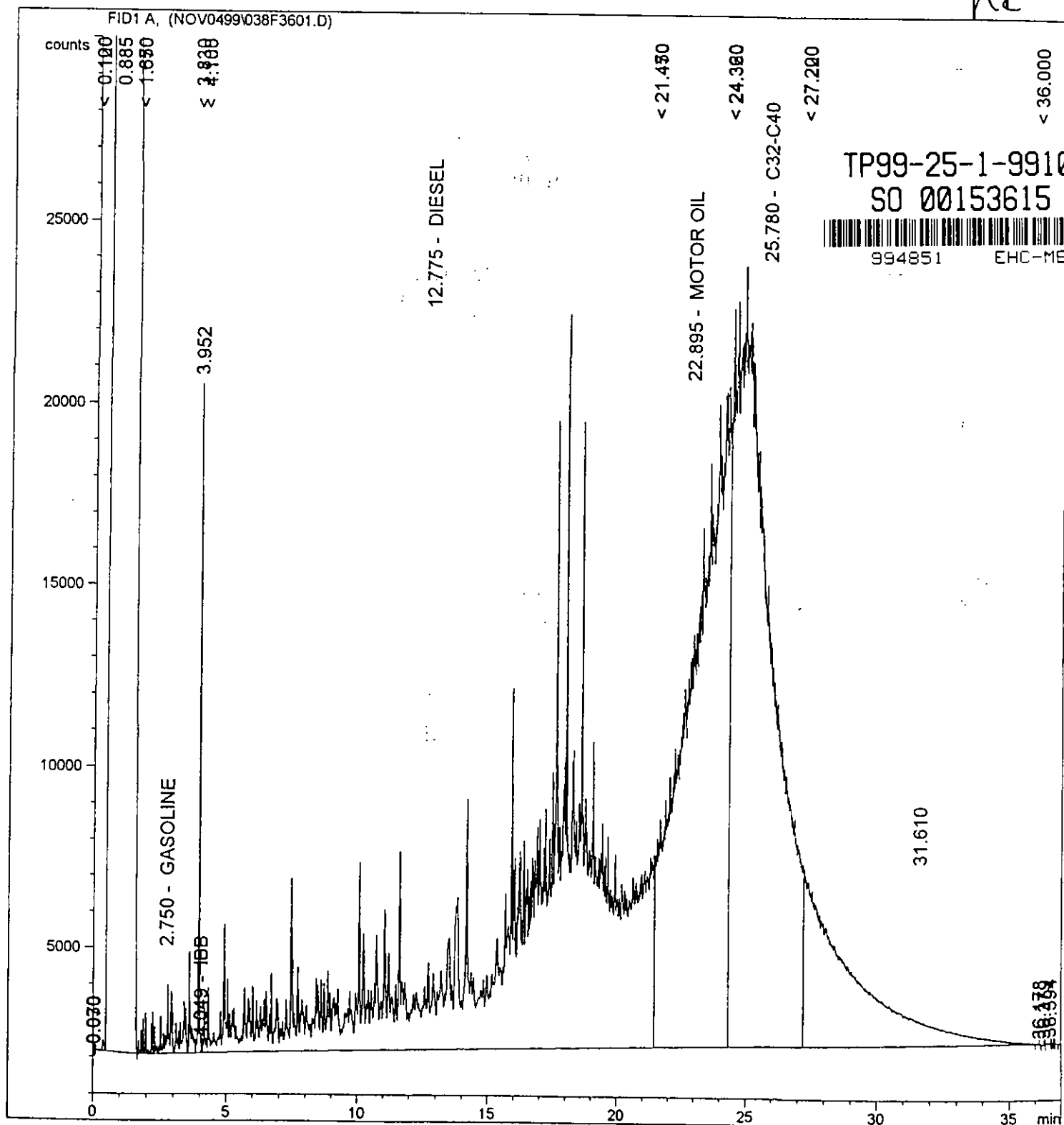
Last changed : 11/03/1999 2:41:23 PM by D. MCLEOD

Analysis Method : C:\HPCHEM\2\METHODS\4TPHIFB.M

Last changed : 11/05/1999 3:23:11 PM by D. MCLEOD

(modified after loading)

4TPHIF METHOD FOR FRONT CHANNEL ON FID IV-15M COLUMN DB-1, HT



Injection Date : 11/05/1999 1:35:53 PM

Seq. Line : 37

Sample Name : 4851-29 10X

Vial : 39

Acq. Operator : D. MCLEOD

Inj : 1

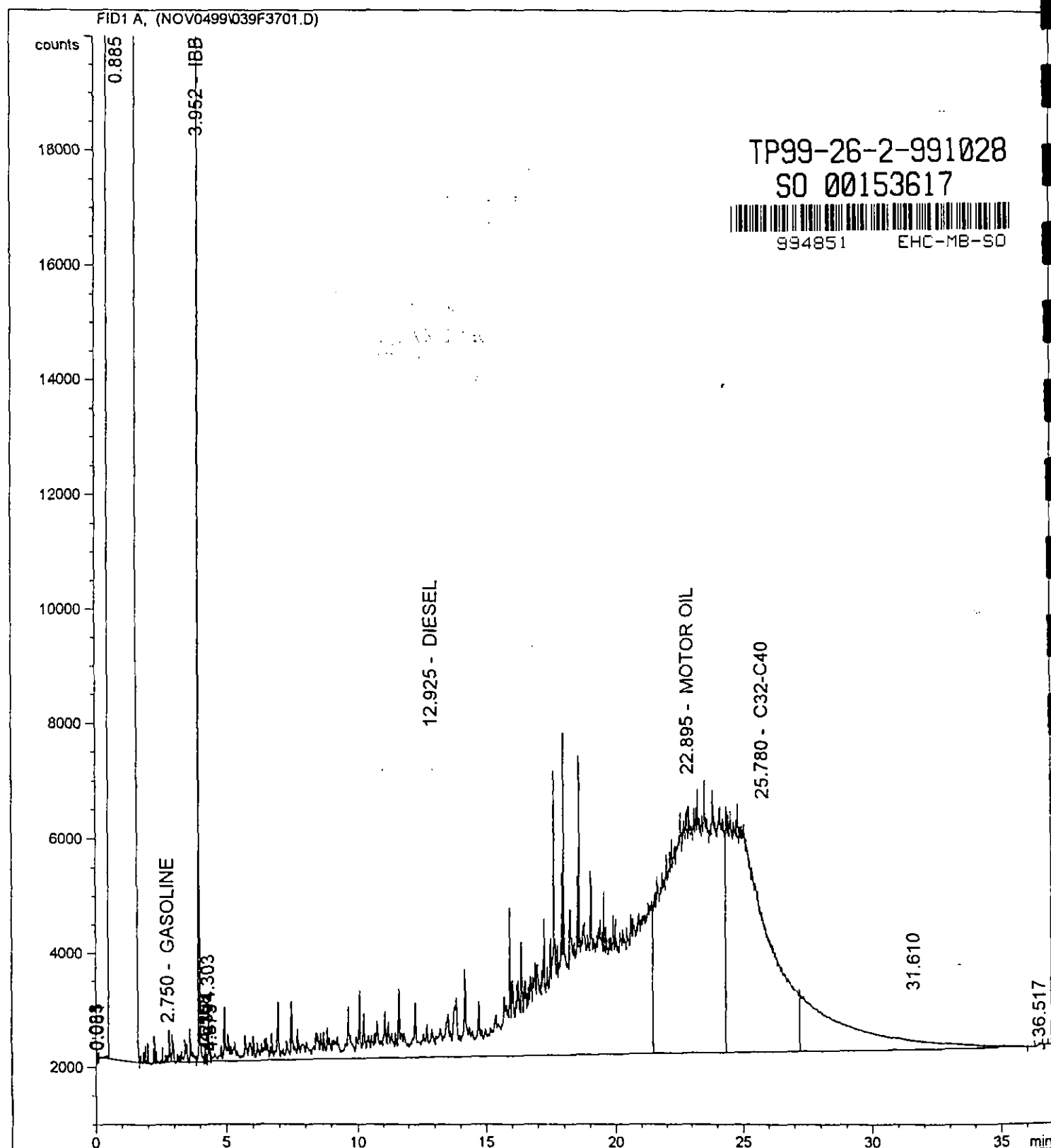
Inj Volume : 1 µl

Sequence File : C:\HPCHEM\2\SEQUENCE\NOV0499.S

Method : C:\HPCHEM\2\METHODS\4TPHIFB.M

Last changed : 11/03/1999 2:41:23 PM by D. MCLEOD

4TPHIF METHOD FOR FRONT CHANNEL ON FID IV-15M COLUMN DB-1, HT



Injection Date : 11/05/1999 2:23:49 PM

Sample Name : 4851-30 10X

Acq. Operator : D. MCLEOD

Seq. Line : 38

Vial : 40

Inj : 1

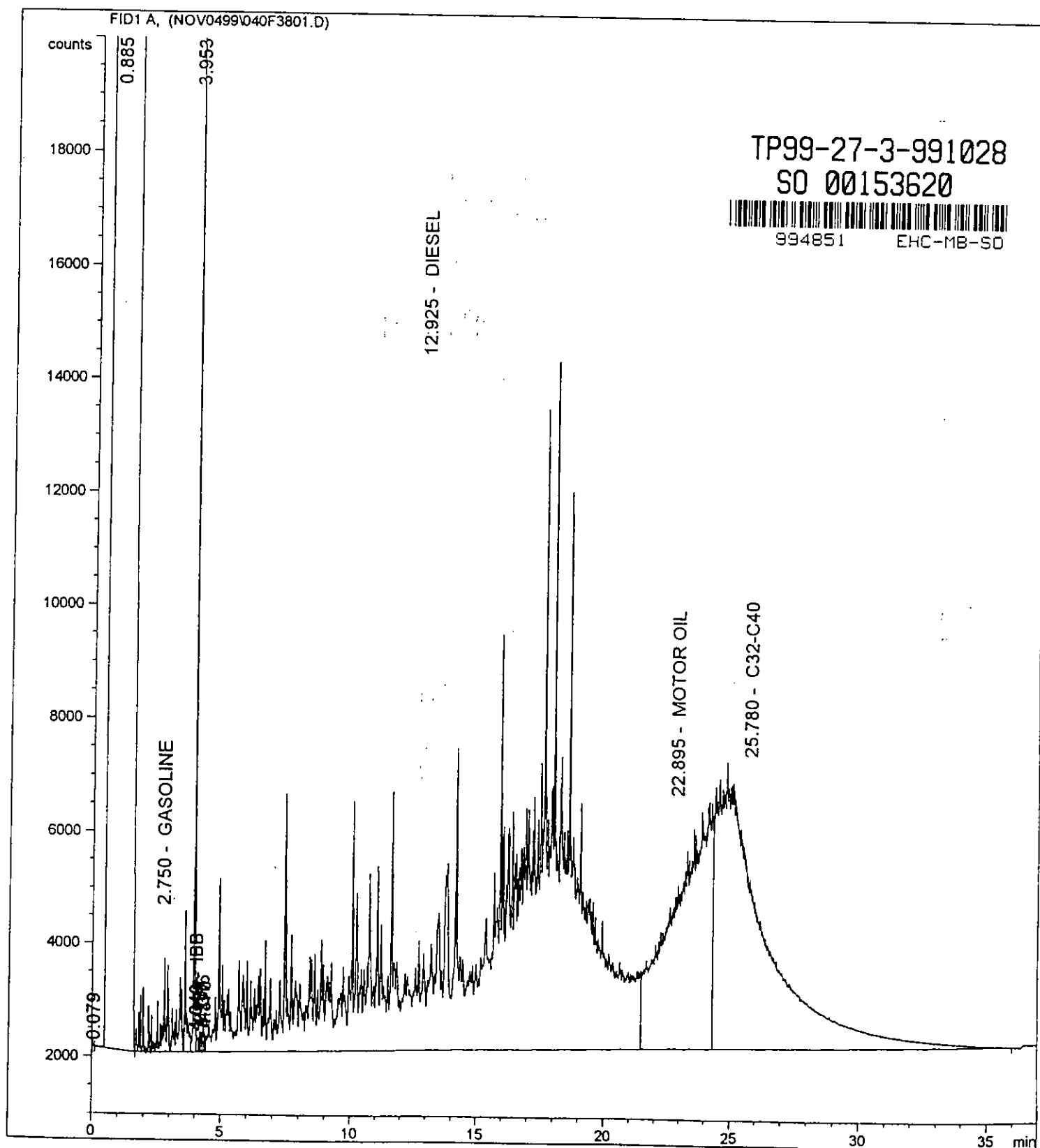
Inj Volume : 1 µl

Sequence File : C:\HPCHEM\2\SEQUENCE\NOV0499.S

Method : C:\HPCHEM\2\METHODS\4TPHIFB.M

Last changed : 11/03/1999 2:41:23 PM by D. MCLEOD

4TPHIF METHOD FOR FRONT CHANNEL ON FID IV-15M COLUMN DB-1,HT



Injection Date : 11/05/1999 11:12:10 AM

Seq. Line : 34

Sample Name : 4851-31 50X

Vial : 18

Acq. Operator : D. MCLEOD

Inj : 1

Inj Volume : 1 µl

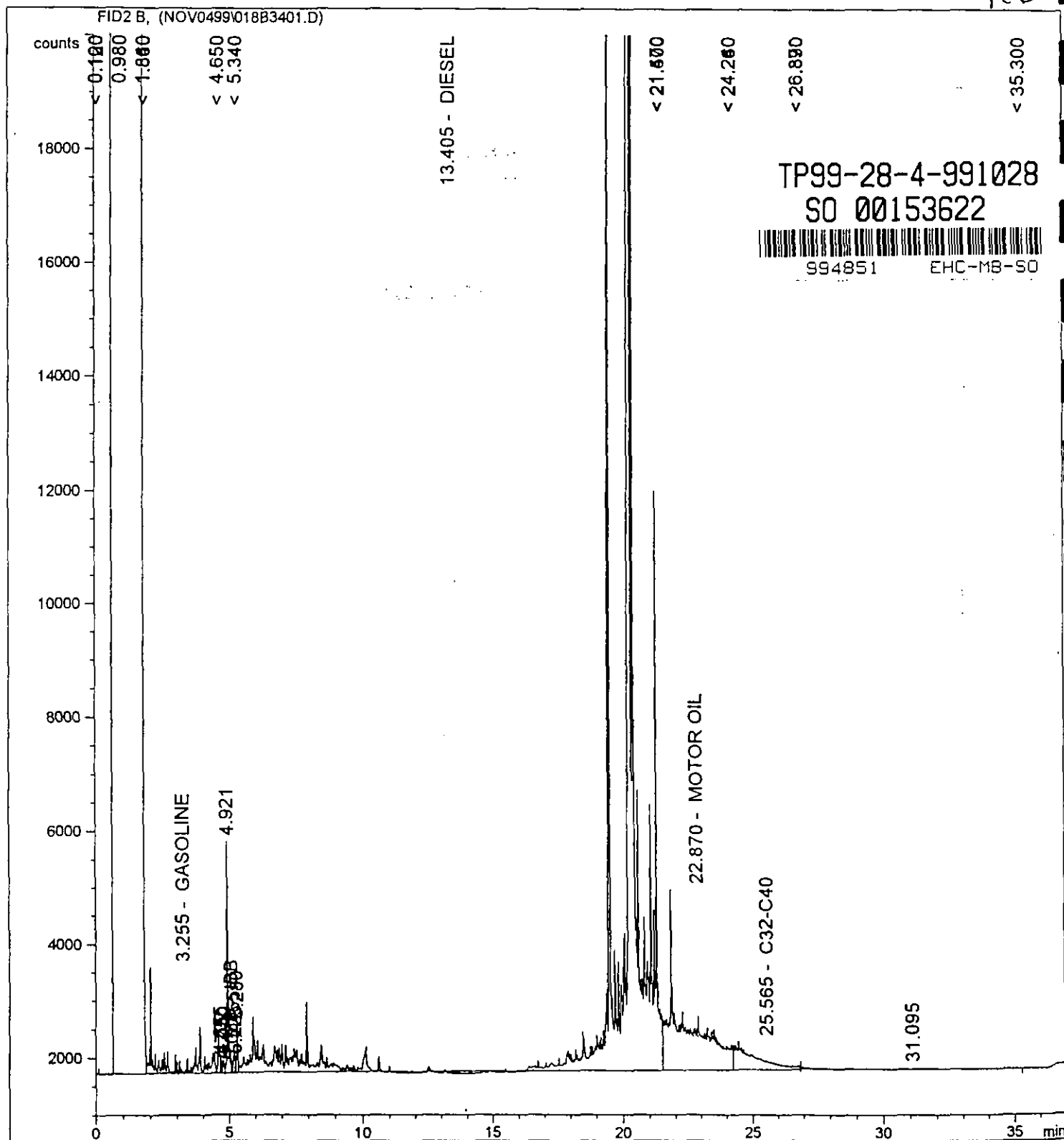
Acq. Method : C:\HPCHEM\2\METHODS\4TPHIFB.M

Last changed : 11/03/1999 2:41:23 PM by D. MCLEOD

Analysis Method : C:\HPCHEM\2\METHODS\4TPHIRA.M

Last changed : 11/03/1999 2:47:12 PM by D. MCLEOD

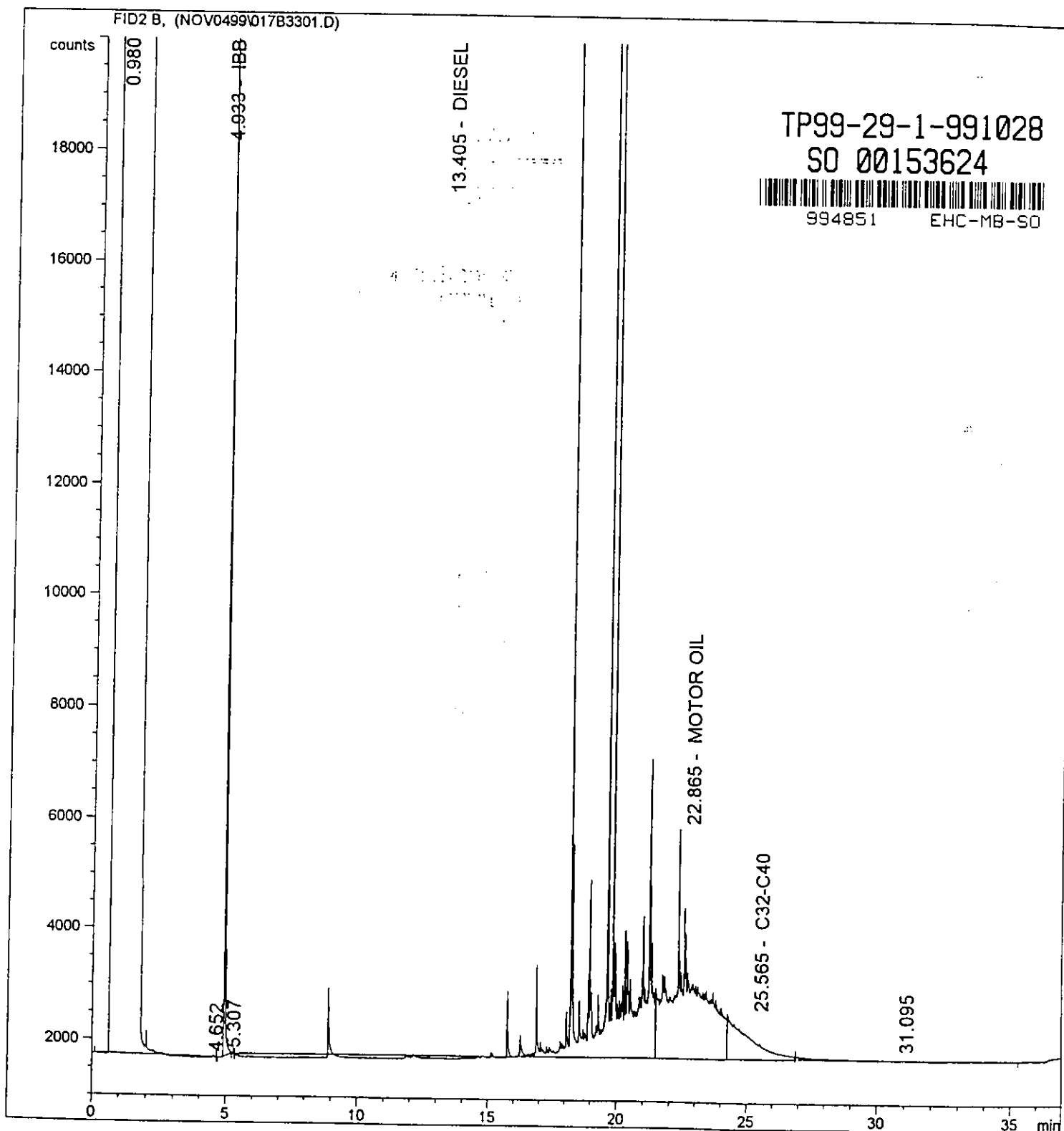
4TPHIRA METHOD FOR REAR CHANNEL ON FID IV-15M COLUMN DB-1, HT



Injection Date : 11/05/1999 10:24:21 AM  
Sample Name : 4851-32 10X  
Acq. Operator : D. MCLEOD

Seq. Line : 33  
Vial : 17  
Inj : 1  
Inj Volume : 1 µl

Sequence File : C:\HPCHEM\2\SEQUENCE\NOV0499.S  
Acq. Method : C:\HPCHEM\2\METHODS\4TPHIFB.M  
Last changed : 11/03/1999 2:41:23 PM by D. MCLEOD  
Analysis Method : C:\HPCHEM\2\METHODS\4TPHIRA.M  
Last changed : 11/03/1999 2:45:05 PM by D. MCLEOD  
4TPHIF METHOD FOR FRONT CHANNEL ON FID IV-15M COLUMN DB-1,HT





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Client: Morrow Environmental Consultants Inc. November 8 1999

Unit E, 1420 Clarence Ave

Winnipeg, MB, CANADA

R3T 1T6

ENVIRONMENTAL  
INC.

Fax: 204-477-9194

Attn: J. Derek Trinke

Date Received: October 30/1999

Date Reported: November 8/1999

Lab Ref#: G994850

Lab Quote#: 96-W238-VG

Client PO#: EA301/WestonYrd

Client Ref#: W8140B

Sampled By: JDT

### Certificate of Analysis

Analysis Performed: Extractable Hydrocarbons(Manitoba Guidelines), C11-C32  
BTEx and Total Volatile Hydrocarbons(Manitoba Criteria)

Methodology: 1) The characterization of HydroCarbon in soil by GC  
analysis, following a solvent extraction.  
U.S. EPA Method No.8011(microextraction)  
2) Analysis of Benzene, Toluene, Ethylbenzene, Xylenes &  
Volatile Hydrocarbons by Static Headspace Capillary GC-P  
ID/FID. External std quantitation with Surrogate stds.  
U.S. EPA Method No. 3810(Modification)

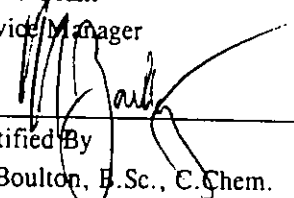
Instrumentation: 1) GC/FID/FID, Hewlett-PackardII GC, Dual injector, Dual FID, A/S  
2) Varian 3400 GC PID/FID, Genesis Headspace Analyzer

Sample Description: Soil

QA/QC: Refer to CERTIFICATE OF QUALITY CONTROL report.

Results: Refer to REPORT of ANALYSIS attached.

  
Certified By  
Elaine Grant  
Service Manager

  
Certified By  
N. Boulton, B.Sc., C.Chem.  
Customer Service Manager

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies and QA/QC procedures. Philip Analytical is limited in liability to the actual cost of the pertinent analyses done. Your samples will be retained by PASC for a period of 30 days following reporting or as per specific contractual arrangements.

# Certificate of Quality Control

Client : Morrow Environmental Consultants Inc.  
Contact: J. Derek Trinke

Date Reported: November 8/1999  
Lab Ref # : G994850  
Lab Quote#: 96-W238-VG  
Client PO#: EA301/WestonYrd  
Client Ref#: W8140B

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | SAMPLE ID<br>(spike) | EQL  | Units | Process Blank |                |        | Process % Recovery |                |                |        | Matrix Spike |        |                |                |        | Overall<br>QC<br>Acceptable |
|------------------------------------------|----------------------|------|-------|---------------|----------------|--------|--------------------|----------------|----------------|--------|--------------|--------|----------------|----------------|--------|-----------------------------|
|                                          |                      |      |       | Result        | Upper<br>Limit | Accept | Result             | Lower<br>Limit | Upper<br>Limit | Accept | Result       | Target | Lower<br>Limit | Upper<br>Limit | Accept |                             |
| Total SemiVolatile Hydrocarbons(C11-C32) | na                   | 10.0 | mg/kg | nd            | 20.0           | yes    | 90                 | 70             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Benzene                                  | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 110                | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Ethylbenzene                             | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 110                | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Toluene                                  | na                   | 0.02 | mg/kg | nd            | 0.04           | yes    | 106                | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Total Volatile Hydrocarbons              | na                   | 10   | mg/kg | nd            | 10             | yes    | 91                 | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |
| Xylenes(Total)                           | na                   | 0.04 | mg/kg | nd            | 0.08           | yes    | 114                | 60             | 120            | yes    | na           | na     | na             | na             | na     | yes                         |

EQL = Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence

\* = Unavailable due to dilution required for analysis

na = Not Applicable

ns = Insufficient Sample Submitted

nd = parameter not detected

TR = trace level less than EQL

## Philip Analytical Services Corp

## Report of Analysis

Client : Morrow Environmental Consultants Inc.  
 Contact: J. Derek Trinke

Report Date: November 8/1999  
 Lab Ref # : G994850  
 Lab Quote #: 96-W238-VG  
 Client PO#: EA301/WestonYrd  
 Client Ref#: W8140B

Analysis of Soil, expressed on a dry weight basis

| Parameter                                | EQL  | Units | BH99-68-1-<br>991029<br>1999/10/29 | BH99-68-1-<br>991029<br>Replicate | BH99-68-3-<br>991029<br>1999/10/29 |  |  |
|------------------------------------------|------|-------|------------------------------------|-----------------------------------|------------------------------------|--|--|
| Resemblance                              | na   | na    | EGDMO?                             | EGDMO?                            | EGDMO?                             |  |  |
| Total SemiVolatile Hydrocarbons(C11-C32) | 10.0 | mg/kg | 19900                              | 20000                             | 5830                               |  |  |
| Benzene                                  | 0.02 | mg/kg | 0.12                               | 0.14                              | nd                                 |  |  |
| Ethylbenzene                             | 0.02 | mg/kg | 3.23                               | 3.22                              | 0.76                               |  |  |
| Toluene                                  | 0.02 | mg/kg | 0.37                               | 0.31                              | 0.14                               |  |  |
| Total Volatile Hydrocarbons              | 10   | mg/kg | 399                                | 347                               | 179                                |  |  |
| Xylenes(Total)                           | 0.04 | mg/kg | 11.3                               | 11.1                              | 0.55                               |  |  |

EQL Estimated Quantitation Limit = lowest level of the parameter that can be quantified with confidence.

EGDMO? Contaminant elutes across the gasoline/diesel/motor oil range but does not match our reference standards.

na Not Applicable

nd parameter not detected ! = EQL higher than listed due to dilution ( ) Adjusted EQL



RECEIVED  
OCT 30 1999

Client: Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Ave  
Winnipeg, MB, CANADA  
R3T 1T6

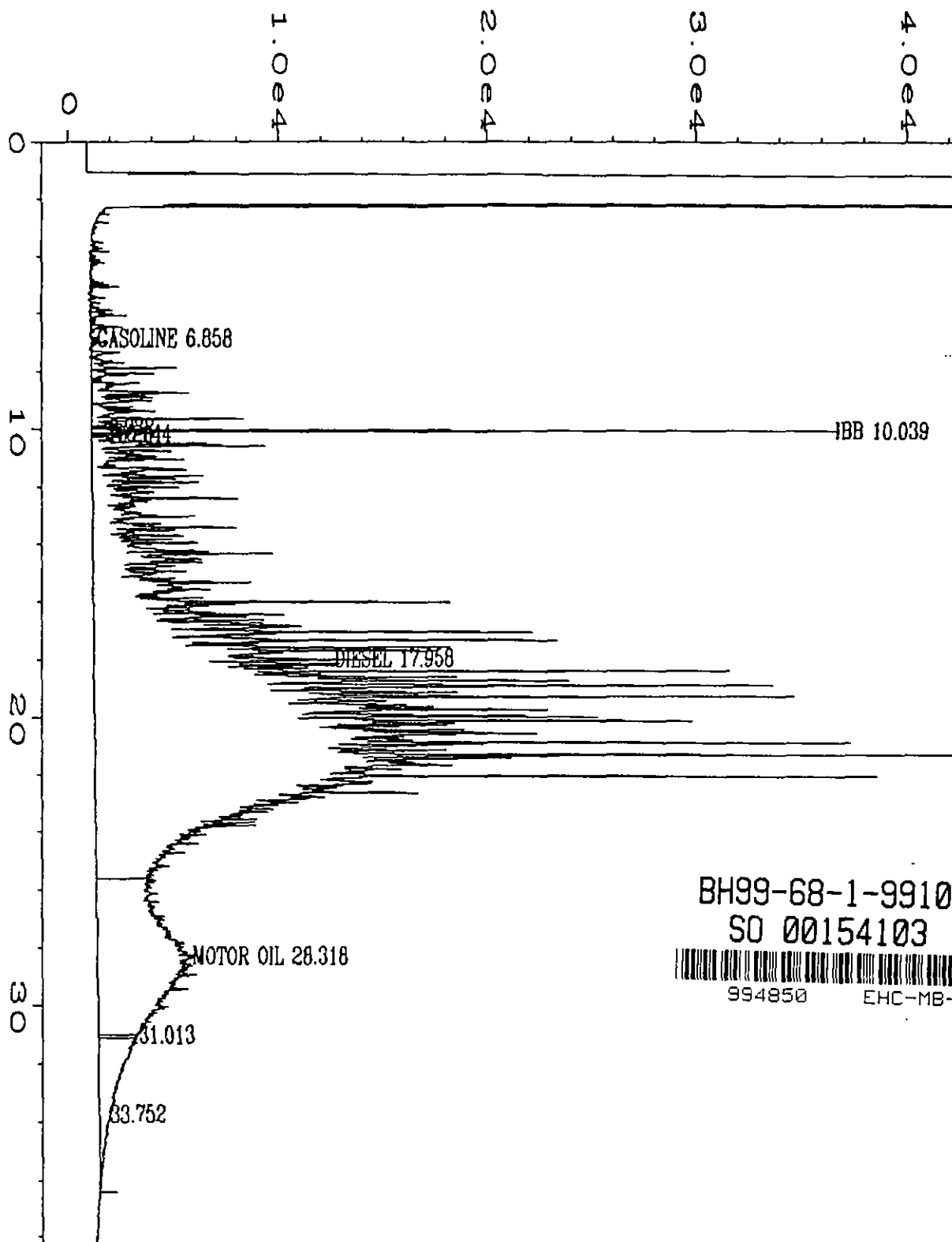
Fax: 204-477-9194

Attn: J. Derek Trinke

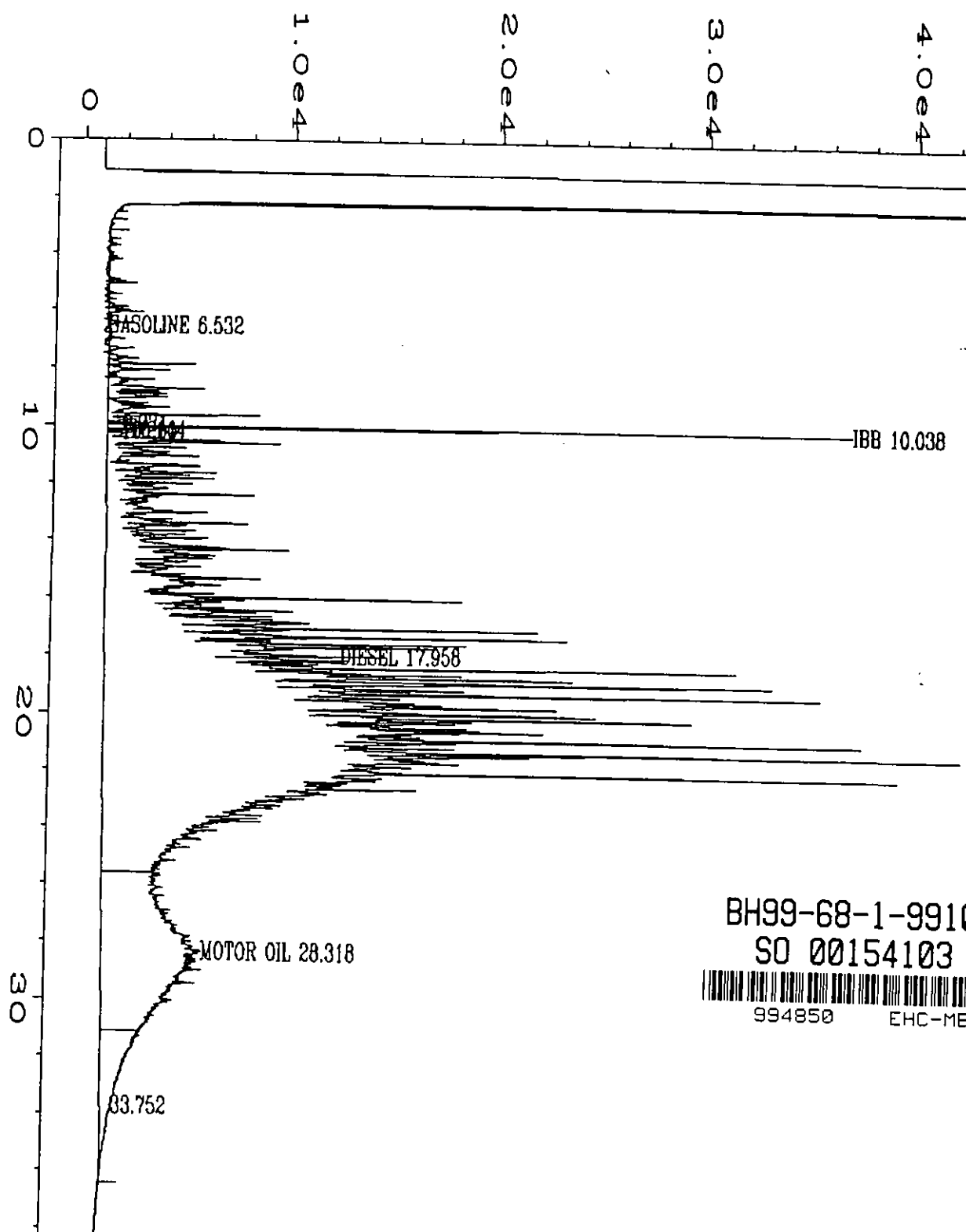
RECEIVED  
OCT 30 1999  
Date Received: October 30/1999  
Date Reported: December 9/1999  
Lab Ref#: G994850  
Lab Quote#: 96-W238-VG  
Client PO#: EA301/WestonYrd  
Client Ref#: W8140B  
Sampled By: JDT

Attached are the chromatograms for your samples.

If you have any questions, please call Elaine Grant,  
your Service Manager at Philip Analytical Services Corp.



|                    |                                       |                    |            |
|--------------------|---------------------------------------|--------------------|------------|
| Data File Name     | : C:\HPCHEM\2\DATA\NOV0499\029F0401.D | Page Number        | : 1        |
| Operator           | : JEEVA                               | Vial Number        | : 29       |
| Instrument         | : INSTRUMEN                           | Injection Number   | : 1        |
| Sample Name        | : 4850-120DF10                        | Sequence Line      | : 4        |
| Run Time Bar Code: |                                       | Instrument Method: | 2DIF.MTH   |
| Acquired on        | : 05 Nov 99 03:32 PM                  | Analysis Method    | : 2DIF.MTH |
| Report Created on: | 05 Nov 99 04:29 PM                    | Sample Amount      | : 0        |
| Last Recalib on    | : 09 SEP 99 02:52 PM                  | ISTD Amount        | :          |
| Multiplier         | : 1                                   |                    |            |

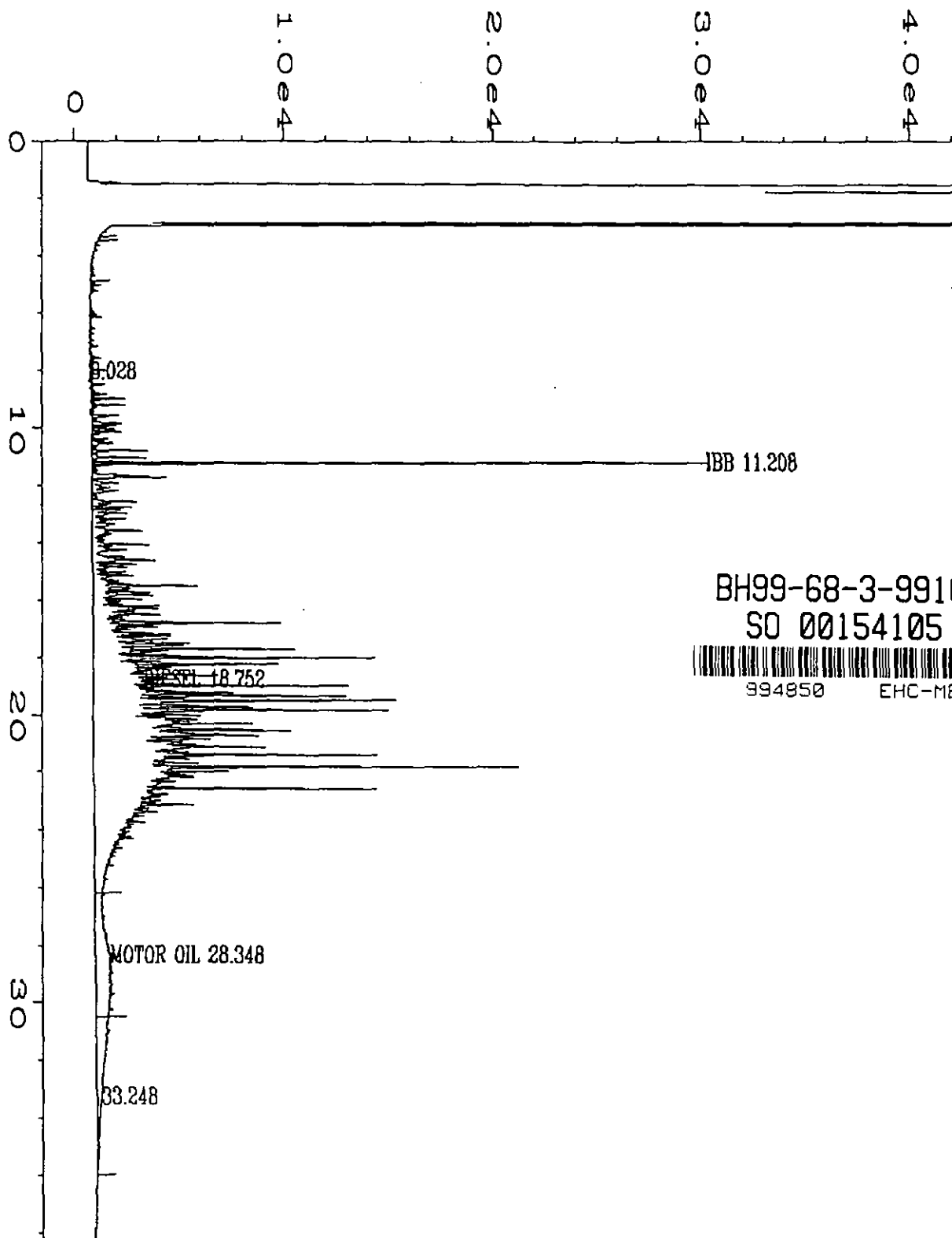


BH99-68-1-991029

SO 00154103



|                    |                                       |                    |            |
|--------------------|---------------------------------------|--------------------|------------|
| Data File Name     | : C:\HPCHEM\2\DATA\NOV0499\030F0401.D | Page Number        | : 1        |
| Operator           | : JEEVA                               | Vial Number        | : 30       |
| Instrument         | : INSTRUMEN                           | Injection Number   | : 1        |
| Sample Name        | : 4850-121DF10                        | Sequence Line      | : 4        |
| Run Time Bar Code: |                                       | Instrument Method: | 2DIF.MTH   |
| Acquired on        | : 05 Nov 99 04:21 PM                  | Analysis Method    | : 2DIF.MTH |
| Report Created on: | 05 Nov 99 05:18 PM                    | Sample Amount      | : 0        |
| Last Recalib on    | : 09 SEP 99 02:52 PM                  | ISTD Amount        | :          |
| Multiplier         | : 1                                   |                    |            |



BH99-68-3-991029

SO 00154105



394850

EHC-MB-SO

|                    |                                       |                    |            |
|--------------------|---------------------------------------|--------------------|------------|
| Data File Name     | : C:\HPCHEM\2\DATA\NOV0499\072R0301.D | Page Number        | : 1        |
| Operator           | : JEEVA                               | Vial Number        | : 72       |
| Instrument         | : INSTRUMEN                           | Injection Number   | : 1        |
| Sample Name        | : 4850-122DF10                        | Sequence Line      | : 3        |
| Run Time Bar Code: |                                       | Instrument Method: | 2DIF.MTH   |
| Acquired on        | : 05 Nov 99 03:32 PM                  | Analysis Method    | : 2DIR.MTH |
| Report Created on: | 05 Nov 99 04:36 PM                    | Sample Amount      | : 0        |
| Last Recalib. on   | : 01 AUG 99 02:42 PM                  | ISTD Amount        | :          |
| Multiplier         | : 1                                   |                    |            |

## **APPENDIX V**

### **Borehole Logs**

|                                                   |  |                                                |  |                                                                                                                                                                                                                                     |  |
|---------------------------------------------------|--|------------------------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140                                                                                                                                                                                                               |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                                                 |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                      | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                       |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, trace silt, light brown to black, loose, dry to moist |                                        | 98-1-1           |                                       | ▲    |       |             |                                    |
| 1         | <b>ORGANIC SILT</b><br>- some clay, black, low plasticity, dry to moist                                               |                                        | 98-1-2           |                                       | ▲    |       |             |                                    |
|           | <b>SILT</b><br>- some clay, greyish light brown, low plasticity, moist                                                |                                        |                  |                                       |      |       |             |                                    |
|           | - grey below 2.0m                                                                                                     |                                        |                  |                                       |      |       |             |                                    |
| 2         |                                                                                                                       | *98-1-3                                |                  |                                       | ▲    |       |             |                                    |
|           | <b>CLAY</b><br>- silty, mottled brown and grey, very stiff, low plasticity, moist                                     | 98-1-4                                 |                  | ▲                                     |      |       |             |                                    |
| 3         | - brown below 2.7m                                                                                                    |                                        |                  |                                       |      |       |             |                                    |
|           | - silt inclusions, firm, medium plasticity, wet below 3.0m                                                            | 98-1-5                                 |                  | ▲                                     |      |       |             |                                    |
| 4         |                                                                                                                       | 98-1-6                                 |                  | ▲                                     |      |       |             |                                    |
| 5         |                                                                                                                       | 98-1-7                                 |                  | ▲                                     |      |       |             |                                    |
|           | - greyish brown, high plasticity below 5.7m                                                                           | 98-1-8                                 |                  | ▲                                     |      |       |             |                                    |
| 6         | End of borehole at 6.1m                                                                                               |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                       |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                       |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                       |                                        |                  |                                       |      |       |             |                                    |

\* sample submitted for laboratory analysis

GROUND SURFACE ELEVATION (m):  
232.806

TOP OF CASING ELEVATION (m):  
232.617

DATE DRILLED: 1998 11 09

OBSERVED WATER LEVEL: 1998 12 02

LOGGED BY: JDT

**LEGEND**

road box

50 mm PVC pipe

50 mm slotted PVC pipe

bentonite seal

silica sand backfill

concrete seal



**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
232.806

TOP OF CASING ELEVATION (m):  
232.617

DATE DRILLED: 1998 11 09

OBSERVED WATER LEVEL: 1998 12 02

LOGGED BY: JDT

SHEET 1 OF 1

|                                                   |  |                                                |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140                                                                                                                                                                                         |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                           |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                 | STRATIGRAPHY PLOT | SAMPLE TYPE | SAMPLE NUMBER | SOIL VAPOUR CONCENTRATION (ppm) |      |       | WATER LEVEL | MONITORING WELL INSTALLATION |
|-----------|----------------------------------------------------------------------------------|-------------------|-------------|---------------|---------------------------------|------|-------|-------------|------------------------------|
|           |                                                                                  |                   |             |               | 100                             | 1000 | 10000 |             |                              |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, light brown, dry |                   |             |               |                                 |      |       |             |                              |
|           | <b>SILT (FILL)</b><br>- some medium grained sand, some gravel, some clay, black  |                   |             | 98-2-1        |                                 |      |       |             |                              |
| 1         | <b>SILT</b><br>- trace to some clay, light brown, soft, low plasticity, moist    |                   |             | 98-2-2        |                                 |      |       |             |                              |
|           |                                                                                  |                   |             | 98-2-3        |                                 |      |       |             |                              |
|           |                                                                                  |                   |             | 98-2-4        |                                 |      |       |             |                              |
|           |                                                                                  |                   |             | 98-2-5        |                                 |      |       |             |                              |
| 2         | <b>CLAY</b><br>- silt lenses, brown, stiff, medium plasticity, moist             |                   |             | 98-2-6        |                                 |      |       |             |                              |
|           |                                                                                  |                   |             | 98-2-7        |                                 |      |       |             |                              |
|           |                                                                                  |                   |             | 98-2-8        |                                 |      |       |             |                              |
|           |                                                                                  |                   |             |               |                                 |      |       |             |                              |
| 3         | - silt inclusions below 3.0m                                                     |                   |             |               |                                 |      |       |             |                              |
| 4         |                                                                                  |                   |             |               |                                 |      |       |             |                              |
| 5         |                                                                                  |                   |             |               |                                 |      |       |             |                              |
| 6         |                                                                                  |                   |             |               |                                 |      |       |             |                              |
| 6         | End of borehole at 6.1m                                                          |                   |             |               |                                 |      |       |             |                              |
| 7         |                                                                                  |                   |             |               |                                 |      |       |             |                              |
| 8         |                                                                                  |                   |             |               |                                 |      |       |             |                              |
| 9         |                                                                                  |                   |             |               |                                 |      |       |             |                              |

GROUND SURFACE ELEVATION (m):  
232.450

TOP OF CASING ELEVATION (m):  
232.179

DATE DRILLED: 1998 11 09

OBSERVED WATER LEVEL: 1998 12 02

LOGGED BY: JDT

SHEET 1 OF 1

#### LEGEND

- road box
- 50 mm Ø PVC pipe
- 50 mm Ø slotted PVC pipe
- bentonite seal
- silica sand backfill
- concrete seal

\* sample submitted for laboratory analysis

|                                                |  |                                                                                                                                                                                                                                     |  |                    |  |
|------------------------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------|--|
| CLIENT: CP RAIL                                |  | DRILLING CONTRACTOR: MAPLE LEAF ENTERPRISES                                                                                                                                                                                         |  | PROJECT No.: W8140 |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD: SOLID STEM AUGER                                                                                                                                                                                                   |  | DIAMETER: 130 mm   |  |
| BOREHOLE LOG                                   |  | PLOTTED: CAD FILE No.:                                                                                                                                                                                                              |  | BOREHOLE No.: 98-3 |  |
|                                                |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |                    |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                         | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER   | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|--------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                          |                                        |                    | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- brown, dry to moist                                                                                                   | X                                      | 98-3-1             |                                       | ▲    |       | ▼           |                                    |
| 1         | <b>SILT AND CLAY (FILL)</b><br>- some fine gravel, trace sand, grey, firm to stiff, low to medium plasticity, moist<br>- trace organics, firm below 0.8m |                                        | 98-3-2             |                                       | ▲    |       |             |                                    |
| 2         | <b>SILT</b><br>- some clay, trace fine sand, light brown, soft, low plasticity, wet to saturated                                                         | X                                      | *98-3-3<br>*98-3-9 |                                       | ▲    |       |             |                                    |
| 3         | <b>CLAY</b><br>- silt lenses, brown, stiff, medium plasticity, moist<br>- silt inclusions, trace fine gravel, firm, wet below 3.0m                       | X                                      | 98-3-4             | ▲                                     |      |       |             |                                    |
|           |                                                                                                                                                          | X                                      | 98-3-5             | ▲                                     |      |       |             |                                    |
| 4         | - no silt lenses below 4.6m                                                                                                                              | X                                      | 98-3-6             | ▲                                     |      |       |             |                                    |
| 5         | - greyish brown, soft below 5.5m                                                                                                                         | X                                      | 98-3-7             | ▲                                     |      |       |             |                                    |
| 6         | End of borehole at 6.1m                                                                                                                                  | X                                      | 98-3-8             | ▲                                     |      |       |             |                                    |
| 7         |                                                                                                                                                          |                                        |                    |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                          |                                        |                    |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                          |                                        |                    |                                       |      |       |             |                                    |



**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m): 232.713

TOP OF CASING ELEVATION (m): 232.465

DATE DRILLED: 1998 11 09

OBSERVED WATER LEVEL: 1998 12 02

LOGGED BY: JDT

SHEET 1 OF 1

\* sample submitted for laboratory analysis

**LEGEND**

— road box

□ 50 mm PVC pipe

▨ 50 mm slotted PVC pipe

▩ bentonite seal

▨ silica sand backfill

▩ concrete seal

|                                                |  |                                                                                                                                                                                                                                                |  |                    |  |
|------------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------|--|
| CLIENT: CP RAIL                                |  | DRILLING CONTRACTOR: MAPLE LEAF ENTERPRISES                                                                                                                                                                                                    |  | PROJECT No.: W8140 |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD: SOLID STEM AUGER                                                                                                                                                                                                              |  | DIAMETER: 130 mm   |  |
| BOREHOLE LOG                                   |  | PLOTTED: CAD FILE No.:                                                                                                                                                                                                                         |  | BOREHOLE No.: 98-4 |  |
|                                                |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> NO RECOVERY |  |                    |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                               | STRATIGRAPHY PLOT | SAMPLE TYPE | SAMPLE NUMBER | SOIL VAPOUR CONCENTRATION (ppm) |      |       | WATER LEVEL | MONITORING WELL INSTALLATION |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------|---------------|---------------------------------|------|-------|-------------|------------------------------|
|           |                                                                                                                                                |                   |             |               | 100                             | 1000 | 10000 |             |                              |
| 0         | <b>BALLAST (FILL)</b>                                                                                                                          |                   |             |               |                                 |      |       |             |                              |
|           | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, coarse grained gravel, brown, dry                                              |                   |             | 98-4-1        |                                 |      |       |             |                              |
| 1         | <b>CLAY (FILL)</b><br>- trace medium grained sand, trace fine grained gravel, trace silt, greyish brown to black, stiff, low plasticity, moist |                   |             | 98-4-2        |                                 |      |       |             |                              |
| 2         | <b>SILT</b><br>- trace to some clay, light brown, soft, low plasticity, moist<br>- greyish brown, wet below 2.1m                               |                   |             | 98-4-3        |                                 |      |       |             |                              |
|           | <b>CLAY</b><br>- silt inclusions, silt lenses, brown, stiff, medium plasticity<br>- firm to stiff, wet below 3.0m                              |                   |             | 98-4-4        |                                 |      |       |             |                              |
| 3         |                                                                                                                                                |                   |             | 98-4-5        |                                 |      |       |             |                              |
| 4         |                                                                                                                                                |                   |             | 98-4-6        |                                 |      |       |             |                              |
|           | - no silt lenses, medium to high plasticity below 4.6m                                                                                         |                   |             | 98-4-7        |                                 |      |       |             |                              |
| 5         |                                                                                                                                                |                   |             | 98-4-8        |                                 |      |       |             |                              |
| 6         | End of borehole at 6.1m                                                                                                                        |                   |             |               |                                 |      |       |             |                              |
| 7         |                                                                                                                                                |                   |             |               |                                 |      |       |             |                              |
| 8         |                                                                                                                                                |                   |             |               |                                 |      |       |             |                              |
| 9         |                                                                                                                                                |                   |             |               |                                 |      |       |             |                              |

\* sample submitted for laboratory analysis

GROUND SURFACE ELEVATION (m): 232.657

TOP OF CASING ELEVATION (m): 232.390

DATE DRILLED: 1998 11 09

OBSERVED WATER LEVEL: 1998 12 02

LOGGED BY: JDT

SHEET 1 OF 1

|                                                   |  |                                                                                                                                                                                                                                                |  |                       |  |
|---------------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES                                                                                                                                                                                                 |  | PROJECT No.:<br>W8140 |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER                                                                                                                                                                                                           |  | DIAMETER:<br>130 mm   |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                                                                                                                                                                                                                      |  | BOREHOLE No.:<br>98-5 |  |
|                                                   |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> NO RECOVERY |  |                       |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                    | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                     |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- brown, loose, dry<br>- black below 0.6m                                                          |                                        | 98-5-1           | ▲                                     |      |       |             |                                    |
| 1         | <b>CLAY AND SILT (FILL)</b><br>- trace medium to coarse grained sand, trace fine gravel, greyish brown to black, stiff, moist       |                                        | 98-5-2           | ▲                                     |      |       |             |                                    |
|           | <b>SILT</b><br>- same clay, light brown, soft, low plasticity, wet                                                                  |                                        | *98-5-9          | ▲                                     |      |       |             |                                    |
| 2         |                                                                                                                                     | 98-5-3                                 | ▲                |                                       |      |       |             |                                    |
| 3         | <b>CLAY</b><br>- silt inclusions, silt lenses, brown, stiff, medium plasticity, moist<br><br>- no silt lenses, firm, wet below 3.7m | 98-5-4                                 | ▲                |                                       |      |       |             |                                    |
|           |                                                                                                                                     | 98-5-5                                 | ▲                |                                       |      |       |             |                                    |
| 4         |                                                                                                                                     | 98-5-6                                 | ▲                |                                       |      |       |             |                                    |
| 5         |                                                                                                                                     | 98-5-7                                 | ▲                |                                       |      |       |             |                                    |
|           |                                                                                                                                     | 98-5-8                                 | ▲                |                                       |      |       |             |                                    |
| 6         | End of borehole at 6.1m                                                                                                             |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                     |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                     |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                     |                                        |                  |                                       |      |       |             |                                    |

\* sample submitted for laboratory analysis

GROUND SURFACE ELEVATION (m):  
232.630

TOP OF CASING ELEVATION (m):  
232.361

DATE DRILLED: 1998 11 09

OBSERVED WATER LEVEL: 1998 12 02

LOGGED BY: JDT

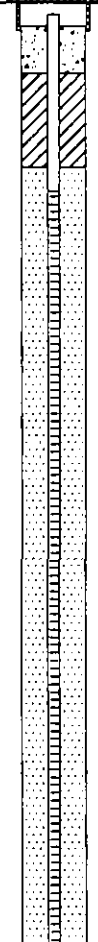
SHEET 1 OF 1

#### LEGEND

- road box
- 50 mm # PVC pipe
- 50 mm # slotted PVC pipe
- bentonite seal
- silica sand backfill
- concrete seal

|                                                   |  |                                                                                                                                                                                                                                                |  |                       |  |
|---------------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES                                                                                                                                                                                                 |  | PROJECT No.:<br>W8140 |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER                                                                                                                                                                                                           |  | DIAMETER:<br>130 mm   |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                                                                                                                                                                                                                      |  | BOREHOLE No.:<br>98-6 |  |
|                                                   |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> NO RECOVERY |  |                       |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                           | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE                                             | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL                                                                          | MONITORING<br>WELL<br>INSTALLATION |
|-----------|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------|---------------------------------------|------|-------|--------------------------------------------------------------------------------------|------------------------------------|
|           |                                                                                                                            |                                                                                    |                  | 100                                   | 1000 | 10000 |                                                                                      |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- fine to coarse grained sand, brown, dry<br>- black below 0.3m<br>- saturated below 0.6m |  | *98-6-1          |                                       |      |       |  |                                    |
| 1         | <b>CLAY</b><br>- dark brown, stiff, medium plasticity, moist<br>- some silt, light grey below 0.9m                         |                                                                                    | 98-6-2           |                                       |      |       |                                                                                      |                                    |
|           | <b>SILT</b><br>- trace clay, light brown, soft, low plasticity, moist<br>- some clay, wet below 1.5m                       |                                                                                    | 98-6-3           |                                       |      |       |                                                                                      |                                    |
| 2         | <b>CLAY</b><br>- silt inclusions, brown, firm to stiff, medium plasticity, moist<br>- silt lenses from 3.0m to 3.3m        |                                                                                    | 98-6-4           |                                       |      |       |                                                                                      |                                    |
| 3         | - firm, medium to high plasticity, wet below 3.7m                                                                          |                                                                                    | 98-6-5           |                                       |      |       |                                                                                      |                                    |
| 4         |                                                                                                                            |                                                                                    | 98-6-6           |                                       |      |       |                                                                                      |                                    |
| 5         | - soft below 5.6m                                                                                                          |                                                                                    | 98-6-7           |                                       |      |       |                                                                                      |                                    |
| 6         | End of borehole at 6.1m                                                                                                    |                                                                                    | 98-6-8           |                                       |      |       |                                                                                      |                                    |
| 7         |                                                                                                                            |                                                                                    |                  |                                       |      |       |                                                                                      |                                    |
| 8         |                                                                                                                            |                                                                                    |                  |                                       |      |       |                                                                                      |                                    |
| 9         |                                                                                                                            |                                                                                    |                  |                                       |      |       |                                                                                      |                                    |

\* sample submitted for laboratory analysis



**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
232.739

TOP OF CASING ELEVATION (m):  
232.403

DATE DRILLED: 1998 11 10

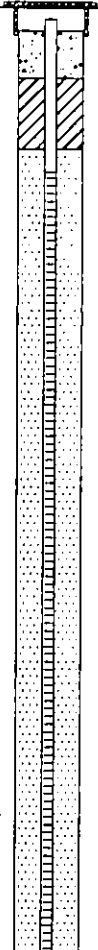
OBSERVED WATER LEVEL: 1998 12 02

LOGGED BY: JDT

SHEET 1 OF 1

|                                                |  |                                                                                                                                                                                                                                     |  |                    |  |
|------------------------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------|--|
| CLIENT: CP RAIL                                |  | DRILLING CONTRACTOR: MAPLE LEAF ENTERPRISES                                                                                                                                                                                         |  | PROJECT No.: W8140 |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD: SOLID STEM AUGER                                                                                                                                                                                                   |  | DIAMETER: 130 mm   |  |
| BOREHOLE LOG                                   |  | PLOTTED: CAD FILE No.:                                                                                                                                                                                                              |  | BOREHOLE No.: 98-7 |  |
|                                                |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |                    |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                    | STRATIGRAPHY PLOT                                                                  | SAMPLE TYPE                                                                        | SAMPLE NUMBER | SOIL VAPOUR CONCENTRATION (ppm) |      |       | WATER LEVEL                                                                          | MONITORING WELL INSTALLATION |
|-----------|---------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|---------------|---------------------------------|------|-------|--------------------------------------------------------------------------------------|------------------------------|
|           |                                                                                                                     |                                                                                    |                                                                                    |               | 100                             | 1000 | 10000 |                                                                                      |                              |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- black, loose<br>- light brown below 0.4m<br>- saturated below 0.7m               |  |  | 98-7-1        |                                 |      |       |  |                              |
| 1         | <b>CLAY</b><br>- trace fine and medium grained sand, trace silt, black to grey, stiff, dry to moist                 |                                                                                    |                                                                                    | 98-7-2        |                                 |      |       |                                                                                      |                              |
|           | <b>SILT</b><br>- some clay, light brown, soft, low plasticity, wet<br>- light grey below 1.7m                       |                                                                                    |                                                                                    | *98-7-3       |                                 |      |       |                                                                                      |                              |
| 2         | <b>CLAY</b><br>- silt inclusions, silt lenses, trace coarse sand, greyish brown, stiff, moist<br>- brown below 2.6m |                                                                                    |                                                                                    | 98-7-4        |                                 |      |       |                                                                                      |                              |
| 3         | <b>SILT</b><br>- trace to some clay, light brown, soft, low plasticity, wet to saturated                            |                                                                                    |                                                                                    | 98-7-5        |                                 |      |       |                                                                                      |                              |
| 4         | <b>CLAY</b><br>- silt inclusions, brown, firm, high plasticity, wet                                                 |                                                                                    |                                                                                    | 98-7-6        |                                 |      |       |                                                                                      |                              |
| 5         | - soft below 5.5m                                                                                                   |                                                                                    |                                                                                    | 98-7-7        |                                 |      |       |                                                                                      |                              |
|           |                                                                                                                     |                                                                                    |                                                                                    | 98-7-8        |                                 |      |       |                                                                                      |                              |
| 6         | End of borehole at 6.1m                                                                                             |                                                                                    |                                                                                    |               |                                 |      |       |                                                                                      |                              |
| 7         |                                                                                                                     |                                                                                    |                                                                                    |               |                                 |      |       |                                                                                      |                              |
| 8         |                                                                                                                     |                                                                                    |                                                                                    |               |                                 |      |       |                                                                                      |                              |
| 9         |                                                                                                                     |                                                                                    |                                                                                    |               |                                 |      |       |                                                                                      |                              |

\* sample submitted for laboratory analysis



**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m): 232.557

TOP OF CASING ELEVATION (m): 232.208

DATE DRILLED: 1998 11 10

OBSERVED WATER LEVEL: 1998 12 02

LOGGED BY: JDT

SHEET 1 OF 1

|                                                |  |                                                                                                                                                                                                               |  |                    |  |
|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------|--|
| CLIENT: CP RAIL                                |  | DRILLING CONTRACTOR: MAPLE LEAF ENTERPRISES                                                                                                                                                                   |  | PROJECT No.: W8140 |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD: SOLID STEM AUGER                                                                                                                                                                             |  | DIAMETER: 130 mm   |  |
| BOREHOLE LOG                                   |  | PLOTTED: CAD FILE No.:                                                                                                                                                                                        |  | BOREHOLE No.: 98-8 |  |
|                                                |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |                    |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                   | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                    |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- black, moist<br>- light brown below 0.4m                                                        |                                        | 98-8-1           |                                       |      |       |             |                                    |
| 1         | <b>CLAY</b><br>- grey to black, stiff, medium plasticity, moist                                                                    |                                        | 98-8-2           |                                       |      |       |             |                                    |
|           | <b>SILT</b><br>- clayey, light brown, soft to firm, low to medium plasticity, moist<br>- wet below 1.4m<br>- light grey below 1.7m |                                        | *98-8-3          |                                       |      |       |             |                                    |
| 2         | <b>CLAY</b><br>- silt lenses, silt inclusions, brown, stiff, medium plasticity, moist<br>- no silt lenses below 2.3m               |                                        | 98-8-4           |                                       |      |       |             |                                    |
| 3         | - firm, medium to high plasticity below 3.0m<br>- silt lenses from 3.0m to 3.3m                                                    |                                        | 98-8-5           |                                       |      |       |             |                                    |
| 4         | - high plasticity, wet below 4.6m                                                                                                  |                                        | 98-8-6           |                                       |      |       |             |                                    |
| 5         | - soft below 5.6m                                                                                                                  |                                        | 98-8-7           |                                       |      |       |             |                                    |
| 6         | End of borehole at 6.1m                                                                                                            |                                        | 98-8-8           |                                       |      |       |             |                                    |
| 7         |                                                                                                                                    |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                    |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                    |                                        |                  |                                       |      |       |             |                                    |

\* sample submitted for laboratory analysis

**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m): 232.568

TOP OF CASING ELEVATION (m): 232.210

DATE DRILLED: 1998 11 10

OBSERVED WATER LEVEL: 1998 12 02

LOGGED BY: JDT

SHEET 1 OF 1

#### LEGEND

- road box
- 50 mm # PVC pipe
- 50 mm # slotted PVC pipe
- bentonite seal
- silica sand backfill
- concrete seal

|                                                   |  |                                                                                                                                                                                                                                                                             |                     |                       |
|---------------------------------------------------|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------------------|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES                                                                                                                                                                                                                              |                     | PROJECT No.:<br>W8140 |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER                                                                                                                                                                                                                                        | DIAMETER:<br>130 mm | BOREHOLE No.:<br>98-9 |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:<br>SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> NO RECOVERY |                     |                       |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                                                           | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                                                            |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- some silt, fine sand, brown, loose, dry<br>- black below 0.5m                                                                                                           |                                        | 98-9-1           |                                       | ▲    |       |             |                                    |
| 1         | <b>CLAY (FILL)</b><br>- silt inclusions, trace coarse grained sand, trace fine grained gravel, black to grey, dry to moist                                                                                 |                                        | 98-9-2           |                                       | ▲    |       |             |                                    |
| 2         | <b>SILT</b><br>- some clay to clayey, light brown, soft, medium plasticity, moist to wet                                                                                                                   |                                        | *98-9-3          |                                       | ▲    |       |             |                                    |
|           | <b>CLAY</b><br>- silt lenses, silt inclusions, brown, stiff, medium to high plasticity, moist<br>- no silt lenses below 2.7m<br>- firm, high plasticity, wet below 3.0m<br>- silt lenses from 3.0m to 3.3m |                                        | 98-9-4           | ▲                                     |      |       |             |                                    |
| 3         |                                                                                                                                                                                                            |                                        | 98-9-5           |                                       | ▲    |       |             |                                    |
| 4         |                                                                                                                                                                                                            |                                        | 98-9-6           | ▲                                     |      |       |             |                                    |
| 5         |                                                                                                                                                                                                            |                                        | 98-9-7           | ▲                                     |      |       |             |                                    |
|           | - soft below 5.8m                                                                                                                                                                                          |                                        | 98-9-8           | ▲                                     |      |       |             |                                    |
| 6         | End of borehole at 6.1m                                                                                                                                                                                    |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                                                            |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                                                            |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                                                            |                                        |                  |                                       |      |       |             |                                    |

\* sample submitted for laboratory analysis

#### LEGEND

- road box
- 50 mm PVC pipe
- 50 mm slotted PVC pipe
- bentonite seal
- silica sand backfill
- concrete seal

|                                                   |  |                                                |  |                                                                                                                                                                                                                                     |  |
|---------------------------------------------------|--|------------------------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140                                                                                                                                                                                                               |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                                                 |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m)               | SOIL DESCRIPTION                                                                                          | STRATIGRAPHY PLOT                         | SAMPLE TYPE         | SAMPLE NUMBER | SOIL VAPOUR CONCENTRATION (ppm) |      |       | WATER LEVEL         | MONITORING WELL INSTALLATION           |  |
|-------------------------|-----------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------|---------------|---------------------------------|------|-------|---------------------|----------------------------------------|--|
|                         |                                                                                                           |                                           |                     |               | 100                             | 1000 | 10000 |                     |                                        |  |
| 0                       | <b>SAND AND GRAVEL (FILL)</b><br>- fine grained sand, fine grained gravel, clay chunks, brown, loose, dry | [Stratigraphy Plot: Sand and Gravel Fill] | [Sample Type: Core] | 98-10-1       | ▲                               |      |       | [Water Level: 1.2m] | [Monitoring Well Installation Diagram] |  |
| 1                       | - greyish below 1.5m                                                                                      |                                           |                     | 98-10-2       | ▲                               |      |       |                     |                                        |  |
| 2                       | - medium grained sand from 2.3m to 2.7m<br>- saturated below 2.3m                                         |                                           |                     | 98-10-3       |                                 | ▲    |       |                     |                                        |  |
|                         |                                                                                                           |                                           |                     | 98-10-4       |                                 | ▲    |       |                     |                                        |  |
| 3                       | <b>CLAY</b><br>- silt inclusions, greyish brown, firm, medium to high plasticity, wet                     |                                           |                     | 98-10-5       | ▲                               |      |       |                     |                                        |  |
| 4                       |                                                                                                           |                                           |                     | 98-10-6       | ▲                               |      |       |                     |                                        |  |
| End of borehole at 4.6m |                                                                                                           |                                           |                     |               |                                 |      |       |                     |                                        |  |
| 5                       |                                                                                                           |                                           |                     |               |                                 |      |       |                     |                                        |  |
| 6                       |                                                                                                           |                                           |                     |               |                                 |      |       |                     |                                        |  |
| 7                       |                                                                                                           |                                           |                     |               |                                 |      |       |                     |                                        |  |
| 8                       |                                                                                                           |                                           |                     |               |                                 |      |       |                     |                                        |  |
| 9                       |                                                                                                           |                                           |                     |               |                                 |      |       |                     |                                        |  |



**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
232.772

TOP OF CASING ELEVATION (m):  
232.569

DATE DRILLED: 1998 11 10

OBSERVED WATER LEVEL: 1998 12 02

LOGGED BY:  
JDT

SHEET 1 OF 1

\* sample submitted for laboratory analysis

**LEGEND**

|                        |                               |
|------------------------|-------------------------------|
| road box               | liquid petroleum hydrocarbons |
| 50 mm PVC pipe         | silica sand backfill          |
| 50 mm slotted PVC pipe | concrete seal                 |
| bentonite seal         | slough                        |

|                                                |  |                                                                                                                                                                                                               |  |                     |  |
|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------|--|
| CLIENT: CP RAIL                                |  | DRILLING CONTRACTOR: MAPLE LEAF ENTERPRISES                                                                                                                                                                   |  | PROJECT No.: W8140  |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD: SOLID STEM AUGER                                                                                                                                                                             |  | DIAMETER: 130 mm    |  |
| BOREHOLE LOG                                   |  | PLOTTED: CAD FILE No.:                                                                                                                                                                                        |  | BOREHOLE No.: 98-11 |  |
|                                                |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |                     |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                           | STRATIGRAPHY<br>PLOT | SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|------------------------------------------------------------------------------------------------------------|----------------------|----------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                            |                      |                |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, dark brown, dry to moist                   |                      |                | 98-11-1          |                                       |      |       |             |                                    |
| 1         | - saturated below 1.1m<br><b>CLAY (FILL)</b><br>- some silt, black to grey, firm, moist                    |                      |                | 98-11-2          |                                       |      |       |             |                                    |
| 2         | <b>CLAY</b><br>- silt inclusions, trace medium grained sand, brown, stiff, medium plasticity, moist        |                      |                | 98-11-4          |                                       |      |       |             |                                    |
|           | <b>SILT</b><br>- trace to some clay, light brown, soft, low to medium plasticity, moist to wet             |                      |                | 98-11-3          |                                       |      |       |             |                                    |
| 3         | <b>CLAY</b><br>- silt inclusions, silt lenses, brown, stiff, medium plasticity, moist<br>- firm below 3.0m |                      |                | 98-11-5          |                                       |      |       |             |                                    |
| 4         | - no silt lenses below 4.0m                                                                                |                      |                | 98-11-6          |                                       |      |       |             |                                    |
| 5         | - silt lenses from 4.6m to 5.2m                                                                            |                      |                | 98-11-7          |                                       |      |       |             |                                    |
|           | - greyish brown, soft below 5.8m                                                                           |                      |                | 98-11-8          |                                       |      |       |             |                                    |
| 6         | End of borehole at 6.1m                                                                                    |                      |                |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                            |                      |                |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                            |                      |                |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                            |                      |                |                  |                                       |      |       |             |                                    |

GROUND SURFACE ELEVATION (m): 232.868

TOP OF CASING ELEVATION (m): 232.609

DATE DRILLED: 1998 11 10

OBSERVED WATER LEVEL: 1998 12 02

LOGGED BY: JDT

SHEET 1 OF 1

|                                                                                                                                                                                                                                    |  |                                                |                     |                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------------------------------------------------|---------------------|------------------------|
| CLIENT:<br>CP RAIL                                                                                                                                                                                                                 |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |                     | PROJECT No.:<br>W8140  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS                                                                                                                                                                                  |  | DRILLING METHOD:<br>SOLID STEM AUGER           | DIAMETER:<br>130 mm | BOREHOLE No.:<br>98-12 |
| BOREHOLE LOG                                                                                                                                                                                                                       |  | PLOTTED:<br>CAD FILE No.:                      |                     |                        |
| SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVER |  |                                                |                     |                        |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                     | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|----------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                      |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, light brown, loose, dry<br>- dark brown below 0.4m   |                                        | *98-12-1         |                                       |      |       |             |                                    |
| 1         | <b>CLAY</b><br>- trace medium to coarse grained sand, black, stiff, medium plasticity, dry to moist                  |                                        | 98-12-2          |                                       |      |       |             |                                    |
|           | <b>SILT</b><br>- clayey, light grey, firm, medium plasticity, dry                                                    |                                        | 98-12-3          |                                       |      |       |             |                                    |
| 2         | <b>CLAY</b><br>- silt inclusions, silt lenses, brown, stiff, medium plasticity, moist<br>- no silt lenses below 2.4m |                                        | 98-12-4          |                                       |      |       |             |                                    |
| 3         | - silt lenses from 3.0m to 3.3m<br>- firm below 3.0m                                                                 |                                        | 98-12-5          |                                       |      |       |             |                                    |
| 4         | - wet below 4.6m                                                                                                     |                                        | 98-12-6          |                                       |      |       |             |                                    |
| 5         | - soft below 5.6m                                                                                                    |                                        | 98-12-7          |                                       |      |       |             |                                    |
| 6         | End of borehole at 6.1m                                                                                              |                                        | 98-12-8          |                                       |      |       |             |                                    |
| 7         |                                                                                                                      |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                      |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                      |                                        |                  |                                       |      |       |             |                                    |

\* sample submitted for laboratory analysis

#### LEGEND

- road box
- 50 mm PVC pipe
- 50 mm slotted PVC pipe
- bentonite seal
- silica sand backfill
- concrete seal



MORROW  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
232.773  
TOP OF CASING ELEVATION (m):  
232.618

DATE DRILLED: 1998 11 10  
OBSERVED WATER LEVEL: 1998 12 02  
LOGGED BY:  
JDT  
SHEET 1 OF 1

|                                                   |  |                                                |  |                                                                                                                                                                                                                                                |  |
|---------------------------------------------------|--|------------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140                                                                                                                                                                                                                          |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                                                            |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                               | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|----------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- fine grained sand, brown, dry<br><br>- trace coarse grained sand below 0.8m | X                                      | 98-13-1          |                                       |      |       | 4 mm LPH    |                                    |
| 1         |                                                                                                                |                                        | 98-13-2          |                                       |      |       |             |                                    |
| 2         |                                                                                                                |                                        | 98-13-3          |                                       |      |       |             |                                    |
| 3         |                                                                                                                |                                        | *98-13-4         |                                       |      |       |             |                                    |
| 4         | <b>CLAY</b><br>- silt inclusions, brown, firm, medium to high plasticity, wet                                  | 98-13-5                                |                  |                                       |      |       |             |                                    |
| 5         |                                                                                                                | 98-13-6                                |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                | 98-13-7                                |                  |                                       |      |       |             |                                    |
| 7         | End of borehole at 5.3m                                                                                        | X                                      |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                |                                        |                  |                                       |      |       |             |                                    |
|           |                                                                                                                |                                        |                  |                                       |      |       |             |                                    |

GROUND SURFACE ELEVATION (m):  
232.795  
 TOP OF CASING ELEVATION (m):  
232.646

DATE DRILLED: 1998 11 12  
 OBSERVED WATER LEVEL: 1998 12 02  
 LOGGED BY: JDT  
 SHEET 1 OF 1

\* sample submitted for laboratory analysis

**LEGEND**

|                        |                |                      |
|------------------------|----------------|----------------------|
| road box               | 50 mm PVC pipe | silica sand backfill |
| 50 mm slotted PVC pipe | concrete seal  | bentonite seal       |
| slough                 |                |                      |

|                                                |  |                                                                                                                                                                                                               |  |                     |  |
|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------|--|
| CLIENT: CP RAIL                                |  | DRILLING CONTRACTOR: MAPLE LEAF ENTERPRISES                                                                                                                                                                   |  | PROJECT No.: W8140  |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD: SOLID STEM AUGER                                                                                                                                                                             |  | DIAMETER: 130 mm    |  |
| BOREHOLE LOG                                   |  | PLOTTED: CAD FILE No.:                                                                                                                                                                                        |  | BOREHOLE No.: 98-14 |  |
|                                                |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |                     |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|-----------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                 |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>GRAVEL (FILL)</b><br>- trace fine grained sand, trace silt, saturated                                        | X                                      | *98-14-1         | ▲                                     |      |       |             |                                    |
| 1         | <b>SILT</b><br>- light brown, non plastic, crumbly, dry<br>- some clay, soft, medium plasticity, wet below 1.2m | X                                      | 98-14-2          | ▲                                     |      |       |             |                                    |
| 2         | <b>CLAY</b><br>- silt inclusions, brown, firm, high plasticity, wet<br>- silt lenses from 3.0m to 3.3m          | X                                      | 98-14-3          | ▲                                     |      |       |             |                                    |
| 3         |                                                                                                                 | X                                      | 98-14-4          | ▲                                     |      |       |             |                                    |
| 4         |                                                                                                                 | X                                      | 98-14-5          | ▲                                     |      |       |             |                                    |
| 5         |                                                                                                                 | X                                      | 98-14-6          | ▲                                     |      |       |             |                                    |
| 6         | - soft below 5.6m                                                                                               | X                                      | 98-14-7          | ▲                                     |      |       |             |                                    |
| 7         | End of borehole at 6.1m                                                                                         | X                                      | 98-14-8          | ▲                                     |      |       |             |                                    |
| 8         |                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |

**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m): 232.226

TOP OF CASING ELEVATION (m): 231.907

DATE DRILLED: 1998 11 12

OBSERVED WATER LEVEL: 1998 12 02

LOGGED BY: JDT

\* sample submitted for laboratory analysis

**LEGEND**

|                          |                  |                      |
|--------------------------|------------------|----------------------|
| road box                 | 50 mm # PVC pipe | silica sand backfill |
| 50 mm # slotted PVC pipe | concrete seal    | bentonite seal       |

SHEET 1 OF 1

|                                                   |  |                                                |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140                                                                                                                                                                                         |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                           |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|---------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                 |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND (FILL)</b><br>- fine to medium grained, some gravel, some silt, brown, moist                                            |                                        | 98-15-1          | ▲                                     |      |       |             |                                    |
|           |                                                                                                                                 |                                        | 98-15-7          | ▲                                     |      |       |             |                                    |
| 1         | <b>CLAY</b><br>- trace medium grained sand, trace organics, black, soft, wet                                                    |                                        | 98-15-2          | ▲                                     |      |       |             |                                    |
|           | <b>SILT</b><br>- trace to some clay, light brown, soft, medium plasticity, moist to wet                                         |                                        |                  |                                       |      |       |             |                                    |
| 2         |                                                                                                                                 |                                        | 98-15-3          | ▲                                     |      |       |             |                                    |
|           | <b>CLAY</b><br>- silt inclusions, silt lenses, brown, stiff, high plasticity, moist to wet<br>- no silt lenses, firm below 3.0m |                                        |                  |                                       |      |       |             |                                    |
| 3         |                                                                                                                                 |                                        | 98-15-4          | ▲                                     |      |       |             |                                    |
|           |                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 4         |                                                                                                                                 |                                        | 98-15-6          | ▲                                     |      |       |             |                                    |
|           |                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 5         | End of borehole at 4.9m                                                                                                         |                                        | 98-15-6          | ▲                                     |      |       |             |                                    |
| 6         |                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |

**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
232.921

TOP OF CASING ELEVATION (m):  
232.709

DATE DRILLED: 1998 11 12

OBSERVED WATER LEVEL: 1998 12 02

LOGGED BY: JDT

SHEET 1 OF 1

**LEGEND**

road box

50 mm PVC pipe

50 mm slotted PVC pipe

bentonite seal

silica sand backfill

concrete seal

|                                                |  |                                             |  |                                                                                                                                                                                                               |  |
|------------------------------------------------|--|---------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT: CP RAIL                                |  | DRILLING CONTRACTOR: MAPLE LEAF ENTERPRISES |  | PROJECT No.: W8140                                                                                                                                                                                            |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD: SOLID STEM AUGER           |  | DIAMETER: 130 mm                                                                                                                                                                                              |  |
| BOREHOLE LOG                                   |  | PLOTTED: CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                        | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                         |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, fine grained gravel, brown, moist<br><br>- wet to saturated below 0.8m                                  |                                        | 98-16-1          |                                       |      |       |             |                                    |
| 98-16-8   |                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
|           |                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 1         | <b>SILT</b><br>- clayey, light brown, soft, medium plasticity, wet                                                                                                      |                                        | *98-16-2         | ▲                                     |      |       |             |                                    |
|           |                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
|           |                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 2         | <b>CLAY</b><br>- silt inclusions, silt lenses, brown, stiff, high plasticity, dry to moist<br>- firm below 3.0m<br><br>- no silt lenses below 3.5m<br>- soft below 3.8m |                                        | 98-16-3          | ▲                                     |      |       |             |                                    |
|           |                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
|           |                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
|           |                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
|           |                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 3         |                                                                                                                                                                         |                                        | 98-16-4          | ▲                                     |      |       |             |                                    |
|           |                                                                                                                                                                         |                                        | 98-16-5          | ▲                                     |      |       |             |                                    |
| 4         |                                                                                                                                                                         |                                        | 98-16-6          | ▲                                     |      |       |             |                                    |
|           |                                                                                                                                                                         |                                        | 98-16-7          | ▲                                     |      |       |             |                                    |
| 5         | End of borehole at 5.2m                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |

\* sample submitted for laboratory analysis

GROUND SURFACE ELEVATION (m): 232.947  
 TOP OF CASING ELEVATION (m): 232.783

DATE DRILLED: 1998 11 12  
 OBSERVED WATER LEVEL: 1998 12 02  
 LOGGED BY: JDT  
 SHEET 1 OF 1

#### LEGEND

- road box
- 50 mm PVC pipe
- 50 mm slotted PVC pipe
- bentonite seal
- silica sand backfill
- concrete seal

|                                                                                                                                                                                                               |  |                                             |  |                     |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------|--|---------------------|--|
| CLIENT: CP RAIL                                                                                                                                                                                               |  | DRILLING CONTRACTOR: MAPLE LEAF ENTERPRISES |  | PROJECT No.: W8140  |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS                                                                                                                                                                |  | DRILLING METHOD: SOLID STEM AUGER           |  | DIAMETER: 130 mm    |  |
| BOREHOLE LOG                                                                                                                                                                                                  |  | PLOTTED: CAD FILE No.:                      |  | BOREHOLE No.: 98-17 |  |
| SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |                                             |  |                     |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                          | STRATIGRAPHY PLOT<br>SAMPLE TYPE | SAMPLE NUMBER | SOIL VAPOUR CONCENTRATION (ppm) |      |       | WATER LEVEL | MONITORING WELL INSTALLATION |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|---------------|---------------------------------|------|-------|-------------|------------------------------|
|           |                                                                                                                                           |                                  |               | 100                             | 1000 | 10000 |             |                              |
| 0         | <b>SAND (FILL)</b><br>- silty, some clay, some gravel, fine grained, black, moist, wood pieces<br>- wet to saturated below 0.8m           |                                  | 98-17-1       |                                 |      |       |             |                              |
| 1         | <b>CLAY</b><br>- trace organics, grey to black, firm, moist                                                                               |                                  | *98-17-2      |                                 |      |       |             |                              |
| 2         | <b>SILT</b><br>- clayey, light brown, soft, medium plasticity, moist to wet                                                               |                                  | 98-17-4       |                                 |      |       |             |                              |
| 3         | <b>CLAY</b><br>- silt inclusions, silt lenses, brown, stiff, medium plasticity, moist<br>- firm below 3.0m<br>- no silt lenses below 3.2m |                                  | 98-17-3       |                                 |      |       |             |                              |
|           |                                                                                                                                           |                                  | 98-17-5       |                                 |      |       |             |                              |
| 4         | 98-17-6                                                                                                                                   |                                  |               |                                 |      |       |             |                              |
| 5         | End of borehole at 4.9m                                                                                                                   |                                  |               |                                 |      |       |             |                              |
| 6         |                                                                                                                                           |                                  |               |                                 |      |       |             |                              |
| 7         |                                                                                                                                           |                                  |               |                                 |      |       |             |                              |
| 8         |                                                                                                                                           |                                  |               |                                 |      |       |             |                              |
| 9         |                                                                                                                                           |                                  |               |                                 |      |       |             |                              |

GROUND SURFACE ELEVATION (m): 232.986  
 TOP OF CASING ELEVATION (m): 232.777

DATE DRILLED: 1998 11 12  
 OBSERVED WATER LEVEL: 1998 12 02  
 LOGGED BY: JDT

\* sample submitted for laboratory analysis

**LEGEND**

road box

50 mm PVC pipe

50 mm slotted PVC pipe

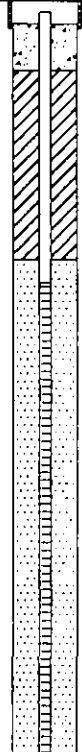
bentonite seal

silica sand backfill

concrete seal

|                                                |  |                                                                                                                                                                                                                |  |                     |  |
|------------------------------------------------|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------|--|
| CLIENT: CP RAIL                                |  | DRILLING CONTRACTOR: MAPLE LEAF ENTERPRISES                                                                                                                                                                    |  | PROJECT No.: W8140  |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD: SOLID STEM AUGER                                                                                                                                                                              |  | DIAMETER: 130 mm    |  |
| BOREHOLE LOG                                   |  | PLOTTED: CAD FILE No.:                                                                                                                                                                                         |  | BOREHOLE No.: 98-18 |  |
|                                                |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELLEY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |                     |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                  | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE                                             | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL                                                                          | MONITORING<br>WELL<br>INSTALLATION |
|-----------|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------|---------------------------------------|------|-------|--------------------------------------------------------------------------------------|------------------------------------|
|           |                                                                                                   |                                                                                    |                  | 100                                   | 1000 | 10000 |                                                                                      |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, fine grained gravel, brown, moist |  | 98-18-1          |                                       |      |       |  |                                    |
| 1         | <b>CLAY</b><br>- black to grey, soft, wet                                                         |                                                                                    | 98-18-2          |                                       |      |       |                                                                                      |                                    |
|           | <b>SILT</b><br>- clayey, light brown, soft, medium plasticity, moist to wet                       |                                                                                    | 98-18-3          |                                       |      |       |                                                                                      |                                    |
| 2         | <b>CLAY</b><br>- silt inclusions, silt lenses, brown, stiff, high plasticity, moist               |                                                                                    | 98-18-4          |                                       |      |       |                                                                                      |                                    |
| 3         | - firm, wet below 3.0m<br>- silt seam at 3.2m<br>- no silt lenses below 3.3m                      |                                                                                    | 98-18-5          |                                       |      |       |                                                                                      |                                    |
| 4         |                                                                                                   |                                                                                    | 98-18-6          |                                       |      |       |                                                                                      |                                    |
| 5         | End of borehole at 4.9m                                                                           |                                                                                    |                  |                                       |      |       |                                                                                      |                                    |
| 6         |                                                                                                   |                                                                                    |                  |                                       |      |       |                                                                                      |                                    |
| 7         |                                                                                                   |                                                                                    |                  |                                       |      |       |                                                                                      |                                    |
| 8         |                                                                                                   |                                                                                    |                  |                                       |      |       |                                                                                      |                                    |
| 9         |                                                                                                   |                                                                                    |                  |                                       |      |       |                                                                                      |                                    |



**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m): 232.957

TOP OF CASING ELEVATION (m): 232.779

DATE DRILLED: 1998 11 12

OBSERVED WATER LEVEL: 1998 12 02

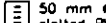
LOGGED BY: JDT

SHEET 1 OF 1

**LEGEND**

 road box

 50 mm PVC pipe

 50 mm slotted PVC pipe

 bentonite seal

 silica sand backfill

 concrete seal

|                                                   |  |                                                |  |                                                                                                                                                                                                                                     |  |
|---------------------------------------------------|--|------------------------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140                                                                                                                                                                                                               |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                                                 |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                               | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                                |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- brown, dry                                                                                                                                  | X                                      | 98-19-1          |                                       |      |       |             |                                    |
|           | <b>SAND AND SILT (FILL)</b><br>- trace clay, trace fine grained gravel, black, soft, moist                                                                                     |                                        | 98-19-12         |                                       |      |       |             |                                    |
| 1         | <b>SAND (FILL)</b><br>- some silt, black, saturated                                                                                                                            | X                                      | 98-19-8          |                                       |      |       |             |                                    |
|           | <b>CLAY</b><br>- dark brown, stiff, medium plasticity, moist                                                                                                                   | X                                      | 19-19-2          |                                       |      |       |             |                                    |
| 2         | <b>SILT</b><br>- clayey, light grey, soft, medium plasticity, saturated<br>- light brown below 1.8m                                                                            | X                                      | 98-19-3          |                                       |      |       |             |                                    |
|           | <b>CLAY</b><br>- silt inclusions, silt lenses, brown, stiff, high plasticity, moist<br>- firm, wet below 3.0m<br>- silt seams from 3.0m to 3.7m<br>- no silt lenses below 3.7m | X                                      | 98-19-4          |                                       |      |       |             |                                    |
| 3         |                                                                                                                                                                                | X                                      | 98-19-5          |                                       |      |       |             |                                    |
| 4         |                                                                                                                                                                                | X                                      | 98-19-6          |                                       |      |       |             |                                    |
| 5         | End of borehole at 5.2m                                                                                                                                                        | X                                      | 98-19-7          |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                                                |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                                |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                                |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                                |                                        |                  |                                       |      |       |             |                                    |

**MORROW ENVIRONMENTAL CONSULTANTS INC.**

GROUND SURFACE ELEVATION (m):  
232.999

TOP OF CASING ELEVATION (m):  
232.820

DATE DRILLED: 1998 11 12

OBSERVED WATER LEVEL: 1998 12 02

LOGGED BY: JDT

SHEET 1 OF 1

#### LEGEND

- road box
- 50 mm PVC pipe
- 50 mm slotted PVC pipe
- benlonite seal
- silica sand backfill
- concrete seal

\* sample submitted for laboratory analysis

|                                                |  |                                                                                                                                                                                                                                     |  |                     |  |
|------------------------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------|--|
| CLIENT: CP RAIL                                |  | DRILLING CONTRACTOR: MAPLE LEAF ENTERPRISES                                                                                                                                                                                         |  | PROJECT No.: W8140  |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD: SOLID STEM AUGER                                                                                                                                                                                                   |  | DIAMETER: 130 mm    |  |
| BOREHOLE LOG                                   |  | PLOTTED: CAD FILE No.:                                                                                                                                                                                                              |  | BOREHOLE No.: 98-20 |  |
|                                                |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |                     |  |

| DEPTH (m)               | SOIL DESCRIPTION                                                                                                                                     | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|                         |                                                                                                                                                      |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0                       | <b>SAND AND GRAVEL (FILL)</b><br>- brown, dry                                                                                                        |                                        | *98-20-1         | ▲                                     |      |       |             |                                    |
|                         | <b>CLAY</b><br>- some silt, trace organics, block, soft to firm, moist                                                                               |                                        |                  |                                       |      |       |             |                                    |
| 1                       | <b>SILT</b><br>- some clay, light grey, soft, medium plasticity, moist<br>- light brown below 0.9m                                                   |                                        | 98-20-2          | ▲                                     |      |       |             |                                    |
| 2                       | <b>CLAY</b><br>- silt inclusions, silt lenses, brown, stiff, high plasticity, fissured, moist<br>- no silt lenses, firm, no fissures, wet below 2.7m |                                        | 98-20-3          | ▲                                     |      |       |             |                                    |
|                         |                                                                                                                                                      |                                        | 98-20-4          | ▲                                     |      |       |             |                                    |
|                         |                                                                                                                                                      |                                        | 98-20-5          | ▲                                     |      |       |             |                                    |
| 4                       |                                                                                                                                                      |                                        | 98-20-6          | ▲                                     |      |       |             |                                    |
| End of borehole at 4.6m |                                                                                                                                                      |                                        |                  |                                       |      |       |             |                                    |
| 5                       |                                                                                                                                                      |                                        |                  |                                       |      |       |             |                                    |
| 6                       |                                                                                                                                                      |                                        |                  |                                       |      |       |             |                                    |
| 7                       |                                                                                                                                                      |                                        |                  |                                       |      |       |             |                                    |
| 8                       |                                                                                                                                                      |                                        |                  |                                       |      |       |             |                                    |
| 9                       |                                                                                                                                                      |                                        |                  |                                       |      |       |             |                                    |

\* sample submitted for laboratory analysis

**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m): 232.586

TOP OF CASING ELEVATION (m): 232.436

DATE DRILLED: 1998 11 12

OBSERVED WATER LEVEL: 1998 12 01

LOGGED BY: JDT

SHEET 1 OF 1

#### LEGEND

- road box
- 50 mm PVC pipe
- 50 mm slotted PVC pipe
- bentonite seal
- silica sand backfill
- concrete seal

|                                                   |  |                                                |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140                                                                                                                                                                                         |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>1" SOLID STEM AUGER        |  | DIAMETER:<br>130 mm                                                                                                                                                                                           |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                                                                               | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                                                                                |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND (FILL)</b><br>- fine grained, silty, gravelly, dark brown, moist                                                                                                                                                       |                                        | 98-21-1          | ▲                                     |      |       |             |                                    |
| 1         | <b>SAND (FILL)</b><br>- medium grained, trace coarse grained sand, trace fine grained gravel, brown, dry<br><b>CLAY AND SILT (FILL)</b><br>- trace organics, black, stiff, moist<br>- no organics, grey to black below 1.2m    |                                        | 98-21-2          | ▲                                     |      |       |             |                                    |
| 2         | <b>SILT</b><br>- some clay, light olive brown, soft, medium plasticity, wet<br><b>CLAY</b><br>- silt inclusions, silt lenses, brown, stiff, high plasticity, moist<br>- firm, wet below 3.0m<br>- silt seams from 3.0m to 3.7m | 98-21-3                                | ▲                |                                       |      |       |             |                                    |
| 3         |                                                                                                                                                                                                                                | 98-21-4                                | ▲                |                                       |      |       |             |                                    |
| 4         |                                                                                                                                                                                                                                | 98-21-5                                | ▲                |                                       |      |       |             |                                    |
| 5         | End of borehole at 4.9m                                                                                                                                                                                                        | 98-21-6                                | ▲                |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                                                                                                |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                                                                                |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                                                                                |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                                                                                |                                        |                  |                                       |      |       |             |                                    |

**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
232.727

TOP OF CASING ELEVATION (m):  
232.593

DATE DRILLED: 1998 11 13

OBSERVED WATER LEVEL: 1998 12 01

LOGGED BY: JDT

SHEET 1 OF 1

**LEGEND**

road box

50 mm # PVC pipe

50 mm # slotted PVC pipe

bentonite seal

silica sand backfill

concrete seal

|                                                |  |                                             |  |                                                                                                                                                                                                                                                |  |
|------------------------------------------------|--|---------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT: CP RAIL                                |  | DRILLING CONTRACTOR: MAPLE LEAF ENTERPRISES |  | PROJECT No.: W8140                                                                                                                                                                                                                             |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD: SOLID STEM AUGER           |  | DIAMETER: 130 mm                                                                                                                                                                                                                               |  |
| BOREHOLE LOG                                   |  | PLOTTED: CAD FILE No.:                      |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                              | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                               |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND (FILL)</b><br>- fine grained, silty, some fine grained gravel, light brown, moist<br>- dark brown below 0.2m          |                                        | *98-22-1         | ▲                                     |      |       |             |                                    |
| 1         | <b>CLAY AND SILT (FILL)</b><br>- some fine grained gravel, grey to black, medium plasticity, moist                            |                                        | 98-22-2          | ▲                                     |      |       |             |                                    |
|           | <b>CLAY</b><br>- silty, trace organics, black, medium plasticity, moist                                                       |                                        | 98-22-3          | ▲                                     |      |       |             |                                    |
| 2         | <b>SILT</b><br>- some clay, light brown, soft to firm, medium plasticity, moist<br>- wet below 1.5m                           |                                        | *98-22-4         | ▲                                     |      |       |             |                                    |
| 3         | <b>CLAY</b><br>- silt inclusions, silt lenses, brown, stiff, high plasticity, moist<br>- no silt lenses, firm, wet below 3.0m |                                        | 98-22-7          | ▲                                     |      |       |             |                                    |
| 4         |                                                                                                                               |                                        | 98-22-5          | ▲                                     |      |       |             |                                    |
|           |                                                                                                                               |                                        | 98-22-6          | ▲                                     |      |       |             |                                    |
| 5         | End of borehole at 4.9m                                                                                                       |                                        |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                               |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                               |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                               |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                               |                                        |                  |                                       |      |       |             |                                    |

\* sample submitted for laboratory analysis

GROUND SURFACE ELEVATION (m): 232.727

TOP OF CASING ELEVATION (m): 232.554

DATE DRILLED: 1998 11 13

OBSERVED WATER LEVEL: 1998 12 01

LOGGED BY: JDT

SHEET 1 OF 1

|                                                |  |                                             |  |                                                                                                                                                                                                               |  |
|------------------------------------------------|--|---------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT: CP RAIL                                |  | DRILLING CONTRACTOR: MAPLE LEAF ENTERPRISES |  | PROJECT No.: W8140                                                                                                                                                                                            |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD: SOLID STEM AUGER           |  | DIAMETER: 130 mm                                                                                                                                                                                              |  |
| BOREHOLE LOG                                   |  | PLOTTED: CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                        | STRATIGRAPHY PLOT | SAMPLE TYPE | SAMPLE NUMBER | SOIL VAPOUR CONCENTRATION (ppm) |      |       | WATER LEVEL | MONITORING WELL INSTALLATION |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------|---------------|---------------------------------|------|-------|-------------|------------------------------|
|           |                                                                                                                                                         |                   |             |               | 100                             | 1000 | 10000 |             |                              |
| 0         | <b>SAND (FILL)</b><br>- fine to medium grained, gravelly, brown, dry<br><b>CLAY AND SILT (FILL)</b><br>- sandy, brown, moist<br>- saturated below 0.9m  | X                 | X           | 98-23-1       | ▲                               |      |       |             |                              |
| 1         | <b>SILT</b><br>- clayey, light brown, firm, high plasticity, moist<br>- trace to some clay, soft, wet to saturated below 1.5m                           | X                 | X           | 98-23-2       | ▲                               |      |       |             |                              |
| 2         | <b>CLAY</b><br>- silt inclusions, silt lenses, brown, stiff, high plasticity, moist<br>- silt seams from 2.4m to 2.7m<br>- soft to firm, wet below 3.0m | X                 | X           | 98-23-3       | ▲                               |      |       |             |                              |
| 3         |                                                                                                                                                         | X                 | X           | 98-23-4       | ▲                               |      |       |             |                              |
| 4         |                                                                                                                                                         | X                 | X           | 98-23-5       | ▲                               |      |       |             |                              |
| 5         |                                                                                                                                                         | X                 | X           | 98-23-6       | ▲                               |      |       |             |                              |
| 5         | End of borehole at 4.9m                                                                                                                                 |                   |             |               |                                 |      |       |             |                              |
| 6         |                                                                                                                                                         |                   |             |               |                                 |      |       |             |                              |
| 7         |                                                                                                                                                         |                   |             |               |                                 |      |       |             |                              |
| 8         |                                                                                                                                                         |                   |             |               |                                 |      |       |             |                              |
| 9         |                                                                                                                                                         |                   |             |               |                                 |      |       |             |                              |

GROUND SURFACE ELEVATION (m): 232.705  
 TOP OF CASING ELEVATION (m): 232.503

DATE DRILLED: 1998 11 13  
 OBSERVED WATER LEVEL: 1998 12 01  
 LOGGED BY: JDT  
 SHEET 1 OF 1

#### LEGEND

- road box
- 50 mm PVC pipe
- 50 mm slotted PVC pipe
- bentonite seal
- silica sand backfill
- concrete seal

|                                                |  |                                             |  |                                                                                                                                                                                                                                                |  |
|------------------------------------------------|--|---------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT: CP RAIL                                |  | DRILLING CONTRACTOR: MAPLE LEAF ENTERPRISES |  | PROJECT No.: W8140                                                                                                                                                                                                                             |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD: SOLID STEM AUGER           |  | DIAMETER: 130 mm                                                                                                                                                                                                                               |  |
| BOREHOLE LOG                                   |  | PLOTTED: CAD FILE No.:                      |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                 | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                  |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- medium grained sand, fine grained gravel, brown, dry                          |                                        | 98-24-1          |                                       |      |       |             |                                    |
| 1         | <b>SILT (FILL)</b><br>- some clay, light brown, mottled rust brown, soft, wet                                    |                                        | 98-24-2          |                                       |      |       |             |                                    |
|           | <b>CLAY (FILL)</b><br>- trace fine grained sand, black to grey, firm, medium plasticity, moist                   |                                        |                  |                                       |      |       |             |                                    |
| 2         | <b>SILT</b><br>- trace clay, light greyish brown, soft, low plasticity, wet<br>- saturated below 2.6m            |                                        | 98-24-3          |                                       |      |       |             |                                    |
|           |                                                                                                                  |                                        | 98-24-4          |                                       |      |       |             |                                    |
| 3         | <b>CLAY</b><br>- silty, silt inclusions, brown, firm to stiff, high plasticity, wet<br>- soft to firm below 3.8m |                                        | 98-24-5          |                                       |      |       |             |                                    |
| 4         |                                                                                                                  |                                        | 98-24-6          |                                       |      |       |             |                                    |
| 5         | End of borehole at 4.9m                                                                                          |                                        |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |

\* sample submitted for laboratory analysis

GROUND SURFACE ELEVATION (m): 232.669

TOP OF CASING ELEVATION (m): 232.485

DATE DRILLED: 1998 11 13

OBSERVED WATER LEVEL: 1998 12 01

LOGGED BY: JDT

SHEET 1 OF 1

### LEGEND

- road box
- 50 mm PVC pipe
- 50 mm slotted PVC pipe
- bentonite seal
- silica sand backfill
- concrete seal

|                                                   |  |                                                |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140                                                                                                                                                                                         |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                           |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                           | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                            |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- brown, dry                                                                                                              |                                        | 98-25-1          |                                       |      |       |             |                                    |
| 1         | <b>CLAY (FILL)</b><br>- some silt, trace coarse grained sand, black to grey, firm to stiff, moist<br>- no sand below 0.8m                                  |                                        | *98-25-2         |                                       |      |       |             |                                    |
| 2         | <b>CLAY</b><br>- trace medium grained sand, brown, stiff, medium plasticity, moist                                                                         | 98-25-3                                |                  |                                       |      |       |             |                                    |
| 3         | <b>SILT</b><br>- some clay, light brown, soft, medium plasticity, wet<br>- trace clay below 2.9m                                                           | 98-25-7<br>98-25-4                     |                  |                                       |      |       |             |                                    |
| 4         | <b>CLAY</b><br>- silt inclusions, silt lenses, brown, stiff, high plasticity, moist<br>- no silt lenses, firm, wet below 3.7m<br>- soft to firm below 4.1m | 98-25-5<br>98-25-6                     |                  |                                       |      |       |             |                                    |
| 5         | End of borehole at 5.3m                                                                                                                                    |                                        |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                            |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                            |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                            |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                            |                                        |                  |                                       |      |       |             |                                    |

\* sample submitted for laboratory analysis

**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
232.916

TOP OF CASING ELEVATION (m):  
232.746

DATE DRILLED: 1998 11 13

OBSERVED WATER LEVEL: 1998 12 01

LOGGED BY: JDT

SHEET 1 OF 1

**LEGEND**

|  |                        |  |                      |
|--|------------------------|--|----------------------|
|  | road box               |  | silica sand backfill |
|  | 50 mm PVC pipe         |  | concrete seal        |
|  | 50 mm slotted PVC pipe |  | bentonite seal       |

|                                                   |  |                                                                                                                                                                                                                                     |  |                        |  |
|---------------------------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES                                                                                                                                                                                      |  | PROJECT No.:<br>W8140  |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER                                                                                                                                                                                                |  | DIAMETER:<br>130 mm    |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                                                                                                                                                                                                           |  | BOREHOLE No.:<br>98-26 |  |
|                                                   |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |                        |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                               | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- black to dark brown, dry                                                                                    |                                        | *98-26-1         | ▲                                     |      |       |             |                                    |
| 1         | <b>CLAY AND SILT (FILL)</b><br>- trace coarse grained sand, trace fine grained gravel, black to grey, dry to moist                             |                                        | 98-26-2          | ▲                                     |      |       |             |                                    |
|           | <b>ORGANIC CLAY</b><br>- silty, black, moist                                                                                                   |                                        | 98-26-3          | ▲                                     |      |       |             |                                    |
| 2         | <b>SILT</b><br>- some clay, light brown, soft, medium plasticity, wet                                                                          |                                        | 98-26-4          | ▲                                     |      |       |             |                                    |
|           | <b>CLAY</b><br>- silt inclusions, silt lenses, brown, stiff, medium plasticity, moist<br>- no silt lenses below 2.4m<br>- soft, wet below 3.0m |                                        | 98-26-7          | ▲                                     |      |       |             |                                    |
| 3         |                                                                                                                                                |                                        | 98-26-5          | ▲                                     |      |       |             |                                    |
| 4         |                                                                                                                                                | 98-26-6                                | ▲                |                                       |      |       |             |                                    |
| 5         | End of borehole at 4.7m                                                                                                                        |                                        |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                |                                        |                  |                                       |      |       |             |                                    |

\* sample submitted for laboratory analysis

**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
232.817

TOP OF CASING ELEVATION (m):  
232.636

DATE DRILLED: 1998 11 13

OBSERVED WATER LEVEL: 1998 12 01

LOGGED BY:  
JDT

SHEET 1 OF 1

#### LEGEND

- road box
- 50 mm PVC pipe
- 50 mm slotted PVC pipe
- bentonite seal
- silica sand backfill
- concrete seal

|                                                |  |                                             |  |                                                                                                                                                                                                                                                |  |
|------------------------------------------------|--|---------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT: CP RAIL                                |  | DRILLING CONTRACTOR: MAPLE LEAF ENTERPRISES |  | PROJECT No.: W8140                                                                                                                                                                                                                             |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD: SOLID STEM AUGER           |  | DIAMETER: 130 mm                                                                                                                                                                                                                               |  |
| BOREHOLE LOG                                   |  | PLOTTED: CAD FILE No.:                      |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                                                                                               | STRATIGRAPHY<br>PLOT<br>SAMPLE TYPE | SAMPLE NUMBER | SOIL VAPOUR CONCENTRATION (ppm) |      |       | WATER LEVEL | MONITORING WELL INSTALLATION |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------|---------------------------------|------|-------|-------------|------------------------------|
|           |                                                                                                                                                                                                                                                |                                     |               | 100                             | 1000 | 10000 |             |                              |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- medium grained sand, rust brown, dry to moist                                                                                                                                                               |                                     | 98-27-1       |                                 |      |       |             |                              |
| 1         | <b>ORGANIC CLAY</b><br>- silty, black, moist                                                                                                                                                                                                   |                                     | 98-27-2       |                                 |      |       |             |                              |
|           | <b>SILT</b><br>- clayey, light brown, firm, medium plasticity, moist<br>- some clay, soft, wet below 1.5m                                                                                                                                      |                                     | 98-27-3       |                                 |      |       |             |                              |
| 2         | <b>CLAY</b><br>- silt inclusions, silt lenses, trace fine grained sand, trace fine grained gravel, brown, stiff, high plasticity, moist<br>- no sand, no gravel below 2.4m<br>- soft to firm, wet below 3.0m<br>- silt seams from 3.0m to 3.7m |                                     | 98-27-4       |                                 |      |       |             |                              |
| 3         |                                                                                                                                                                                                                                                |                                     | 98-27-5       |                                 |      |       |             |                              |
| 4         |                                                                                                                                                                                                                                                |                                     | 98-27-6       |                                 |      |       |             |                              |
| 5         | End of borehole at 4.9m                                                                                                                                                                                                                        |                                     |               |                                 |      |       |             |                              |
| 6         |                                                                                                                                                                                                                                                |                                     |               |                                 |      |       |             |                              |
| 7         |                                                                                                                                                                                                                                                |                                     |               |                                 |      |       |             |                              |
| 8         |                                                                                                                                                                                                                                                |                                     |               |                                 |      |       |             |                              |
| 9         |                                                                                                                                                                                                                                                |                                     |               |                                 |      |       |             |                              |

GROUND SURFACE ELEVATION (m): 232.702

TOP OF CASING ELEVATION (m): 232.475

DATE DRILLED: 1998 11 13

OBSERVED WATER LEVEL: 1998 12 01

LOGGED BY: JDT

SHEET 1 OF 1

# LEGEND

- road box
- 50 mm PVC pipe
- 50 mm slotted PVC pipe
- bentonite seal
- silica sand backfill
- concrete seal
- slough

\* sample submitted for laboratory analysis

|                                                   |  |                                                |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140                                                                                                                                                                                         |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                           |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                   | STRATIGRAPHY PLOT | SAMPLE TYPE | SAMPLE NUMBER | SOIL VAPOUR CONCENTRATION (ppm) |      |       | WATER LEVEL | MONITORING WELL INSTALLATION |
|-----------|--------------------------------------------------------------------------------------------------------------------|-------------------|-------------|---------------|---------------------------------|------|-------|-------------|------------------------------|
|           |                                                                                                                    |                   |             |               | 100                             | 1000 | 10000 |             |                              |
| 0         | <b>SAND (FILL)</b><br>- fine to coarse grained, gravelly, some silt, brown, moist                                  |                   |             | 98-28-1       |                                 |      |       |             |                              |
| 1         | <b>ORGANIC CLAY</b><br>- silty, black, firm, medium plasticity, moist                                              |                   |             | 98-28-2       |                                 |      |       |             |                              |
|           | <b>SILT</b><br>- some clay, light brown, soft, medium plasticity, moist to wet                                     |                   |             | 98-28-3       |                                 |      |       |             |                              |
| 2         | <b>CLAY</b><br>- silt inclusions, silt seams, brown, stiff, medium plasticity, moist<br>- no silt seams below 2.6m |                   |             | 98-28-4       |                                 |      |       |             |                              |
| 3         | - firm, high plasticity, wet below 3.0m                                                                            |                   |             | 98-28-5       |                                 |      |       |             |                              |
| 4         |                                                                                                                    |                   |             | 98-28-6       |                                 |      |       |             |                              |
| 5         | End of borehole at 4.9m                                                                                            |                   |             |               |                                 |      |       |             |                              |
| 6         |                                                                                                                    |                   |             |               |                                 |      |       |             |                              |
| 7         |                                                                                                                    |                   |             |               |                                 |      |       |             |                              |
| 8         |                                                                                                                    |                   |             |               |                                 |      |       |             |                              |
| 9         |                                                                                                                    |                   |             |               |                                 |      |       |             |                              |

\* sample submitted for laboratory analysis

GROUND SURFACE ELEVATION (m):  
232.943

TOP OF CASING ELEVATION (m):  
232.748

DATE DRILLED: 1998 11 13

OBSERVED WATER LEVEL: 1998 12 01

LOGGED BY: JDT

**LEGEND**

|                        |                      |
|------------------------|----------------------|
| road box               | silica sand backfill |
| 50 mm PVC pipe         | concrete seal        |
| 50 mm slotted PVC pipe | bentonite seal       |

SHEET 1 OF 1

|                                                   |  |                                                                                                                                                                                                                                                |  |                        |  |
|---------------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES                                                                                                                                                                                                 |  | PROJECT No.:<br>WB140  |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>1 SOLID STEM AUGER                                                                                                                                                                                                         |  | DIAMETER:<br>130 mm    |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                                                                                                                                                                                                                      |  | BOREHOLE No.:<br>98-29 |  |
|                                                   |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> NO RECOVERY |  |                        |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                              | STRATIGRAPHY PLOT | SAMPLE TYPE | SAMPLE NUMBER | SOIL VAPOUR CONCENTRATION (ppm) |      |       | WATER LEVEL | MONITORING WELL INSTALLATION |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------|---------------|---------------------------------|------|-------|-------------|------------------------------|
|           |                                                                                                                                                                               |                   |             |               | 100                             | 1000 | 10000 |             |                              |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- brown, dry                                                                                                                                 |                   |             | 98-29-1       |                                 |      |       |             |                              |
|           | <b>SILT AND CLAY (FILL)</b><br>- some coarse sand, light brown and black, soft to firm, moist                                                                                 |                   |             |               |                                 |      |       |             |                              |
| 1         | <b>ORGANIC CLAY</b><br>- silty, black, soft, medium plasticity, wet                                                                                                           |                   |             | 98-29-2       |                                 |      |       |             |                              |
|           | <b>CLAY</b><br>- silt inclusions, trace fine sand, trace organics, light olive brown, stiff, medium plasticity, dry to moist                                                  |                   |             |               |                                 |      |       |             |                              |
| 2         | <b>SILT</b><br>- some clay, light brown, soft, medium plasticity, wet to saturated                                                                                            |                   |             | 98-29-3       |                                 |      |       |             |                              |
|           |                                                                                                                                                                               |                   |             |               |                                 |      |       |             |                              |
| 3         | <b>CLAY</b><br>- silt inclusions, silt seams, brown, stiff, high plasticity, moist<br>- firm, wet below 3.0m<br>- silt lenses from 3.0m to 3.7m<br>- no silt seams below 3.5m |                   |             | 98-29-4       |                                 |      |       |             |                              |
|           |                                                                                                                                                                               |                   |             |               |                                 |      |       |             |                              |
| 4         |                                                                                                                                                                               |                   |             | 98-29-5       |                                 |      |       |             |                              |
|           |                                                                                                                                                                               |                   |             |               |                                 |      |       |             |                              |
| 5         | <b>CLAY</b><br>- soft to firm below 4.4m                                                                                                                                      |                   |             | 98-29-6       |                                 |      |       |             |                              |
|           |                                                                                                                                                                               |                   |             |               |                                 |      |       |             |                              |
| 6         | End of borehole at 4.9m                                                                                                                                                       |                   |             |               |                                 |      |       |             |                              |
| 7         |                                                                                                                                                                               |                   |             |               |                                 |      |       |             |                              |
| 8         |                                                                                                                                                                               |                   |             |               |                                 |      |       |             |                              |
| 9         |                                                                                                                                                                               |                   |             |               |                                 |      |       |             |                              |

GROUND SURFACE ELEVATION (m):  
232.850

TOP OF CASING ELEVATION (m):  
233.625

DATE DRILLED: 1998 11 16

OBSERVED WATER LEVEL: 1998 12 01

LOGGED BY: JDT

SHEET 1 OF 1

|                                                |  |                                                                                                                                                                                                               |  |                     |  |
|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------|--|
| CLIENT: CP RAIL                                |  | DRILLING CONTRACTOR: MAPLE LEAF ENTERPRISES                                                                                                                                                                   |  | PROJECT No.: W8140  |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD: SOLID STEM AUGER                                                                                                                                                                             |  | DIAMETER: 130 mm    |  |
| BOREHOLE LOG                                   |  | PLOTTED: CAD FILE No.:                                                                                                                                                                                        |  | BOREHOLE No.: 98-30 |  |
|                                                |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |                     |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                      | STRATIGRAPHY<br>PLOT | SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                       |                      |                |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>CLAY AND SILT (FILL)</b><br>- some medium to coarse grained sand, some gravel, trace organics, brown, crumbly, moist<br>- black, concrete pieces, glass below 0.8m |                      |                | 98-30-1          | ▲                                     |      |       |             |                                    |
| 1         | <b>ORGANIC CLAY</b><br>- some silt, black to rust brown, soft, medium plasticity, wet                                                                                 |                      |                | 98-30-2          | ▲                                     |      |       |             |                                    |
| 2         | <b>CLAY</b><br>- silt lenses, silt inclusions, brown, stiff, medium to high plasticity, moist<br>- silt seams below 2.6m                                              |                      |                | 98-30-3          | ▲                                     |      |       |             |                                    |
| 3         | <b>SILT</b><br>- some clay, light brown, soft, medium plasticity, moist to wet<br>- clayey, wet to saturated below 3.3m                                               |                      |                | 98-30-4          | ▲                                     |      |       |             |                                    |
|           |                                                                                                                                                                       |                      |                | 98-30-5          | ▲                                     |      |       |             |                                    |
| 4         | <b>CLAY</b><br>- silt inclusions, brown, firm, high plasticity, wet                                                                                                   |                      |                | 98-30-6          | ▲                                     |      |       |             |                                    |
|           |                                                                                                                                                                       |                      |                | 98-30-7          | ▲                                     |      |       |             |                                    |
| 5         | End of borehole at 5.2m                                                                                                                                               |                      |                |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                                       |                      |                |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                       |                      |                |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                       |                      |                |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                       |                      |                |                  |                                       |      |       |             |                                    |

**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m): 233.279

TOP OF CASING ELEVATION (m): 234.066

DATE DRILLED: 1998 11 16

OBSERVED WATER LEVEL: 1998 12 01

LOGGED BY: JDT

SHEET 1 OF 1

|                                                |  |                                             |  |                                                                                                                                                                                                               |  |
|------------------------------------------------|--|---------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT: CP RAIL                                |  | DRILLING CONTRACTOR: MAPLE LEAF ENTERPRISES |  | PROJECT No.: W8140                                                                                                                                                                                            |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD: SOLID STEM AUGER           |  | DIAMETER: 130 mm                                                                                                                                                                                              |  |
| BOREHOLE LOG                                   |  | PLOTTED: CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                          | STRATIGRAPHY<br>PLOT | SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                           |                      |                |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SILT AND CLAY (FILL)</b><br>- some sand, some gravel, trace organics, brown to black, crumbly, dry to moist                            |                      |                | 98-31-1          | ▲                                     |      |       |             |                                    |
| 1         | <b>CLAY (FILL)</b><br>- silty, some medium to coarse grained sand, trace gravel, trace organics, brown, stiff, dry to moist               |                      |                | 98-31-2          | ▲                                     |      |       |             |                                    |
| 2         | <b>ORGANIC CLAY</b><br>- some silt, black, soft to firm, medium plasticity, moist                                                         |                      |                | *98-31-3         | ▲                                     |      |       |             |                                    |
| 3         | <b>CLAY</b><br>- silt-inclusions, brown, stiff, medium plasticity, moist                                                                  |                      |                | 98-31-4          | ▲                                     |      |       |             |                                    |
|           | <b>SILT</b><br>- clayey, light brown, soft, medium plasticity, moist to wet<br>- wet below 3.5m                                           |                      |                | 98-31-5          | ▲                                     |      |       |             |                                    |
| 4         | <b>CLAY</b><br>- silt inclusions, silt seams, brown, firm, high plasticity, moist<br>- no silt seams, wet below 4.3m<br>- soft below 4.6m |                      |                | 98-31-6          | ▲                                     |      |       |             |                                    |
| 5         | End of borehole at 5.2m                                                                                                                   |                      |                |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                           |                      |                |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                           |                      |                |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                           |                      |                |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                           |                      |                |                  |                                       |      |       |             |                                    |

GROUND SURFACE ELEVATION (m): 233.582

TOP OF CASING ELEVATION (m): 234.585

DATE DRILLED: 1998 11 16

OBSERVED WATER LEVEL: 1998 12 01

LOGGED BY: JDT

SHEET 1 OF 1

|                                                |  |                                                                                                                                                                                                                                                |  |                     |  |
|------------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------|--|
| CLIENT: CP RAIL                                |  | DRILLING CONTRACTOR: MAPLE LEAF ENTERPRISES                                                                                                                                                                                                    |  | PROJECT No.: W8140  |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD: SOLID STEM AUGER                                                                                                                                                                                                              |  | DIAMETER: 130 mm    |  |
| BOREHOLE LOG                                   |  | PLOTTED: CAD FILE No.:                                                                                                                                                                                                                         |  | BOREHOLE No.: 98-32 |  |
|                                                |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> NO RECOVERY |  |                     |  |

| DEPTH (m)               | SOIL DESCRIPTION                                                                                                                          | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|                         |                                                                                                                                           |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0                       | <b>SAND (FILL)</b><br>- fine grained, silty, trace coarse grained sand, dark brown, dry to moist<br>- some gravel, light brown below 0.3m |                                        | *98-32-1         | ▲                                     |      |       |             |                                    |
| 1                       | <b>CLAY</b><br>- silt inclusions, trace fine grained sand, grey to black, firm to stiff, medium to high plasticity, moist                 |                                        | 98-32-2          | ▲                                     |      |       |             |                                    |
| 2                       | <b>SILT</b><br>- trace clay, light brown, soft, low plasticity, moist                                                                     |                                        | 98-32-3          | ▲                                     |      |       |             |                                    |
|                         | <b>CLAY</b><br>- silt inclusions, silt lenses, brown, stiff, high plasticity, moist to wet<br>- firm, wet below 3.0m                      |                                        | 98-32-4          | ▲                                     |      |       |             |                                    |
| 3                       | - silt seams from 3.3m to 3.7m                                                                                                            |                                        | 98-32-5          | ▲                                     |      |       |             |                                    |
| 4                       | - no silt lenses, soft below 4.0m                                                                                                         |                                        | 98-32-6          | ▲                                     |      |       |             |                                    |
| End of borehole at 4.6m |                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |
| 5                       |                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |
| 6                       |                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |
| 7                       |                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |
| 8                       |                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |
| 9                       |                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |

\* sample submitted for laboratory analysis

GROUND SURFACE ELEVATION (m): 232.653

TOP OF CASING ELEVATION (m): 232.458

DATE DRILLED: 1998 11 16

OBSERVED WATER LEVEL: 1998 12 02

LOGGED BY: JDT

SHEET 1 OF 1

#### LEGEND

- road box
- 50 mm # PVC pipe
- 50 mm # slotted PVC pipe
- bentonite seal
- silica sand backfill
- concrete seal

|                                                                                                                                                                                                               |  |                                             |  |                     |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------|--|---------------------|--|
| CLIENT: CP RAIL                                                                                                                                                                                               |  | DRILLING CONTRACTOR: MAPLE LEAF ENTERPRISES |  | PROJECT No.: W8140  |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS                                                                                                                                                                |  | DRILLING METHOD: SOLID STEM AUGER           |  | DIAMETER: 130 mm    |  |
| BOREHOLE LOG                                                                                                                                                                                                  |  | PLOTTED: CAD FILE No.:                      |  | BOREHOLE No.: 98-33 |  |
| SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |                                             |  |                     |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                        | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                         |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND (FILL)</b><br>- brown, dry<br>- fine grained, silty, some fine gravel, trace clay, black, moist, glass pieces below 0.1m                                        |                                        | 98-33-1          | ▲                                     |      |       |             |                                    |
| 1         | <b>SAND AND GRAVEL (FILL)</b><br>- medium grained sand, brown, dry                                                                                                      |                                        | 98-33-2          | ▲                                     |      |       |             |                                    |
| 2         | <b>SILT</b><br>- some clay, light brown, firm, medium plasticity, dry to moist                                                                                          |                                        | 98-33-3          | ▲                                     |      |       |             |                                    |
|           | <b>CLAY</b><br>- silt lenses, brown, firm to stiff, medium plasticity, moist                                                                                            |                                        | 98-33-4          | ▲                                     |      |       |             |                                    |
|           | <b>SILT</b><br>- clayey, light greyish brown, soft, medium plasticity, moist                                                                                            |                                        | 98-33-5          | ▲                                     |      |       |             |                                    |
|           | <b>CLAY</b><br>- silty, silt lenses, silt seams, brown, firm, high plasticity, moist<br>- silt inclusions, no silt seams, no silt lenses below 3.0m<br>- wet below 3.7m |                                        | 98-33-6          | ▲                                     |      |       |             |                                    |
| 5         | End of borehole at 4.9m                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |

\* sample submitted for laboratory analysis

**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m): 232.647

TOP OF CASING ELEVATION (m): 232.432

DATE DRILLED: 1998 11 17

OBSERVED WATER LEVEL: 1998 12 01

LOGGED BY: JDT

SHEET 1 OF 1

#### LEGEND

- road box
- 50 mm PVC pipe
- 50 mm slotted PVC pipe
- bentonite seal
- silica sand backfill
- concrete seal

|                                                   |  |                                                |  |                                                                                                                                                                                                                                                |  |
|---------------------------------------------------|--|------------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140                                                                                                                                                                                                                          |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                                                            |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> NO RECOVERY |  |

| DEPTH (m)               | SOIL DESCRIPTION                                                                                                                                | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|                         |                                                                                                                                                 |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0                       | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, trace coarse grained sand, dry, moist                                           |                                        | 98-34-1          | ▲                                     |      |       |             |                                    |
| 1                       | <b>CLAY (FILL)</b><br>- some coarse grained sand, trace fine grained gravel, black, firm, moist                                                 |                                        | 98-34-2          | ▲                                     |      |       |             |                                    |
|                         | <b>SILT</b><br>- trace clay, light brown, soft, low plasticity, moist<br>- grey below 1.5m                                                      |                                        | *98-34-3         |                                       | ▲    |       |             |                                    |
| 2                       | <b>CLAY</b><br>- silt lenses, brown, stiff, high plasticity, fissured, moist<br>- silt inclusions, no silt lenses, firm, no fissures below 2.7m |                                        | 98-34-4          |                                       | ▲    |       |             |                                    |
|                         |                                                                                                                                                 |                                        | 98-34-7          | ▲                                     |      |       |             |                                    |
| 3                       | - soft to firm, wet below 3.3m                                                                                                                  |                                        | 98-34-5          | ▲                                     |      |       |             |                                    |
| 4                       |                                                                                                                                                 |                                        | 98-34-6          | ▲                                     |      |       |             |                                    |
| End of borehole at 4.6m |                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 5                       |                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 6                       |                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 7                       |                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 8                       |                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 9                       |                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |

\* sample submitted for laboratory analysis

**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
232.709

TOP OF CASING ELEVATION (m):  
232.481

DATE DRILLED: 1998 11 17

OBSERVED WATER LEVEL: 1998 12 01

LOGGED BY:  
JDT

SHEET 1 OF 1

#### LEGEND

- road box
- 50 mm PVC pipe
- 50 mm slotted PVC pipe
- bentonite seal
- silica sand backfill
- concrete seal

|                                                |  |                                                                                                                                                                                                               |                  |                     |
|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|
| CLIENT: CP RAIL                                |  | DRILLING CONTRACTOR: MAPLE LEAF ENTERPRISES                                                                                                                                                                   |                  | PROJECT No.: W8140  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD: SOLID STEM AUGER                                                                                                                                                                             | DIAMETER: 130 mm | BOREHOLE No.: 98-35 |
| BOREHOLE LOG                                   |  | PLOTTED: CAD FILE No.:                                                                                                                                                                                        |                  |                     |
|                                                |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |                  |                     |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                       | STRATIGRAPHY PLOT | SAMPLE TYPE | SAMPLE NUMBER | SOIL VAPOUR CONCENTRATION (ppm) |      |       | WATER LEVEL | MONITORING WELL INSTALLATION |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------|---------------|---------------------------------|------|-------|-------------|------------------------------|
|           |                                                                                                                                        |                   |             |               | 100                             | 1000 | 10000 |             |                              |
| 0         | CONCRETE                                                                                                                               |                   |             |               |                                 |      |       |             |                              |
|           | CRUSHED LIMESTONE (FILL)                                                                                                               |                   |             |               |                                 |      |       |             |                              |
|           | SAND (FILL)<br>- some gravel, brown, dry                                                                                               |                   |             |               |                                 |      |       |             |                              |
| 1         | CONCRETE RUBBLE (FILL)<br>- dry                                                                                                        |                   |             |               |                                 |      |       |             |                              |
|           | SAND (FILL)<br>- medium to coarse grained, trace fine grained gravel, trace silt, brown, dry<br>- saturated below 2.1m                 |                   |             |               |                                 |      |       |             |                              |
| 2         |                                                                                                                                        |                   |             |               |                                 |      |       |             |                              |
| 3         | CLAY<br>- silt lenses, brown, firm to stiff, high plasticity, wet<br>- silt inclusions, no silt lenses below 3.0m<br>- soft below 3.7m |                   |             |               |                                 |      |       |             |                              |
| 4         |                                                                                                                                        |                   |             |               |                                 |      |       |             |                              |
| 5         | End of borehole at 5.2m                                                                                                                |                   |             |               |                                 |      |       |             |                              |
| 6         |                                                                                                                                        |                   |             |               |                                 |      |       |             |                              |
| 7         |                                                                                                                                        |                   |             |               |                                 |      |       |             |                              |
| 8         |                                                                                                                                        |                   |             |               |                                 |      |       |             |                              |
| 9         |                                                                                                                                        |                   |             |               |                                 |      |       |             |                              |

\* sample submitted for laboratory analysis

**LEGEND**

road box

50 mm Ø PVC pipe

50 mm Ø slotted PVC pipe

bentonite seal

silica sand backfill

concrete seal

\* sample submitted for laboratory analysis

#### LEGEND

- road box
- 50 mm PVC pipe
- 50 mm slotted PVC pipe
- bentonite seal
- silica sand backfill
- concrete seal



**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
232.713  
TOP OF CASING ELEVATION (m):  
232.596

DATE DRILLED: 1998 11 17  
OBSERVED WATER LEVEL: 1998 12 01  
LOGGED BY: JDT  
SHEET 1 OF 1

|                                                   |  |                                                |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                           |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                                                                        | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER     | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|----------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                                                                         |                                        |                      | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND (FILL)</b><br>- fine to medium grained, some silt, trace fine grained gravel, brown, moist<br>- black below 0.2m                                                                                                |                                        | 99-36-1              |                                       |      |       |             |                                    |
| 1         | <b>SILT AND SAND (FILL)</b><br>- medium grained sand, grey, firm, wet<br><b>CLAY</b><br>- trace fine grained sand, trace fine grained gravel, trace organics, trace silt, black, medium plasticity, moist               |                                        | 99-36-2              |                                       |      |       |             |                                    |
| 2         | <b>SILT</b><br>- trace clay, brown, low plasticity, wet<br>- grey staining below 1.8m<br><b>CLAY</b><br>- silt in fractures, greyish brown, stiff, medium plasticity<br>- brown, firm to stiff, no fractures below 2.6m |                                        | *99-36-3<br>*99-36-8 |                                       |      |       |             |                                    |
| 3         | - light brown silt seam at 3.4m<br>- firm, high plasticity below 3.7m                                                                                                                                                   |                                        | 99-36-4<br>99-36-5   |                                       |      |       |             |                                    |
| 4         |                                                                                                                                                                                                                         |                                        | 99-36-6<br>99-36-7   |                                       |      |       |             |                                    |
| 5         | End of borehole at 4.6m                                                                                                                                                                                                 |                                        |                      |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                                                                                         |                                        |                      |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                                                                         |                                        |                      |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                                                                         |                                        |                      |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                                                                         |                                        |                      |                                       |      |       |             |                                    |

**MORROW ENVIRONMENTAL CONSULTANTS INC.**

GROUND SURFACE ELEVATION (m):  
232.792

TOP OF CASING ELEVATION (m):  
232.641

DATE DRILLED: 1999 07 13

OBSERVED WATER LEVEL: 1999 08 31

LOGGED BY: JDT

SHEET 1 OF 1

\* sample submitted for laboratory analysis

**LEGEND**

road box

50 mm PVC pipe

50 mm slotted PVC pipe

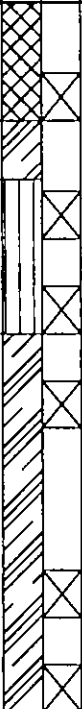
bentonite seal

silica sand backfill

concrete seal

|                                                   |  |                                                |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W81408                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                           |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m)               | SOIL DESCRIPTION                                                                                                                                                 | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE                                             | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL                                                                          | MONITORING<br>WELL<br>INSTALLATION |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------|---------------------------------------|------|-------|--------------------------------------------------------------------------------------|------------------------------------|
|                         |                                                                                                                                                                  |                                                                                    |                  | 100                                   | 1000 | 10000 |                                                                                      |                                    |
| 0                       | <b>SAND (FILL)</b><br>- fine to medium grained, some gravel, trace coarse grained sand, trace to some silt, dark brown to black, wet<br>- light brown below 0.2m |  | 99-37-1          | ▲                                     |      |       |  |                                    |
| 1                       | <b>CLAY</b><br>- organics, trace fine grained sand, greyish brown, stiff, moist                                                                                  |                                                                                    | 99-37-2          | ▲                                     |      |       |                                                                                      |                                    |
|                         | <b>SILT</b><br>- trace clay, light brown, low plasticity, moist                                                                                                  |                                                                                    | *99-37-3         |                                       | ▲    |       |                                                                                      |                                    |
| 2                       | <b>CLAY</b><br>- silt inclusions, silt partings in fractures, brown, stiff, moist<br>- less silt, no fractures below 2.4m                                        |                                                                                    | 99-37-4          | ▲                                     |      |       |                                                                                      |                                    |
| 3                       | - firm to stiff, high plasticity below 3.7m                                                                                                                      |                                                                                    | 99-37-5          | ▲                                     |      |       |                                                                                      |                                    |
| 4                       |                                                                                                                                                                  |                                                                                    | 99-37-6          | ▲                                     |      |       |                                                                                      |                                    |
| End of borehole at 4.6m |                                                                                                                                                                  |                                                                                    |                  |                                       |      |       |                                                                                      |                                    |
| 5                       |                                                                                                                                                                  |                                                                                    |                  |                                       |      |       |                                                                                      |                                    |
| 6                       |                                                                                                                                                                  |                                                                                    |                  |                                       |      |       |                                                                                      |                                    |
| 7                       |                                                                                                                                                                  |                                                                                    |                  |                                       |      |       |                                                                                      |                                    |
| 8                       |                                                                                                                                                                  |                                                                                    |                  |                                       |      |       |                                                                                      |                                    |
| 9                       |                                                                                                                                                                  |                                                                                    |                  |                                       |      |       |                                                                                      |                                    |

\* sample submitted for laboratory analysis



**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE DRILLED: 1999 07 13

OBSERVED WATER LEVEL: N/A

LOGGED BY:  
JDT

SHEET 1 OF 1

**LEGEND**

 cuttings

 bentonite seal

 slough

|                                                   |  |                                                |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>WB140B                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                           |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m)               | SOIL DESCRIPTION                                                                                                                                                                                | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|                         |                                                                                                                                                                                                 |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0                       | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained, some silt, trace coarse grained sand, black, wet<br>- brown, saturated below 0.3m                                                    |                                        | 99-38-1          | ▲                                     |      |       |             |                                    |
| 1                       | <b>CLAY</b><br>- trace organics, trace fine grained sand, greyish brown, stiff, medium plasticity                                                                                               |                                        | 99-38-2          | ▲                                     |      |       |             |                                    |
|                         | <b>SILT</b><br>- trace clay, light brown, firm, low plasticity, moist<br>- greyish brown below 1.2m<br>- black staining below 1.5m                                                              |                                        | 99-38-3          | ▲                                     |      |       |             |                                    |
| 2                       | <b>CLAY</b><br>- silt partings, greyish brown, stiff, medium plasticity, fractured, moist<br>- silt inclusions, brown, less fractures below 2.3m<br>- firm to stiff, high plasticity below 2.7m |                                        | 99-38-4          | ▲                                     |      |       |             |                                    |
|                         |                                                                                                                                                                                                 |                                        | 99-38-5          | ▲                                     |      |       |             |                                    |
| 3                       |                                                                                                                                                                                                 |                                        | 99-38-6          | ▲                                     |      |       |             |                                    |
| 4                       |                                                                                                                                                                                                 |                                        | 99-38-7          | ▲                                     |      |       |             |                                    |
| End of borehole at 4.6m |                                                                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 5                       |                                                                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 6                       |                                                                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 7                       |                                                                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 8                       |                                                                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 9                       |                                                                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |

**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE DRILLED: 1999 07 13

OBSERVED WATER LEVEL: N/A

LOGGED BY: JDT

**LEGEND**

cuttings

bentonite seal

slough

\* sample submitted for laboratory analysis

SHEET 1 OF 1

|                                                   |  |                                                |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                           |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m)               | SOIL DESCRIPTION                                                                                                                                           | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|                         |                                                                                                                                                            |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0                       | <b>SAND (FILL)</b><br>- fine to medium grained, some gravel, trace silt, dark brown to black, moist<br>- silty, gravelly, light grey, saturated below 0.8m | X                                      | 99-39-1          |                                       | ▲    |       |             |                                    |
| 1                       | <b>CLAY</b><br>- trace fine grained sand, trace organics, trace silt, greyish brown, mottled black, stiff, medium plasticity, moist                        | X                                      | 99-39-2          |                                       | ▲    |       |             |                                    |
| 2                       | <b>SILT</b><br>- trace clay, greyish light brown, soft, moist<br>- wet below 2.3m                                                                          | X                                      | *99-39-3         |                                       | ▲    |       |             |                                    |
|                         |                                                                                                                                                            | X                                      | 99-39-4          |                                       | ▲    |       |             |                                    |
| 3                       | <b>CLAY</b><br>- some silt, silt inclusions, very stiff, medium plasticity, dry to moist<br>- stiff, moist below 3.0m                                      | X                                      | 99-39-5          |                                       | ▲    |       |             |                                    |
| 4                       | - firm to stiff, high plasticity below 4.0m                                                                                                                | X                                      | 99-39-6          |                                       | ▲    |       |             |                                    |
| End of borehole at 4.6m |                                                                                                                                                            |                                        |                  |                                       |      |       |             |                                    |
| 5                       |                                                                                                                                                            |                                        |                  |                                       |      |       |             |                                    |
| 6                       |                                                                                                                                                            |                                        |                  |                                       |      |       |             |                                    |
| 7                       |                                                                                                                                                            |                                        |                  |                                       |      |       |             |                                    |
| 8                       |                                                                                                                                                            |                                        |                  |                                       |      |       |             |                                    |
| 9                       |                                                                                                                                                            |                                        |                  |                                       |      |       |             |                                    |

GROUND SURFACE ELEVATION (m):  
N/A  
 TOP OF CASING ELEVATION (m):  
N/A

DATE DRILLED: 1999 07 13  
 OBSERVED WATER LEVEL: N/A  
 LOGGED BY:  
JDT

SHEET 1 OF 1

|                                                   |  |                                                |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                           |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                       | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                        |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND (FILL)</b><br>- fine to medium grained, some gravel, trace coarse grained sand, brown, dry to moist<br>- black below 0.3m                      |                                        | 99-40-1          | ▲                                     |      |       |             |                                    |
| 1         | <b>SAND AND GRAVEL (FILL)</b><br>- medium and coarse grained sand, light grey, saturated<br>- cobbles at 0.9m                                          |                                        | 99-40-2          | ▲                                     |      |       |             |                                    |
| 2         | <b>CLAY</b><br>- trace fine grained sand, trace organics, greyish brown, mottled black, medium plasticity, moist                                       |                                        | *99-40-3         |                                       |      | ▲     |             |                                    |
|           | <b>SILT</b><br>- trace clay, light brown, soft, low plasticity, wet                                                                                    |                                        | 99-40-7          |                                       |      |       |             |                                    |
| 3         | <b>CLAY</b><br>- silt inclusions, greyish brown, stiff, medium plasticity, fractured, dry<br>- high plasticity, moist below 3.0m<br>- brown below 3.4m |                                        | 99-40-4          | ▲                                     |      |       |             |                                    |
| 4         | - silt layer at 3.8m<br>- firm below 3.8m                                                                                                              |                                        | 99-40-5          | ▲                                     |      |       |             |                                    |
|           | End of borehole at 4.6m                                                                                                                                |                                        | 99-40-6          | ▲                                     |      |       |             |                                    |
| 5         |                                                                                                                                                        |                                        |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                        |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                        |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                        |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                        |                                        |                  |                                       |      |       |             |                                    |

**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE DRILLED: 1999 07 13

OBSERVED WATER LEVEL: N/A

LOGGED BY:  
JDT

**LEGEND**

cuttings

bentonite seal

SHEET 1 OF 1

|                                                   |  |                                                |  |                                                                                                                                                                                                                                                |  |
|---------------------------------------------------|--|------------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                                                         |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                                                            |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> NO RECOVERY |  |

| DEPTH (m)               | SOIL DESCRIPTION                                                                                                                                                                 | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|                         |                                                                                                                                                                                  |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0                       | <b>SAND (FILL)</b><br>- fine to medium grained, silty, some fine grained gravel, trace coarse grained sand, black, dry to moist<br>- trace silt, brown below 0.6m                |                                        | 99-41-1 ▲        |                                       |      |       |             |                                    |
| 1                       |                                                                                                                                                                                  |                                        | 99-41-2 ▲        |                                       |      |       |             |                                    |
| 2                       | <b>CLAY</b><br>- trace fine grained sand, trace organics, dark brown, mottled black, stiff, medium plasticity, moist                                                             |                                        |                  |                                       |      |       |             |                                    |
|                         | <b>SILT</b><br>- some clay, light brown, soft, medium plasticity, moist to wet                                                                                                   |                                        | 99-41-3 ▲        |                                       |      |       |             |                                    |
|                         | <b>CLAY</b><br>- some silt, silt inclusions, brown, stiff, high plasticity, dry to moist<br>- silt partings from 2.4m to 3.0m<br>- silt seam at 3.2m<br>- firm, moist below 3.7m |                                        | 99-41-4 ▲        |                                       |      |       |             |                                    |
| 3                       |                                                                                                                                                                                  |                                        | 99-41-5 ▲        |                                       |      |       |             |                                    |
| 4                       |                                                                                                                                                                                  | 99-41-6 ▲                              |                  |                                       |      |       |             |                                    |
| End of borehole at 4.6m |                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |
| 5                       |                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |
| 6                       |                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |
| 7                       |                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |
| 8                       |                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |
| 9                       |                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |

GROUND SURFACE ELEVATION (m):  
232.855

TOP OF CASING ELEVATION (m):  
232.655

DATE DRILLED: 1999 07 13

OBSERVED WATER LEVEL: 1999 08 31

LOGGED BY: JDT

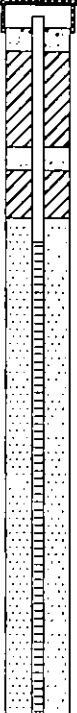
SHEET 1 OF 1

#### LEGEND

- road box
- 50 mm PVC pipe
- 50 mm slotted PVC pipe
- bentonite seal
- cuttings
- silica sand backfill
- concrete seal

|                                                   |  |                                                |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W81408                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                           |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                             | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE                                            | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL                                                                          | MONITORING<br>WELL<br>INSTALLATION |
|-----------|------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------|---------------------------------------|------|-------|--------------------------------------------------------------------------------------|------------------------------------|
|           |                                                                                                                              |                                                                                   |                  | 100                                   | 1000 | 10000 |                                                                                      |                                    |
| 0         | <b>SAND (FILL)</b><br>- fine to medium grained, trace coarse grained sand, brown, moist                                      |  | 99-42-1          |                                       |      |       |  |                                    |
|           | <b>CRUSHED LIMESTONE (FILL)</b><br>- cobbly, sandy (medium grained), moist                                                   |                                                                                   | 99-42-2          |                                       |      |       |                                                                                      |                                    |
| 1         |                                                                                                                              |                                                                                   | 99-42-3          |                                       |      |       |                                                                                      |                                    |
| 2         | - saturated at 2.1m                                                                                                          |                                                                                   | 99-42-4          |                                       |      |       |                                                                                      |                                    |
|           | <b>CLAY</b><br>- silt partings, black stained silt inclusions, brown, stiff to very stiff, high plasticity, fractured, moist |                                                                                   | 99-42-5          |                                       |      |       |                                                                                      |                                    |
| 3         | - stiff, no black staining below 2.4m                                                                                        |                                                                                   | 99-42-6          |                                       |      |       |                                                                                      |                                    |
| 4         | - firm, wet below 3.7m                                                                                                       |                                                                                   | 99-42-7          |                                       |      |       |                                                                                      |                                    |
| 4.6       | End of borehole at 4.6m                                                                                                      |                                                                                   |                  |                                       |      |       |                                                                                      |                                    |
| 5         |                                                                                                                              |                                                                                   |                  |                                       |      |       |                                                                                      |                                    |
| 6         |                                                                                                                              |                                                                                   |                  |                                       |      |       |                                                                                      |                                    |
| 7         |                                                                                                                              |                                                                                   |                  |                                       |      |       |                                                                                      |                                    |
| 8         |                                                                                                                              |                                                                                   |                  |                                       |      |       |                                                                                      |                                    |
| 9         |                                                                                                                              |                                                                                   |                  |                                       |      |       |                                                                                      |                                    |



**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
232.449

TOP OF CASING ELEVATION (m):  
232.287

DATE DRILLED: 1999 07 13

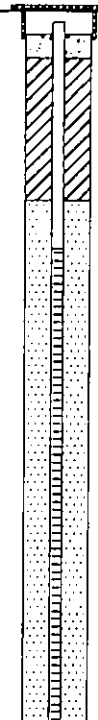
OBSERVED WATER LEVEL: 1999 08 31

LOGGED BY:  
JDT

SHEET 1 OF 1

|                                                   |  |                                                |  |                                                                                                                                                                                                                                     |  |
|---------------------------------------------------|--|------------------------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W81408                                                                                                                                                                                                              |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                                                 |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m)               | SOIL DESCRIPTION                                                                                                                                                  | STRATIGRAPHY<br>PLOT | SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION                                                   |  |  |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------|------------------|---------------------------------------|------|-------|-------------|--------------------------------------------------------------------------------------|--|--|
|                         |                                                                                                                                                                   |                      |                |                  | 100                                   | 1000 | 10000 |             |                                                                                      |  |  |
| 0                       | <b>SAND AND GRAVEL (FILL)</b><br>- medium grained sand, fine to coarse grained gravel, some fine grained sand, some silt, greyish brown, saturated                | X                    | X              | 99-43-1          |                                       | ▲    |       | ▼           |  |  |  |
| 1                       | <b>SAND (FILL)</b><br>- fine to medium grained, some gravel, trace coarse grained sand, trace silt, brown, moist to wet                                           |                      |                | *99-43-2         |                                       | ▲    |       |             |                                                                                      |  |  |
|                         | <b>SILT</b><br>- some clay, light brown, firm, medium plasticity, moist                                                                                           |                      |                | *99-43-3         | ▲                                     |      |       |             |                                                                                      |  |  |
| 2                       | <b>CLAY</b><br>- silt inclusions, silt partings, brown, stiff, fractured, moist, silt seams<br>- no silt partings, firm to stiff, no visible fractures below 2.6m | X                    | X              | 99-43-4          |                                       |      |       |             |                                                                                      |  |  |
|                         |                                                                                                                                                                   |                      |                | 99-43-5          | ▲                                     |      |       |             |                                                                                      |  |  |
| 3                       | - no silt seams below 3.2m                                                                                                                                        |                      |                | 99-43-7          | ▲                                     |      |       |             |                                                                                      |  |  |
| 4                       | - firm below 3.7m                                                                                                                                                 |                      |                | 99-43-6          | ▲                                     |      |       |             |                                                                                      |  |  |
| End of borehole at 4.6m |                                                                                                                                                                   |                      |                |                  |                                       |      |       |             |                                                                                      |  |  |
| 5                       |                                                                                                                                                                   |                      |                |                  |                                       |      |       |             |                                                                                      |  |  |
| 6                       |                                                                                                                                                                   |                      |                |                  |                                       |      |       |             |                                                                                      |  |  |
| 7                       |                                                                                                                                                                   |                      |                |                  |                                       |      |       |             |                                                                                      |  |  |
| 8                       |                                                                                                                                                                   |                      |                |                  |                                       |      |       |             |                                                                                      |  |  |
| 9                       |                                                                                                                                                                   |                      |                |                  |                                       |      |       |             |                                                                                      |  |  |

\* sample submitted for laboratory analysis

**LEGEND**

road box

50 mm PVC pipe

50 mm slotted PVC pipe

bentonite seal

silica sand backfill

concrete seal

|                                                                                     |                                          |                                  |
|-------------------------------------------------------------------------------------|------------------------------------------|----------------------------------|
|  | GROUND SURFACE ELEVATION (m):<br>232.666 | DATE DRILLED: 1999 07 14         |
|                                                                                     | TOP OF CASING ELEVATION (m):<br>232.544  | OBSERVED WATER LEVEL: 1999 08 31 |
|                                                                                     |                                          | LOGGED BY: JDT                   |
|                                                                                     |                                          | SHEET 1 OF 1                     |

|                                                   |  |                                                |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                           |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                                                              | STRATIGRAPHY<br>PLOT | SAMPLE<br>TYPE | SAMPLE<br>NUMBER  | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |         | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |  |  |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------|-------------------|---------------------------------------|------|---------|-------------|------------------------------------|--|--|
|           |                                                                                                                                                                                                               |                      |                |                   | 100                                   | 1000 | 10000   |             |                                    |  |  |
| 0         | <b>SAND (FILL)</b><br>- fine to medium grained, gravelly, trace coarse grained sand, trace silt, brown, moist<br>- saturated below 0.4m<br>- some gravel, moist to wet below 0.8m<br>- clay pieces below 1.5m |                      |                | 99-44-1           |                                       |      |         |             |                                    |  |  |
| 99-44-2   |                                                                                                                                                                                                               |                      |                |                   |                                       |      |         |             |                                    |  |  |
| 99-44-3   |                                                                                                                                                                                                               |                      |                |                   |                                       |      |         |             |                                    |  |  |
| 2         | <b>CLAY</b><br>- trace fine grained sand, trace silt, silt inclusions, silt partings, brown, stiff, medium plasticity, fractured<br>- firm to stiff below 2.7m                                                |                      |                | *99-44-4          |                                       |      |         |             |                                    |  |  |
| 99-44-5   |                                                                                                                                                                                                               |                      |                |                   |                                       |      |         |             |                                    |  |  |
| 3         |                                                                                                                                                                                                               |                      |                | - firm below 3.4m |                                       |      | 99-44-6 |             |                                    |  |  |
| 99-44-7   |                                                                                                                                                                                                               |                      |                |                   |                                       |      |         |             |                                    |  |  |
| 4         | End of borehole at 4.6m                                                                                                                                                                                       |                      |                |                   |                                       |      |         |             |                                    |  |  |
| 5         |                                                                                                                                                                                                               |                      |                |                   |                                       |      |         |             |                                    |  |  |
| 6         |                                                                                                                                                                                                               |                      |                |                   |                                       |      |         |             |                                    |  |  |
| 7         |                                                                                                                                                                                                               |                      |                |                   |                                       |      |         |             |                                    |  |  |
| 8         |                                                                                                                                                                                                               |                      |                |                   |                                       |      |         |             |                                    |  |  |
| 9         |                                                                                                                                                                                                               |                      |                |                   |                                       |      |         |             |                                    |  |  |

|                                          |                                  |
|------------------------------------------|----------------------------------|
| GROUND SURFACE ELEVATION (m):<br>232.747 | DATE DRILLED: 1999 07 14         |
| TOP OF CASING ELEVATION (m):<br>232.618  | OBSERVED WATER LEVEL: 1999 08 31 |
|                                          | LOGGED BY: JDT                   |

SHEET 1 OF 1

# LEGEND

- road box
- 50 mm # PVC pipe
- 50 mm # slotted PVC pipe
- bentonite seal
- silica sand backfill
- concrete seal

\* sample submitted for laboratory analysis

|                                                   |  |                                                |  |                                                                                                                                                                                                                                                |  |
|---------------------------------------------------|--|------------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>WB140B                                                                                                                                                                                                                         |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                                                            |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> NO RECOVERY |  |

| DEPTH (m)               | SOIL DESCRIPTION                                                                                                                                                                                  | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|                         |                                                                                                                                                                                                   |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0                       | <b>CRUSHED ROCK (FILL)</b> - grey                                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
|                         | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, some silt,<br>brown to black, wet                                                                                                 |                                        | 99-45-1          |                                       |      |       |             |                                    |
| 1                       | <b>CLAY (FILL)</b><br>- trace sand, trace gravel, black to dark<br>brown, wet                                                                                                                     |                                        | 99-45-2          |                                       |      |       |             |                                    |
|                         | <b>CLAY</b><br>- trace fine grained sand, greyish brown, medium<br>plasticity, moist                                                                                                              |                                        | 99-45-3          |                                       |      |       |             |                                    |
| 2                       | <b>SILT</b><br>- trace clay, light brown, soft, low to medium<br>plasticity, moist<br>- some clay, moist to wet below 1.5m                                                                        |                                        | 99-45-4          |                                       |      |       |             |                                    |
|                         | <b>CLAY</b><br>- silt seams, silt inclusions, brown, stiff, high<br>plasticity, fractured, moist<br>- firm below 2.6m<br>- silt layer at 3.1m<br>- no silt seams, no visible fractures below 3.2m |                                        | 99-45-5          |                                       |      |       |             |                                    |
| 3                       |                                                                                                                                                                                                   |                                        | 99-45-6          |                                       |      |       |             |                                    |
| 4                       |                                                                                                                                                                                                   |                                        | 99-45-7          |                                       |      |       |             |                                    |
| End of borehole at 4.6m |                                                                                                                                                                                                   |                                        |                  |                                       |      |       |             |                                    |
| 5                       |                                                                                                                                                                                                   |                                        |                  |                                       |      |       |             |                                    |
| 6                       |                                                                                                                                                                                                   |                                        |                  |                                       |      |       |             |                                    |
| 7                       |                                                                                                                                                                                                   |                                        |                  |                                       |      |       |             |                                    |
| 8                       |                                                                                                                                                                                                   |                                        |                  |                                       |      |       |             |                                    |
| 9                       |                                                                                                                                                                                                   |                                        |                  |                                       |      |       |             |                                    |

\* sample submitted for laboratory analysis

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE DRILLED: 1999 07 14

OBSERVED WATER LEVEL: N/A

LOGGED BY:  
JDT

SHEET 1 OF 1

|                                                |  |                                             |  |                                                                                                                                                                                                                                     |  |
|------------------------------------------------|--|---------------------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT: CP RAIL                                |  | DRILLING CONTRACTOR: MAPLE LEAF ENTERPRISES |  | PROJECT No.: W8140B                                                                                                                                                                                                                 |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD: SOLID STEM AUGER           |  | DIAMETER: 130 mm                                                                                                                                                                                                                    |  |
| BOREHOLE LOG                                   |  | PLOTTED: CAD FILE No.:                      |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                      | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                       |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND (FILL)</b><br>- medium grained, gravelly (fine grained), trace silt, brown, moist to wet                                      | X                                      | 99-46-1          | ▲                                     |      |       |             | X                                  |
|           | <b>SAND AND CLAY (FILL)</b><br>- medium grained sand, some gravel, black, low plasticity, saturated                                   |                                        | 99-46-2          | ▲                                     |      |       |             |                                    |
| 1         | <b>SILT</b><br>- some clay, light brown, soft, medium plasticity, wet                                                                 | X                                      | 99-46-3          | ▲                                     |      |       |             |                                    |
| 2         | <b>CLAY</b><br>- silt inclusions, silt partings, brown, stiff, high plasticity, moist<br><br>- silt seam at 3.5m<br>- firm below 3.7m | X                                      | 99-46-4          | ▲                                     |      |       |             |                                    |
| 3         |                                                                                                                                       | X                                      | 99-46-5          | ▲                                     |      |       |             |                                    |
| 4         |                                                                                                                                       | X                                      | 99-46-6          | ▲                                     |      |       |             |                                    |
| 5         |                                                                                                                                       | End of borehole at 4.6m                |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                       |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                       |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                       |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                       |                                        |                  |                                       |      |       |             |                                    |

• sample submitted for laboratory analysis

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE DRILLED: 1999 07 14

OBSERVED WATER LEVEL: N/A

LOGGED BY: JDT

**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

**LEGEND**

cuttings

slough

bentonite seal

SHEET 1 OF 1

|                                                   |  |                                                |  |                                                                                                                                                                                                                                     |  |
|---------------------------------------------------|--|------------------------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                                              |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                                                 |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                          | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                           |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- light brown, dry                                                                                                       | X                                      | 99-47-1          | ▲                                     |      |       |             | X                                  |
|           | <b>SAND (FILL)</b><br>- fine to medium grained, some gravel, some silt, dark brown to black, moist                                                        |                                        |                  |                                       |      |       |             |                                    |
| 1         | <b>CLAY</b><br>- organics, black, firm, medium plasticity, moist                                                                                          | X                                      | 99-47-2          | ▲                                     |      |       |             | X                                  |
|           | <b>SILT</b><br>- some clay, greyish light brown, soft, medium plasticity, moist to wet<br>- light brown, very soft below 1.5m                             |                                        |                  |                                       |      |       |             |                                    |
| 2         | <b>CLAY</b><br>- silt inclusions, silt partings along fractures, brown, stiff, high plasticity, moist<br>- firm to stiff, no visible fractures below 2.7m | X                                      | 99-47-3          | ▲                                     |      |       |             | X                                  |
|           | <b>CLAY</b><br>- silt inclusions, silt partings along fractures, brown, stiff, high plasticity, moist<br>- firm to stiff, no visible fractures below 2.7m |                                        |                  |                                       |      |       |             |                                    |
| 3         | - silt seams from 3.4m to 3.5m                                                                                                                            | X                                      | 99-47-4          | ▲                                     |      |       |             | X                                  |
|           | - silt seams from 3.4m to 3.5m                                                                                                                            |                                        |                  |                                       |      |       |             |                                    |
| 4         | - firm below 4.0m                                                                                                                                         | X                                      | 99-47-5          | ▲                                     |      |       |             | X                                  |
|           | - firm below 4.0m                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 5         | End of borehole at 4.6m                                                                                                                                   | X                                      | 99-47-6          | ▲                                     |      |       |             | X                                  |
|           | End of borehole at 4.6m                                                                                                                                   |                                        |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |



**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE DRILLED: 1999 07 14

OBSERVED WATER LEVEL: N/A

LOGGED BY: JDT

**LEGEND**

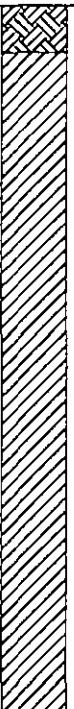
 cuttings     slough

 bentonite seal

SHEET 1 OF 1

|                                                   |  |                                                |  |                                                                                                                                                                                                                                                |  |
|---------------------------------------------------|--|------------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                                                         |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                                                            |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> NO RECOVERY |  |

| DEPTH (m)               | SOIL DESCRIPTION                                                                                                                                                              | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE                                             | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL                                                                          | MONITORING<br>WELL<br>INSTALLATION |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------|---------------------------------------|------|-------|--------------------------------------------------------------------------------------|------------------------------------|
|                         |                                                                                                                                                                               |                                                                                    |                  | 100                                   | 1000 | 10000 |                                                                                      |                                    |
| 0                       | <b>SAND (FILL)</b><br>- fine to medium grained, gravelly (fine grained),<br>trace coarse grained sand, brown, dry<br>- fine grained, some silt, dark brown, wet<br>below 0.5m |  | *99-48-1 ▲       |                                       |      |       |  |                                    |
| 1                       | <b>CLAY</b><br>- trace fine grained sand, silt inclusions,<br>greyish brown, stiff, moist                                                                                     |                                                                                    | 99-48-2 ▲        |                                       |      |       |                                                                                      |                                    |
| 2                       | <b>SILT</b><br>- trace clay, light brown, soft, low plasticity, wet<br>- sandy to and sand, saturated below 2.1m                                                              |                                                                                    | 99-48-3 ▲        |                                       |      |       |                                                                                      |                                    |
|                         | <b>CLAY</b><br>- silt partings, silt inclusions, brown, stiff, high<br>plasticity, moist                                                                                      |                                                                                    | 99-48-4 ▲        |                                       |      |       |                                                                                      |                                    |
| 3                       | - silt seams at 3.7m                                                                                                                                                          |                                                                                    | 99-48-5 ▲        |                                       |      |       |                                                                                      |                                    |
| 4                       | - firm below 4.0m                                                                                                                                                             |                                                                                    | 99-48-6 ▲        |                                       |      |       |                                                                                      |                                    |
| End of borehole at 4.6m |                                                                                                                                                                               |                                                                                    |                  |                                       |      |       |                                                                                      |                                    |
| 5                       |                                                                                                                                                                               |                                                                                    |                  |                                       |      |       |                                                                                      |                                    |
| 6                       |                                                                                                                                                                               |                                                                                    |                  |                                       |      |       |                                                                                      |                                    |
| 7                       |                                                                                                                                                                               |                                                                                    |                  |                                       |      |       |                                                                                      |                                    |
| 8                       |                                                                                                                                                                               |                                                                                    |                  |                                       |      |       |                                                                                      |                                    |
| 9                       |                                                                                                                                                                               |                                                                                    |                  |                                       |      |       |                                                                                      |                                    |

\* sample submitted for laboratory analysis



**MORROW  
ENVIRONMENTAL  
CONSULTANTS INC.**

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE DRILLED: 1999 07 14

OBSERVED WATER LEVEL: N/A

LOGGED BY:  
JDT

SHEET 1 OF 1

**LEGEND**

 cuttings

 bentonite seal

|                                                   |  |                                                |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W81408                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                           |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m)               | SOIL DESCRIPTION                                                                                                                                                                                                                                                                  | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|                         |                                                                                                                                                                                                                                                                                   |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0                       | <b>SAND (FILL)</b><br>- medium grained, some fine grained gravel, brown, wet<br>- fine to medium grained, silty, some gravel, black to dark brown, wet below 0.2m                                                                                                                 | X                                      | 99-49-1          | ▲                                     |      |       |             |                                    |
| 1                       | <b>CLAY</b><br>- trace fine grained sand, black to grey, stiff, moist<br><br><b>SILT</b><br>- some clay to clayey, light grey, soft, medium plasticity, moist<br>- light brown below 1.2m<br>- greyish light brown below 1.5m                                                     | X                                      | 99-49-2          | ▲                                     |      |       |             |                                    |
| 2                       | <b>CLAY</b><br>- silt partings, silt inclusions, greyish brown, stiff, medium plasticity, fractured, grey and black staining<br>- no staining below 2.4m<br>- no silt partings, brown, firm, no visible fractures below 2.7m<br>- silt seams at 3.7m<br>- soft to firm below 4.0m | X                                      | 99-49-3          | ▲                                     |      |       |             |                                    |
|                         |                                                                                                                                                                                                                                                                                   | X                                      | 99-49-4          | ▲                                     |      |       |             |                                    |
|                         |                                                                                                                                                                                                                                                                                   | X                                      | 99-49-5          | ▲                                     |      |       |             |                                    |
|                         |                                                                                                                                                                                                                                                                                   | X                                      | 99-49-6          | ▲                                     |      |       |             |                                    |
|                         |                                                                                                                                                                                                                                                                                   | X                                      | 99-49-7          | ▲                                     |      |       |             |                                    |
| End of borehole at 4.6m |                                                                                                                                                                                                                                                                                   |                                        |                  |                                       |      |       |             |                                    |
| 5                       |                                                                                                                                                                                                                                                                                   |                                        |                  |                                       |      |       |             |                                    |
| 6                       |                                                                                                                                                                                                                                                                                   |                                        |                  |                                       |      |       |             |                                    |
| 7                       |                                                                                                                                                                                                                                                                                   |                                        |                  |                                       |      |       |             |                                    |
| 8                       |                                                                                                                                                                                                                                                                                   |                                        |                  |                                       |      |       |             |                                    |
| 9                       |                                                                                                                                                                                                                                                                                   |                                        |                  |                                       |      |       |             |                                    |

GROUND SURFACE ELEVATION (m):  
N/A  
 TOP OF CASING ELEVATION (m):  
N/A

DATE DRILLED: 1999 07 14  
 OBSERVED WATER LEVEL: N/A  
 LOGGED BY:  
JDT

SHEET 1 OF 1

|                                                   |  |                                                |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                           |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                                                 | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                                                  |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND (FILL)</b><br>- fine to medium grained, some coarse grained, trace fine grained gravel, trace silt, brown, moist<br>- fine grained, silty, dark brown, no coarse grained sand below 0.3m |                                        | 99-50-1 ▲        |                                       |      |       |             |                                    |
|           | 99-50-3 ▲                                                                                                                                                                                        |                                        |                  |                                       |      |       |             |                                    |
| 1         | <b>CLAY (FILL)</b><br>- silty, trace fine and coarse grained sand, greyish brown, stiff                                                                                                          |                                        | *99-50-2 ▲       |                                       |      |       |             |                                    |
|           | <b>SAND (FILL)</b><br>- fine to medium grained, silty, some gravel, trace coarse grained sand, dark brown, moist to wet, wood pieces                                                             |                                        | 99-50-4 ▲        |                                       |      |       |             |                                    |
| 2         | <b>CLAY</b><br>- some silt, trace fine grained sand, silt inclusions, brown, firm to stiff, high plasticity, moist                                                                               |                                        | 99-50-5 ▲        |                                       |      |       |             |                                    |
|           | <b>SILT</b><br>- some clay, light brown, soft, medium plasticity, moist<br>- trace fine grained sand, trace clay, saturated below 3.0m                                                           |                                        | 99-50-6 ▲        |                                       |      |       |             |                                    |
| 3         |                                                                                                                                                                                                  |                                        | 99-50-7 ▲        |                                       |      |       |             |                                    |
|           | <b>CLAY</b><br>- silt partings, silt inclusions, brown, stiff, high plasticity, moist<br>- silt layer at 3.9m<br>- firm below 4.0m                                                               |                                        | 99-50-8 ▲        |                                       |      |       |             |                                    |
| 4         |                                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |
| 5         | End of borehole at 4.6m                                                                                                                                                                          |                                        |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |

\* sample submitted for laboratory analysis

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE DRILLED: 1999 07 15-16

OBSERVED WATER LEVEL: N/A

LOGGED BY: JDT

**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

**LEGEND**

cuttings

slough

bentonite seal

SHEET 1 OF 1

|                                                   |  |                                                |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                           |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m)               | SOIL DESCRIPTION                                                                                                                                                           | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|                         |                                                                                                                                                                            |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0                       | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained, trace coarse grained, brown, moist                                                                              |                                        | *99-51-1         |                                       |      |       |             |                                    |
|                         | <b>CLAY (FILL)</b><br>- silty, trace gravel, trace medium and coarse grained sand, greyish brown, stiff, low plasticity, dry to moist                                      |                                        | 99-51-2          |                                       |      |       |             |                                    |
| 1                       | - organics, some sand, wood pieces, brown to black below 0.8m                                                                                                              |                                        |                  |                                       |      |       |             |                                    |
|                         | <b>CLAY</b><br>- trace silt, silt inclusions, brown, firm to stiff, high plasticity, moist                                                                                 |                                        | 99-51-3          |                                       |      |       |             |                                    |
| 2                       |                                                                                                                                                                            |                                        |                  |                                       |      |       |             |                                    |
|                         | <b>SILT</b><br>- some clay, trace fine grained sand, light olive brown, soft, medium plasticity, moist to wet<br>- light brown below 3.4m<br>- clay layers, wet below 3.7m |                                        | 99-51-4          |                                       |      |       |             |                                    |
| 3                       |                                                                                                                                                                            |                                        | 99-51-5          |                                       |      |       |             |                                    |
| 4                       | <b>CLAY</b><br>- silt inclusions, silt layers, brown, firm to stiff, high plasticity, moist to wet                                                                         |                                        | 99-51-6          |                                       |      |       |             |                                    |
| End of borehole at 4.6m |                                                                                                                                                                            |                                        |                  |                                       |      |       |             |                                    |
| 5                       |                                                                                                                                                                            |                                        |                  |                                       |      |       |             |                                    |
| 6                       |                                                                                                                                                                            |                                        |                  |                                       |      |       |             |                                    |
| 7                       |                                                                                                                                                                            |                                        |                  |                                       |      |       |             |                                    |
| 8                       |                                                                                                                                                                            |                                        |                  |                                       |      |       |             |                                    |
| 9                       |                                                                                                                                                                            |                                        |                  |                                       |      |       |             |                                    |

\* sample submitted for laboratory analysis

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE DRILLED: 1999 07 16

OBSERVED WATER LEVEL: N/A

LOGGED BY: JDT

SHEET 1 OF 1

**LEGEND**

cuttings    slough

bentonite seal

|                                                   |  |                                                |  |                                                                                                                                                                                                                                     |  |
|---------------------------------------------------|--|------------------------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W81408                                                                                                                                                                                                              |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                                                 |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m)               | SOIL DESCRIPTION                                                                                                                               | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|                         |                                                                                                                                                |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0                       | <b>SAND (FILL)</b><br>- fine to medium grained, gravelly, some silt,<br>trace coarse grained sand, dark brown, dry<br>to moist                 |                                        | 99-52-1          |                                       |      |       |             |                                    |
| 1                       | <b>CLAY (FILL)</b><br>- some silt, trace fine grained gravel, trace<br>coarse grained sand, brown to black, stiff,<br>medium plasticity, moist |                                        | 99-52-2          |                                       |      |       |             |                                    |
|                         | <b>CLAY</b><br>- organics, some silt, dark grey to black, firm,<br>moist                                                                       |                                        | 99-52-3          |                                       |      |       |             |                                    |
| 2                       | <b>SILT</b><br>- some clay, light brown, soft, medium<br>plasticity, moist                                                                     |                                        | 99-52-4          |                                       |      |       |             |                                    |
| 3                       | <b>CLAY</b><br>- silt inclusions, silt seams, brown, firm, high<br>plasticity, moist<br><br>- no silt seams below 3.5m                         |                                        | 99-52-5          |                                       |      |       |             |                                    |
| 4                       |                                                                                                                                                |                                        | 99-52-6          |                                       |      |       |             |                                    |
| End of borehole at 4.6m |                                                                                                                                                |                                        |                  |                                       |      |       |             |                                    |
| 5                       |                                                                                                                                                |                                        |                  |                                       |      |       |             |                                    |
| 6                       |                                                                                                                                                |                                        |                  |                                       |      |       |             |                                    |
| 7                       |                                                                                                                                                |                                        |                  |                                       |      |       |             |                                    |
| 8                       |                                                                                                                                                |                                        |                  |                                       |      |       |             |                                    |
| 9                       |                                                                                                                                                |                                        |                  |                                       |      |       |             |                                    |

**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE DRILLED: 1999 07 16

OBSERVED WATER LEVEL: N/A

LOGGED BY: JDT

**LEGEND**

cuttings    slough

bentonite seal

SHEET 1 OF 1

|                                                   |  |                                                |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & DIESEL SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                           |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m)               | SOIL DESCRIPTION                                                                                                                                                                                                                                                                 | STRATIGRAPHY<br>PLOT | SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|                         |                                                                                                                                                                                                                                                                                  |                      |                |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0                       | <b>CONCRETE</b><br><b>SAND (FILL)</b><br>- fine grained, gravelly (fine grained), trace medium and coarse grained sand, concrete pieces, brown, dry<br>- no concrete pieces, fine to coarse grained gravel, dense below 0.8m<br>- some medium and coarse grained sand below 1.5m |                      |                | 99-53-1          |                                       |      |       |             |                                    |
| 1                       |                                                                                                                                                                                                                                                                                  |                      |                | 99-53-2          |                                       |      |       |             |                                    |
| 2                       |                                                                                                                                                                                                                                                                                  |                      |                | 99-53-3          |                                       |      |       |             |                                    |
|                         |                                                                                                                                                                                                                                                                                  | *99-53-4             |                |                  |                                       |      |       |             |                                    |
| 3                       | <b>CLAY</b><br>- silt seams, silt inclusions, brown, firm, high plasticity, moist<br>- silt seam at 3.5m<br>- no silt seams below 3.7m                                                                                                                                           |                      |                | 99-53-5          |                                       |      |       |             |                                    |
| 4                       |                                                                                                                                                                                                                                                                                  |                      |                | 99-53-6          |                                       |      |       |             |                                    |
| End of borehole at 4.6m |                                                                                                                                                                                                                                                                                  |                      |                |                  |                                       |      |       |             |                                    |
| 5                       |                                                                                                                                                                                                                                                                                  |                      |                |                  |                                       |      |       |             |                                    |
| 6                       |                                                                                                                                                                                                                                                                                  |                      |                |                  |                                       |      |       |             |                                    |
| 7                       |                                                                                                                                                                                                                                                                                  |                      |                |                  |                                       |      |       |             |                                    |
| 8                       |                                                                                                                                                                                                                                                                                  |                      |                |                  |                                       |      |       |             |                                    |
| 9                       |                                                                                                                                                                                                                                                                                  |                      |                |                  |                                       |      |       |             |                                    |

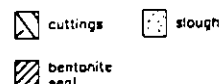
\* sample submitted for laboratory analysis

GROUND SURFACE ELEVATION (m):  
N/A  
 TOP OF CASING ELEVATION (m):  
N/A

DATE DRILLED: 1999 07 16  
 OBSERVED WATER LEVEL: N/A  
 LOGGED BY: JDT  
 SHEET 1 OF 1

**LEGEND**



|                                                |  |                                             |  |                                                                                                                                                                                                               |  |
|------------------------------------------------|--|---------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT: CP RAIL                                |  | DRILLING CONTRACTOR: MAPLE LEAF ENTERPRISES |  | PROJECT No.: W8140B                                                                                                                                                                                           |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD: SOLID STEM AUGER           |  | DIAMETER: 130 mm                                                                                                                                                                                              |  |
| BOREHOLE LOG                                   |  | PLOTTED: CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                                                | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                                                 |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND (FILL)</b><br>- fine to medium grained, some silt, some gravel, trace coarse grained sand, black, moist<br>- some medium and coarse grained sand, brown below 0.3m                      |                                        | 99-54-1          |                                       |      |       |             |                                    |
| 1         | <b>CLAY (FILL)</b><br>- some medium and coarse grained sand, some gravel, greyish brown, stiff, low to medium plasticity, moist                                                                 |                                        | 99-54-2          |                                       |      |       |             |                                    |
|           |                                                                                                                                                                                                 |                                        | 99-54-3          |                                       |      |       |             |                                    |
| 2         | <b>CLAY</b><br>- organics, trace silt, dark brown to black, firm to stiff, medium plasticity, moist<br>- greyish brown below 1.2m                                                               |                                        | 99-54-4          |                                       |      |       |             |                                    |
|           | <b>SILT</b><br>- some clay, trace organics, light brown, soft, medium plasticity, moist                                                                                                         |                                        | 99-54-5          |                                       |      |       |             |                                    |
| 3         | <b>CLAY</b><br>- silt inclusions, silt partings, silt seams, brown, stiff, medium plasticity, fractured, moist<br>- no silt seams, firm, no visible fractures below 2.6m<br>- silt seam at 3.4m |                                        | 99-54-7          |                                       |      |       |             |                                    |
| 4         | End of borehole at 4.6m                                                                                                                                                                         |                                        | 99-54-6          |                                       |      |       |             |                                    |
| 5         |                                                                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |

GROUND SURFACE ELEVATION (m): N/A  
 TOP OF CASING ELEVATION (m): N/A

DATE DRILLED: 1999 07 16  
 OBSERVED WATER LEVEL: N/A  
 LOGGED BY: JDT  
 SHEET 1 OF 1

**LEGEND**  
 cuttings  
 bentonite seal

| CLIENT:                              |                                                                                                                                                                    | DRILLING CONTRACTOR:   |                | PROJECT No.:                                                                                                                                                                                                           |                                       |             |                                    |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|-------------|------------------------------------|
| CP RAIL                              |                                                                                                                                                                    | MAPLE LEAF ENTERPRISES |                | W8140B                                                                                                                                                                                                                 |                                       |             |                                    |
| LOCATION:                            |                                                                                                                                                                    | DRILLING METHOD:       |                | DIAMETER:                                                                                                                                                                                                              |                                       |             |                                    |
| WINNIPEG DIESEL SHOPS & WESTON SHOPS |                                                                                                                                                                    | SOLID STEM AUGER       |                | 130 mm                                                                                                                                                                                                                 |                                       |             |                                    |
| BOREHOLE LOG                         |                                                                                                                                                                    | PLOTTED:               |                | SAMPLE TYPE:                                                                                                                                                                                                           |                                       |             |                                    |
|                                      |                                                                                                                                                                    | CAD FILE No.:          |                | <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |                                       |             |                                    |
| DEPTH (m)                            | SOIL DESCRIPTION                                                                                                                                                   | STRATIGRAPHY<br>PLOT   | SAMPLE<br>TYPE | SAMPLE<br>NUMBER                                                                                                                                                                                                       | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
| 0                                    | <b>ASPHALT</b><br><b>SAND (FILL)</b><br>- fine to medium grained, silty, trace coarse grained sand, trace gravel, brown, moist<br>- black to dark brown below 0.2m |                        |                | 99-55-1                                                                                                                                                                                                                |                                       |             |                                    |
| 1                                    | <b>CLAY</b><br>- trace fine grained sand, trace silt, brown to black, firm, moist                                                                                  |                        |                | 99-55-2                                                                                                                                                                                                                |                                       |             |                                    |
|                                      | <b>SILT</b><br>- trace clay, light brown, soft, low plasticity, moist                                                                                              |                        |                | 99-55-3                                                                                                                                                                                                                |                                       |             |                                    |
| 2                                    | <b>CLAY</b><br>- silt inclusions, brown, firm to stiff, high plasticity, fractured, moist<br>- firm, no visible fractures below 3.0m                               |                        |                | 99-55-4                                                                                                                                                                                                                |                                       |             |                                    |
| 3                                    | - silt seam at 3.4m                                                                                                                                                |                        |                | 99-55-6                                                                                                                                                                                                                |                                       |             |                                    |
| 4                                    |                                                                                                                                                                    |                        |                | 99-55-5                                                                                                                                                                                                                |                                       |             |                                    |
| End of borehole at 4.6m              |                                                                                                                                                                    |                        |                |                                                                                                                                                                                                                        |                                       |             |                                    |
| 5                                    |                                                                                                                                                                    |                        |                |                                                                                                                                                                                                                        |                                       |             |                                    |
| 6                                    |                                                                                                                                                                    |                        |                |                                                                                                                                                                                                                        |                                       |             |                                    |
| 7                                    |                                                                                                                                                                    |                        |                |                                                                                                                                                                                                                        |                                       |             |                                    |
| 8                                    |                                                                                                                                                                    |                        |                |                                                                                                                                                                                                                        |                                       |             |                                    |
| 9                                    |                                                                                                                                                                    |                        |                |                                                                                                                                                                                                                        |                                       |             |                                    |

**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
232.883

TOP OF CASING ELEVATION (m):  
232.726

DATE DRILLED: 1999 07 16

OBSERVED WATER LEVEL: 1999 09 01

LOGGED BY: JDT

**LEGEND**

road box

50 mm # PVC pipe

50 mm # slotted PVC pipe

bentonite seal

silica sand backfill

concrete seal

SHEET 1 OF 1

| CLIENT:      |                                                                                                     | CP RAIL                              |  | DRILLING CONTRACTOR: |  | MAPLE LEAF ENTERPRISES |  | PROJECT No.:                                                                                                                                                                                     |  | W8140B                          |  |
|--------------|-----------------------------------------------------------------------------------------------------|--------------------------------------|--|----------------------|--|------------------------|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------|--|
| LOCATION:    |                                                                                                     | WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:     |  | SOLID STEM AUGER       |  | DIAMETER:                                                                                                                                                                                        |  | 130 mm                          |  |
| BOREHOLE LOG |                                                                                                     | PLOTTED:                             |  | CAD FILE No.:        |  | SAMPLE TYPE:           |  | <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  | BOREHOLE No.:                   |  |
| DEPTH (m)    |                                                                                                     | SOIL DESCRIPTION                     |  | STRATIGRAPHY PLOT    |  | SAMPLE TYPE            |  | SAMPLE NUMBER                                                                                                                                                                                    |  | SOIL VAPOUR CONCENTRATION (ppm) |  |
|              |                                                                                                     |                                      |  |                      |  |                        |  |                                                                                                                                                                                                  |  | 100      1000      10000        |  |
| 0            | ASPHALT                                                                                             |                                      |  |                      |  |                        |  |                                                                                                                                                                                                  |  |                                 |  |
|              | SAND (FILL)                                                                                         |                                      |  |                      |  |                        |  |                                                                                                                                                                                                  |  |                                 |  |
|              | - fine to medium grained, some gravel, trace coarse grained sand, brown, moist                      |                                      |  |                      |  |                        |  |                                                                                                                                                                                                  |  |                                 |  |
|              | - some silt, dark brown to black below 0.5m                                                         |                                      |  |                      |  |                        |  |                                                                                                                                                                                                  |  |                                 |  |
| 1            | CLAY AND SILT (FILL)                                                                                |                                      |  |                      |  |                        |  |                                                                                                                                                                                                  |  |                                 |  |
|              | - some coarse grained sand, light brown to brown, firm, moist                                       |                                      |  |                      |  |                        |  |                                                                                                                                                                                                  |  |                                 |  |
|              | CLAY                                                                                                |                                      |  |                      |  |                        |  |                                                                                                                                                                                                  |  |                                 |  |
|              | - trace silt, greyish brown, firm, high plasticity, moist                                           |                                      |  |                      |  |                        |  |                                                                                                                                                                                                  |  |                                 |  |
| 2            | SILT                                                                                                |                                      |  |                      |  |                        |  |                                                                                                                                                                                                  |  |                                 |  |
|              | - some clay, light brown, soft, medium plasticity, moist                                            |                                      |  |                      |  |                        |  |                                                                                                                                                                                                  |  |                                 |  |
|              | SAND (FILL)                                                                                         |                                      |  |                      |  |                        |  |                                                                                                                                                                                                  |  |                                 |  |
|              | - medium grained, silty, some clay, some gravel, trace coarse grained sand, brown, wet to saturated |                                      |  |                      |  |                        |  |                                                                                                                                                                                                  |  |                                 |  |
| 3            | CLAY                                                                                                |                                      |  |                      |  |                        |  |                                                                                                                                                                                                  |  |                                 |  |
|              | - silt inclusions, brown, firm to stiff, high plasticity, moist                                     |                                      |  |                      |  |                        |  |                                                                                                                                                                                                  |  |                                 |  |
|              | - firm below 3.0m                                                                                   |                                      |  |                      |  |                        |  |                                                                                                                                                                                                  |  |                                 |  |
| 4            |                                                                                                     |                                      |  |                      |  |                        |  |                                                                                                                                                                                                  |  |                                 |  |
| 5            | End of borehole at 4.9m                                                                             |                                      |  |                      |  |                        |  |                                                                                                                                                                                                  |  |                                 |  |
| 6            |                                                                                                     |                                      |  |                      |  |                        |  |                                                                                                                                                                                                  |  |                                 |  |
| 7            |                                                                                                     |                                      |  |                      |  |                        |  |                                                                                                                                                                                                  |  |                                 |  |
| 8            |                                                                                                     |                                      |  |                      |  |                        |  |                                                                                                                                                                                                  |  |                                 |  |
| 9            |                                                                                                     |                                      |  |                      |  |                        |  |                                                                                                                                                                                                  |  |                                 |  |



**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
232.727

TOP OF CASING ELEVATION (m):  
232.608

DATE DRILLED: 1999 07 16

OBSERVED WATER LEVEL: 1999 09 01

LOGGED BY: JDT

SHEET 1 OF 1

|                                                |  |                                             |  |                                                                                                                                                                                                                                                |  |
|------------------------------------------------|--|---------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT: CP RAIL                                |  | DRILLING CONTRACTOR: MAPLE LEAF ENTERPRISES |  | PROJECT No.: W8140B                                                                                                                                                                                                                            |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD: SOLID STEM AUGER           |  | DIAMETER: 130 mm                                                                                                                                                                                                                               |  |
| BOREHOLE LOG                                   |  | PLOTTED: CAD FILE No.:                      |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> NO RECOVERY |  |

| DEPTH (m)               | SOIL DESCRIPTION                                                                                           | STRATIGRAPHY<br>PLOT | SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-------------------------|------------------------------------------------------------------------------------------------------------|----------------------|----------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|                         |                                                                                                            |                      |                |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0                       | <b>SAND (FILL)</b><br>- medium grained, some fine grained gravel,<br>trace coarse grained sand, brown, wet |                      |                | 99-57-1          |                                       |      |       |             |                                    |
| 1                       | <b>CLAY AND SILT (FILL)</b><br>- trace gravel, trace sand, brown, crumbly,<br>low plasticity, moist        |                      |                | 99-57-2          |                                       |      |       |             |                                    |
| 2                       | <b>CLAY</b><br>- silt partings, silt seams, silt inclusions, brown,<br>firm, medium plasticity, moist      |                      |                | 99-57-4          |                                       |      |       |             |                                    |
|                         | - no silt partings, no silt seams, high<br>plasticity below 2.6m                                           |                      |                | 99-57-3          |                                       |      |       |             |                                    |
| 3                       |                                                                                                            |                      |                | 99-57-5          |                                       |      |       |             |                                    |
| 4                       |                                                                                                            |                      |                | 99-57-6          |                                       |      |       |             |                                    |
| End of borehole at 4.6m |                                                                                                            |                      |                |                  |                                       |      |       |             |                                    |
| 5                       |                                                                                                            |                      |                |                  |                                       |      |       |             |                                    |
| 6                       |                                                                                                            |                      |                |                  |                                       |      |       |             |                                    |
| 7                       |                                                                                                            |                      |                |                  |                                       |      |       |             |                                    |
| 8                       |                                                                                                            |                      |                |                  |                                       |      |       |             |                                    |
| 9                       |                                                                                                            |                      |                |                  |                                       |      |       |             |                                    |



**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE DRILLED: 1999 07 20

OBSERVED WATER LEVEL: N/A

LOGGED BY: JDT

SHEET 1 OF 1

\* sample submitted for laboratory analysis

**LEGEND**

 cuttings

 bentonite seal

|                                                   |  |                                                |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                           |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m)               | SOIL DESCRIPTION                                                                                                                                                                             | STRATIGRAPHY PLOT                                                                  | SAMPLE TYPE                                                                        | SAMPLE NUMBER      | SOIL VAPOUR CONCENTRATION (ppm) |      |       | WATER LEVEL | MONITORING WELL INSTALLATION                                                         |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|--------------------|---------------------------------|------|-------|-------------|--------------------------------------------------------------------------------------|
|                         |                                                                                                                                                                                              |                                                                                    |                                                                                    |                    | 100                             | 1000 | 10000 |             |                                                                                      |
| 0                       | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, fine to coarse grained gravel, some silt, brown, saturated                                                                   |  |  | 99-58-1            | ▲                               |      |       |             |  |
| 1                       | <b>CLAY</b><br>- organics, black, firm, moist<br>- trace fine grained sand, silt inclusions, brown to dark brown, stiff to firm below 0.9m                                                   |                                                                                    |                                                                                    | 99-58-2            | ▲                               |      |       |             |                                                                                      |
|                         | <b>SILT</b><br>- trace clay, greyish brown, soft, moist                                                                                                                                      |                                                                                    |                                                                                    | 99-58-3<br>99-58-8 |                                 | ▲    |       |             |                                                                                      |
| 2                       | <b>CLAY</b><br>- silt partings, silt inclusions, brown, stiff, medium plasticity, fractured, dry to moist<br>- no silt partings, firm, moist below 2.6m<br>- no visible fractures below 2.9m |                                                                                    |                                                                                    | 99-58-4            | ▲                               |      |       |             |                                                                                      |
|                         |                                                                                                                                                                                              |                                                                                    |                                                                                    | 99-58-5            | ▲                               |      |       |             |                                                                                      |
| 3                       |                                                                                                                                                                                              |                                                                                    |                                                                                    | 99-58-6            | ▲                               |      |       |             |                                                                                      |
| 4                       |                                                                                                                                                                                              |                                                                                    |                                                                                    | 99-58-7            | ▲                               |      |       |             |                                                                                      |
| End of borehole at 4.6m |                                                                                                                                                                                              |                                                                                    |                                                                                    |                    |                                 |      |       |             |                                                                                      |
| 5                       |                                                                                                                                                                                              |                                                                                    |                                                                                    |                    |                                 |      |       |             |                                                                                      |
| 6                       |                                                                                                                                                                                              |                                                                                    |                                                                                    |                    |                                 |      |       |             |                                                                                      |
| 7                       |                                                                                                                                                                                              |                                                                                    |                                                                                    |                    |                                 |      |       |             |                                                                                      |
| 8                       |                                                                                                                                                                                              |                                                                                    |                                                                                    |                    |                                 |      |       |             |                                                                                      |
| 9                       |                                                                                                                                                                                              |                                                                                    |                                                                                    |                    |                                 |      |       |             |                                                                                      |



**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE DRILLED: 1999 07 20

OBSERVED WATER LEVEL: N/A

LOGGED BY: JDT

**LEGEND**

 cuttings

 bentonite seal

SHEET 1 OF 1

|                                                   |  |                                                |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                           |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m)               | SOIL DESCRIPTION                                                                                                                                        | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|                         |                                                                                                                                                         |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0                       | <b>SAND (FILL)</b><br>- fine to medium grained, silty, some fine grained gravel, trace coarse grained sand, dark brown, wet                             |                                        | 99-59-1          |                                       |      |       |             |                                    |
| 1                       | <b>SILT (FILL)</b><br>- clayey, trace organics, light brown to brown, soft, wet, wood pieces<br><br>- trace sand, trace gravel, mottled grey below 1.5m |                                        | 99-59-2          |                                       |      |       |             |                                    |
| 2                       | <b>SILT</b><br>- some clay, greyish light brown, soft, medium plasticity, wet, black staining                                                           |                                        | 99-59-3          |                                       |      |       |             |                                    |
|                         |                                                                                                                                                         |                                        | 99-59-4          |                                       |      |       |             |                                    |
|                         |                                                                                                                                                         |                                        | 99-59-5          |                                       |      |       |             |                                    |
| 3                       | <b>CLAY</b><br>- silt inclusions, silt seams, brown, firm, high plasticity, moist<br>- no silt seams below 3.2m                                         |                                        | 99-59-6          |                                       |      |       |             |                                    |
| 4                       |                                                                                                                                                         |                                        | 99-59-7          |                                       |      |       |             |                                    |
|                         |                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| End of borehole at 4.6m |                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 5                       |                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 6                       |                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 7                       |                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 8                       |                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 9                       |                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |

\* sample submitted for laboratory analysis

GROUND SURFACE ELEVATION (m):  
232.606

TOP OF CASING ELEVATION (m):  
232.532

DATE DRILLED: 1999 07 20

OBSERVED WATER LEVEL: 1999 09 01

LOGGED BY: JDT

SHEET 1 OF 1

#### LEGEND

- road box
- 50 mm PVC pipe
- 50 mm slotted PVC pipe
- bentonite seal
- silica sand backfill
- concrete seal

|                                                   |  |                                                |  |                                                                                                                                                                                                                                     |  |
|---------------------------------------------------|--|------------------------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                                              |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                                                 |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                   | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|----------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                    |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | CONCRETE                                                                                           |                                        |                  |                                       |      |       |             |                                    |
|           | CLAY (FILL)<br>- silty, brown, firm, medium plasticity, moist                                      |                                        | 99-60-1          |                                       |      |       |             |                                    |
| 1         | CLAY<br>- trace silt, silt inclusions, dark brown to brown, firm, medium plasticity, moist         |                                        | 99-60-2          |                                       |      |       |             |                                    |
|           | SILT<br>- trace clay, light brown, soft, low plasticity, moist<br>- some clay to clayey below 1.5m |                                        | 99-60-3          |                                       |      |       |             |                                    |
| 2         |                                                                                                    |                                        | 99-60-4          |                                       |      |       |             |                                    |
|           |                                                                                                    |                                        | 99-60-5          |                                       |      |       |             |                                    |
| 3         | CLAY<br>- silt seams, brown, stiff, high plasticity, moist<br>- no silt seams, firm below 3.0m     |                                        | 99-60-6          |                                       |      |       |             |                                    |
| 4         | End of borehole at 4.6m                                                                            |                                        |                  |                                       |      |       |             |                                    |
| 5         |                                                                                                    |                                        |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                    |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                    |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                    |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                    |                                        |                  |                                       |      |       |             |                                    |

GROUND SURFACE ELEVATION (m):  
232.671

TOP OF CASING ELEVATION (m):  
232.625

DATE DRILLED: 1999 07 20

OBSERVED WATER LEVEL: 1999 09 01

LOGGED BY: JDT

SHEET 1 OF 1

**LEGEND**

road box

50 mm # PVC pipe

50 mm # slotted PVC pipe

bentonite seal

silica sand backfill

concrete seal

|                                                   |  |                                                |  |                                                                                                                                                                                                                          |  |
|---------------------------------------------------|--|------------------------------------------------|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                                   |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                                      |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                       | STRATIGRAPHY<br>FLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                        |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>CONCRETE</b><br><b>SAND AND GRAVEL (FILL)</b><br>- dark brown, dry<br><b>CLAY</b><br>- trace fine grained sand, dark brown to black, firm, medium plasticity, moist |                                        | 99-61-1 ▲        |                                       |      |       |             |                                    |
| 1         | <b>SILT</b><br>- some clay, light brown, soft, medium plasticity, moist<br>- clayey below 1.5m                                                                         |                                        | 99-61-2 ▲        |                                       |      |       |             |                                    |
| 2         | <b>CLAY</b><br>- silt partings, silt seams, silt inclusions, brown, stiff, high plasticity, moist<br>- no silt seams, firm below 2.6m<br>- no silt partings below 3.0m |                                        | *99-61-3 ▲       |                                       |      |       |             |                                    |
| 3         |                                                                                                                                                                        |                                        | 99-61-4 ▲        |                                       |      |       |             |                                    |
| 4         |                                                                                                                                                                        |                                        | 99-61-5 ▲        |                                       |      |       |             |                                    |
| 5         |                                                                                                                                                                        |                                        | 99-61-6 ▲        |                                       |      |       |             |                                    |
| 6         | End of borehole at 4.6m                                                                                                                                                |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                        |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                        |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                        |                                        |                  |                                       |      |       |             |                                    |

\* sample submitted for laboratory analysis

|                                          |                                  |
|------------------------------------------|----------------------------------|
| GROUND SURFACE ELEVATION (m):<br>232.688 | DATE DRILLED: 1999 07 20         |
| TOP OF CASING ELEVATION (m):<br>232.629  | OBSERVED WATER LEVEL: 1999 09 01 |
|                                          | LOGGED BY: JDT                   |

LEGEND

road box

50 mm PVC pipe

50 mm slotted PVC pipe

benonite seal

silica sand backfill

concrete seal

SHEET 1 OF 1

|                                                   |  |                                                |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                           |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                                                      | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                                                       |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | CONCRETE                                                                                                                                                                                              |                                        | 99-62-1          |                                       |      |       |             |                                    |
|           | SAND AND GRAVEL (FILL)                                                                                                                                                                                |                                        |                  |                                       |      |       |             |                                    |
|           | CONCRETE                                                                                                                                                                                              |                                        |                  |                                       |      |       |             |                                    |
|           | CLAY                                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |
| 1         | - some silt, trace gravel, trace sand, brown, firm, medium to high plasticity, moist                                                                                                                  |                                        | 99-62-2          |                                       |      |       |             |                                    |
|           | SILT                                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |
|           | - some clay, light brown, soft, medium plasticity, moist                                                                                                                                              | 99-62-3                                |                  |                                       |      |       |             |                                    |
| 2         | CLAY<br>- silt seams, silt partings, silt inclusions, brown, stiff, high plasticity, moist<br>- no silt seams, no silt partings, firm to stiff below 2.7m<br>- firm below 3.0m<br>- silt seam at 3.1m | 99-62-4                                |                  |                                       |      |       |             |                                    |
|           |                                                                                                                                                                                                       | 99-62-5                                |                  |                                       |      |       |             |                                    |
| 3         |                                                                                                                                                                                                       | 99-62-6                                |                  |                                       |      |       |             |                                    |
| 4         |                                                                                                                                                                                                       |                                        |                  |                                       |      |       |             |                                    |
| 5         | End of borehole at 4.6m                                                                                                                                                                               |                                        |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                                                                       |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                                                       |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                                                       |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                                                       |                                        |                  |                                       |      |       |             |                                    |

GROUND SURFACE ELEVATION (m):  
232.679

TOP OF CASING ELEVATION (m):  
232.601

DATE DRILLED: 1999 07 21

OBSERVED WATER LEVEL: 1999 09 01

LOGGED BY: JDT

**LEGEND**

road box

50 mm # PVC pipe

50 mm # slotted PVC pipe

bentonite seal

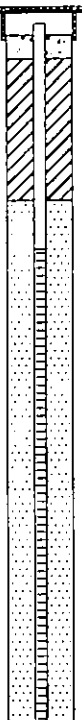
silica sand backfill

concrete seal

SHEET 1 OF 1

|                                                   |  |                                                |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                           |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                             | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE                                            | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL                                                                          | MONITORING<br>WELL<br>INSTALLATION |
|-----------|------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------|---------------------------------------|------|-------|--------------------------------------------------------------------------------------|------------------------------------|
|           |                                                                                                                              |                                                                                   |                  | 100                                   | 1000 | 10000 |                                                                                      |                                    |
| 0         | CONCRETE                                                                                                                     |  |                  |                                       |      |       |  |                                    |
| 1         | SAND (FILL)<br>- fine to medium grained, silty, some gravel,<br>trace clay, trace coarse grained sand, light<br>brown, moist |                                                                                   | 99-63-1 ▲        |                                       |      |       |                                                                                      |                                    |
| 2         | CLAY<br>- silt partings, silt inclusions, brown, stiff, high<br>plasticity, moist<br>- no silt partings, firm below 2.7m     |                                                                                   | *99-63-2 ▲       |                                       |      |       |                                                                                      |                                    |
| 3         |                                                                                                                              |                                                                                   | 99-63-3 ▲        |                                       |      |       |                                                                                      |                                    |
| 4         |                                                                                                                              |                                                                                   | 99-63-4 ▲        |                                       |      |       |                                                                                      |                                    |
| 4.6       | End of borehole at 4.6m                                                                                                      |                                                                                   | 99-63-5 ▲        |                                       |      |       |                                                                                      |                                    |
| 5         |                                                                                                                              |                                                                                   |                  |                                       |      |       |                                                                                      |                                    |
| 6         |                                                                                                                              |                                                                                   |                  |                                       |      |       |                                                                                      |                                    |
| 7         |                                                                                                                              |                                                                                   |                  |                                       |      |       |                                                                                      |                                    |
| 8         |                                                                                                                              |                                                                                   |                  |                                       |      |       |                                                                                      |                                    |
| 9         |                                                                                                                              |                                                                                   |                  |                                       |      |       |                                                                                      |                                    |



**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
232.705

TOP OF CASING ELEVATION (m):  
232.633

DATE DRILLED: 1999 07 21

OBSERVED WATER LEVEL: 1999 09 01

LOGGED BY:  
JDT

SHEET 1 OF 1

\* sample submitted for laboratory analysis

**LEGEND**

 road box

 50 mm PVC pipe

 50 mm slotted PVC pipe

 bentonite seal

 silica sand backfill

 concrete seal

|                                                   |  |                                                |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                           |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m)               | SOIL DESCRIPTION                                                                                                                                                                                 | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|                         |                                                                                                                                                                                                  |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0                       | <b>SAND (FILL)</b><br>- fine to coarse grained, gravelly, trace silt,<br>dark brown, wet<br>- brown below 0.5m                                                                                   |                                        | 99-64-1          |                                       |      |       |             |                                    |
| 1                       | <b>CLAY</b><br>- some coarse grained sand, trace fine grained<br>gravel, black, firm, moist                                                                                                      |                                        | 99-64-2          |                                       |      |       |             |                                    |
|                         | <b>SILT</b><br>- trace clay, light brown, soft, low plasticity, moist                                                                                                                            |                                        | *99-64-3         |                                       |      |       |             |                                    |
| 2                       | <b>CLAY</b><br>- silt seams, silt partings, silt inclusions, greyish<br>brown, stiff, high plasticity, fractured, moist<br>- no silt seams, no silt partings, brown, firm<br>to stiff below 2.4m |                                        | 99-64-4          |                                       |      |       |             |                                    |
|                         | - firm below 3.0m                                                                                                                                                                                |                                        | 99-64-5          |                                       |      |       |             |                                    |
| 3                       |                                                                                                                                                                                                  |                                        | 99-64-6          |                                       |      |       |             |                                    |
| 4                       |                                                                                                                                                                                                  |                                        | 99-64-7          |                                       |      |       |             |                                    |
| End of borehole at 4.6m |                                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |
| 5                       |                                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |
| 6                       |                                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |
| 7                       |                                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |
| 8                       |                                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |
| 9                       |                                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |

\* sample submitted for laboratory analysis

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE DRILLED: 1999 07 21

OBSERVED WATER LEVEL: N/A

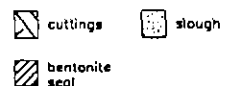
LOGGED BY: JDT

SHEET 1 OF 1



MORROW  
ENVIRONMENTAL  
CONSULTANTS INC.

**LEGEND**



|                                                   |  |                                                |  |                                                                                                                                                                                                                                                |  |
|---------------------------------------------------|--|------------------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                                                         |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                                                            |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input checked="" type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> NO RECOVERY |  |

| DEPTH (m)               | SOIL DESCRIPTION                                                                                                                                                                                | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|                         |                                                                                                                                                                                                 |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0                       | <b>CONCRETE</b><br><b>SAND (FILL)</b><br>- fine to medium grained, gravelly, trace coarse grained sand, trace silt, brown, dry to moist                                                         |                                        |                  |                                       |      |       |             |                                    |
| 1                       |                                                                                                                                                                                                 |                                        | 99-65-1          |                                       |      |       |             |                                    |
| 2                       | <b>CLAY</b><br>- trace fine grained gravel, trace coarse grained sand, black, firm, moist<br><b>SILT</b><br>- trace clay, light brown, soft, low plasticity, moist<br>- 75mm clay layer at 2.6m |                                        | 99-65-2          |                                       |      |       |             |                                    |
|                         |                                                                                                                                                                                                 |                                        | *99-65-3         |                                       |      |       |             |                                    |
| 3                       | <b>CLAY</b><br>- silt inclusions, brown, stiff, high plasticity, moist                                                                                                                          |                                        | 99-65-4          |                                       |      |       |             |                                    |
| 4                       | - firm below 4.3m                                                                                                                                                                               |                                        | 99-65-5          |                                       |      |       |             |                                    |
| End of borehole at 4.6m |                                                                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 5                       |                                                                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 6                       |                                                                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 7                       |                                                                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 8                       |                                                                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 9                       |                                                                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |

GROUND SURFACE ELEVATION (m):  
N/A  
 TOP OF CASING ELEVATION (m):  
N/A

DATE DRILLED: 1999 07 21  
 OBSERVED WATER LEVEL: N/A  
 LOGGED BY: JDT  
 SHEET 1 OF 1

\* sample submitted for laboratory analysis

**LEGEND**

cuttings

slough

benlonite seal

concrete seal

|                                                   |  |                                                |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W81408                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                           |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                    | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                     |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND (FILL)</b><br>- fine to medium grained, some gravel, trace silt, dark brown to black, moist<br><br>- silty, gravelly, light grey below 0.8m |                                        |                  |                                       |      |       |             |                                    |
| 1         | <b>CLAY</b><br>- trace fine grained sand, trace organics, trace silt, greyish brown, mottled black, stiff, medium plasticity, moist                 |                                        |                  |                                       |      |       |             |                                    |
| 2         | <b>SILT</b><br>- trace clay, greyish light brown, soft, moist                                                                                       |                                        |                  |                                       |      |       |             |                                    |
| 3         | <b>CLAY</b><br>- some silt, silt inclusions, very stiff, medium plasticity, dry to moist<br>- stiff, moist below 3.0m                               |                                        |                  |                                       |      |       |             |                                    |
| 4         | - firm to stiff, high plasticity below 4.0m                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 5         | End of borehole at 4.6m                                                                                                                             |                                        |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                     |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                     |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                     |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                     |                                        |                  |                                       |      |       |             |                                    |

GROUND SURFACE ELEVATION (m):  
232.689  
 TOP OF CASING ELEVATION (m):  
232.473

DATE DRILLED: 1999 10 29  
 OBSERVED WATER LEVEL: 1999 11 26  
 LOGGED BY: JDT  
 SHEET 1 OF 1

**LEGEND**  
 road box  
 50 mm PVC pipe  
 50 mm slotted PVC pipe  
 bentonite seal  
 silica sand backfill  
 concrete seal

|                                                   |  |                                                |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                           |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                              | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                               |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND (FILL)</b><br>- fine grained sand, gravelly (fine grained), brown, saturated                                                          | [Pattern]                              |                  |                                       |      |       | [Pattern]   | [Pattern]                          |
| 1         | <b>CLAY</b><br>- organics, some silt, black, firm, medium plasticity                                                                          |                                        |                  |                                       |      |       |             |                                    |
|           | <b>SILT</b><br>- some clay, light brown, soft to firm, moist                                                                                  |                                        |                  |                                       |      |       |             |                                    |
| 2         | <b>CLAY</b><br>- silt seams, silt partings, greyish brown, stiff, medium plasticity, moist<br>- no silt seams below 2.4m<br>- firm below 2.7m |                                        |                  |                                       |      |       |             |                                    |
| 3         | - silt inclusions, no silt partings, soft below 3.0m                                                                                          | [Pattern]                              |                  |                                       |      |       | [Pattern]   | [Pattern]                          |
| 4         |                                                                                                                                               |                                        |                  |                                       |      |       |             |                                    |
| 5         | End of borehole at 4.6m                                                                                                                       |                                        |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                               |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                               |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                               |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                               |                                        |                  |                                       |      |       |             |                                    |



**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
232.645

TOP OF CASING ELEVATION (m):  
232.558

DATE DRILLED: 1999 10 29

OBSERVED WATER LEVEL: 1999 11 26

LOGGED BY:  
JDT

SHEET 1 OF 1

**LEGEND**

[Symbol] road box

[Symbol] 50 mm # PVC pipe

[Symbol] 50 mm # slotted PVC pipe

[Symbol] bentonite seal

[Symbol] silica sand backfill

[Symbol] concrete seal

|                                                   |  |                                                |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | DRILLING CONTRACTOR:<br>MAPLE LEAF ENTERPRISES |  | PROJECT No.:<br>W81408                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | DRILLING METHOD:<br>SOLID STEM AUGER           |  | DIAMETER:<br>130 mm                                                                                                                                                                                           |  |
| BOREHOLE LOG                                      |  | PLOTTED:<br>CAD FILE No.:                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                                                          | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                                                           |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND (FILL)</b><br>- medium grained sand, gravelly, trace silt,<br>trace coarse grained sand, brown, saturated                                                                                         | X                                      | *99-68-1         |                                       | ▲    |       |             |                                    |
| 1         | <b>CLAY</b><br>- silty, silt seams, black, firm, medium plasticity, moist                                                                                                                                 | X                                      | 99-68-2          |                                       | ▲    |       |             |                                    |
|           | <b>SILT</b><br>- trace clay, greyish light brown, soft, low plasticity, moist                                                                                                                             | X                                      | *99-68-3         |                                       | ▲    |       |             |                                    |
| 2         | <b>CLAY</b><br>- some silt, silt partings, silt seams, greyish brown, stiff, fractures, moist<br>- no silt seams, no visible fractures below 2.8m<br>- silt inclusions, no silt partings, soft below 3.0m | X                                      | 99-68-4          |                                       | ▲    |       |             |                                    |
| 3         |                                                                                                                                                                                                           | X                                      | 99-68-5          |                                       | ▲    |       |             |                                    |
| 4         |                                                                                                                                                                                                           | X                                      | 99-68-6          |                                       | ▲    |       |             |                                    |
| 5         | End of borehole at 4.6m                                                                                                                                                                                   |                                        |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |

**MORROW ENVIRONMENTAL CONSULTANTS INC.**

GROUND SURFACE ELEVATION (m):  
232.604

TOP OF CASING ELEVATION (m):  
232.496

DATE DRILLED: 1999 10 29

OBSERVED WATER LEVEL: 1999 11 26

LOGGED BY: JDT

SHEET 1 OF 1

#### LEGEND

- road box
- 50 mm # PVC pipe
- 50 mm # slotted PVC pipe
- bentonite seal
- silica sand backfill
- concrete seal

\* sample submitted for laboratory analysis

|                                                |  |                                               |  |                                                                                                                                                                                                               |  |
|------------------------------------------------|--|-----------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT: CP RAIL                                |  | EXCAVATION CONTRACTOR: KEN PALSON ENTERPRISES |  | PROJECT No.: W8140                                                                                                                                                                                            |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD: BACKHOE                    |  | TEST PIT No.: TP98-1                                                                                                                                                                                          |  |
| <b>TEST PIT LOG</b>                            |  | PLOTTED: _____                                |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                |  | CAD FILE No.: _____                           |  |                                                                                                                                                                                                               |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                      | STRATIGRAPHY<br>PLOT | SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |                |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, trace silt, brown, frozen<br><br><b>SAND (FILL)</b><br>- fine to medium grained, some fine grained gravel, some silt, black, moist<br><br><b>SAND AND GRAVEL (FILL)</b><br>- medium to coarse grained sand, coarse grained gravel, some cobbles, grey, saturated<br><br><b>SILT</b><br>- clayey, trace fine grained sand, light brown, soft, medium plasticity, moist |                      |                | 98-1-1           |                                       |      |       |             |                                    |
|           |                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |                | 98-1-5           |                                       |      |       |             |                                    |
|           |                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |                | 98-1-2           |                                       |      |       |             |                                    |
|           |                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |                | 98-1-3           |                                       |      |       |             |                                    |
| 1         |                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |                | 98-1-4           |                                       |      |       |             |                                    |
| 2         | End of testpit at 1.5m                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                |                  |                                       |      |       |             |                                    |
| 3         |                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |                |                  |                                       |      |       |             |                                    |
| 4         |                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |                |                  |                                       |      |       |             |                                    |
| 5         |                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |                |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |                |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |                |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |                |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |                |                  |                                       |      |       |             |                                    |

**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m): N/A

TOP OF CASING ELEVATION (m): N/A

DATE EXCAVATED: 1998 11 18

OBSERVED WATER LEVEL: N/A

LOGGED BY: JDT

**LEGEND**

cuttings

SHEET 1 OF 1

|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|--------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | EXCAVATION CONTRACTOR:<br>KEN PALSON ENTERPRISES |  | PROJECT No.:<br>W8140                                                                                                                                                                                         |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD:<br>BACKHOE                    |  | TEST PIT No.:<br>TP98-2                                                                                                                                                                                       |  |
| <b>TEST PIT LOG</b>                               |  | PLOTTED:                                         |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                   |  | CAD FILE No.:                                    |  |                                                                                                                                                                                                               |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                                       | STRATIGRAPHY<br>PLOT | SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                                        |                      |                |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, fine to coarse grained gravel, clayey, some silt, brown, frozen                                                        | X                    | X              | *98-2-1          | ▲                                     |      |       |             | X                                  |
| 1         | <b>SAND (FILL)</b><br>- fine grained, some silt, some fine to coarse grained gravel, clay chunks, trace coarse grained sand, dark brown, moist, metal and wood debris, concrete pieces |                      |                | 98-2-2           | ▲                                     |      |       |             |                                    |
|           | <b>ORGANIC CLAY</b><br>- trace silt, black to grey, firm, medium to high plasticity, moist                                                                                             |                      |                | 98-2-3           | ▲                                     |      |       |             |                                    |
| 2         | End of testpit at 1.8m                                                                                                                                                                 |                      |                |                  |                                       |      |       |             |                                    |
| 3         |                                                                                                                                                                                        |                      |                |                  |                                       |      |       |             |                                    |
| 4         |                                                                                                                                                                                        |                      |                |                  |                                       |      |       |             |                                    |
| 5         |                                                                                                                                                                                        |                      |                |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                                                        |                      |                |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                                        |                      |                |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                                        |                      |                |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                                        |                      |                |                  |                                       |      |       |             |                                    |



**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE EXCAVATED: 1998 11 18

OBSERVED WATER LEVEL: N/A

LOGGED BY:  
JDT

SHEET 1 OF 1

• submitted for laboratory analysis

**LEGEND**  
 cuttings

|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|--------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | EXCAVATION CONTRACTOR:<br>KEN PALSON ENTERPRISES |  | PROJECT No.:<br>W8140                                                                                                                                                                                         |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD:<br>BACKHOE                    |  | TEST PIT No.:<br>TP98-3                                                                                                                                                                                       |  |
| <b>TEST PIT LOG</b>                               |  | PLOTTED:                                         |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                   |  | CAD FILE No.:                                    |  |                                                                                                                                                                                                               |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                   | STRATIGRAPHY<br>PLOT | SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                    |                      |                |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND (FILL)</b><br>- brown, frozen                                                                                                              | <br><br>             |                |                  |                                       |      |       |             |                                    |
|           | <b>SILT (FILL)</b><br>- clayey, trace coarse grained sand, trace gravel,<br>brown to light brown, moist, metal and concrete<br>debris, wood pieces |                      | 98-3-1         |                  |                                       |      |       |             |                                    |
| 1         |                                                                                                                                                    |                      |                |                  |                                       |      |       |             |                                    |
|           | <b>ORGANIC CLAY</b><br>- silty, black, soft, medium plasticity, moist to wet                                                                       | 98-3-2               |                |                  |                                       |      |       |             |                                    |
| 2         | End of testpit at 1.8m                                                                                                                             |                      |                |                  |                                       |      |       |             |                                    |
| 3         |                                                                                                                                                    |                      |                |                  |                                       |      |       |             |                                    |
| 4         |                                                                                                                                                    |                      |                |                  |                                       |      |       |             |                                    |
| 5         |                                                                                                                                                    |                      |                |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                    |                      |                |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                    |                      |                |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                    |                      |                |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                    |                      |                |                  |                                       |      |       |             |                                    |

**MORROW  
ENVIRONMENTAL  
CONSULTANTS INC.**

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE EXCAVATED: 1998 11 18

OBSERVED WATER LEVEL: N/A

LOGGED BY:  
JDT

**LEGEND**

cuttings

SHEET 1 OF 1

|                                                   |  |                                                  |  |                                                                                                                                                                                                                |  |
|---------------------------------------------------|--|--------------------------------------------------|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | EXCAVATION CONTRACTOR:<br>KEN PALSON ENTERPRISES |  | PROJECT No.:<br>WB140                                                                                                                                                                                          |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD:<br>BACKHOE                    |  | TEST PIT No.:<br>TP98-4                                                                                                                                                                                        |  |
| <b>TEST PIT LOG</b>                               |  | PLOTTED:                                         |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHIELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                   |  | CAD FILE No.:                                    |  |                                                                                                                                                                                                                |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                                                                                                  | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                                                                                                   |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND (FILL)</b><br>- gravelly, some silt, black to dark brown, frozen<br><b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, trace coarse grained sand, trace cobbles, brown, dry to moist, concrete and metal debris, wood pieces | X                                      | 98-4-1           | ▲                                     |      |       |             | [Pattern]                          |
| 1         | <b>SILT AND CLAY (FILL)</b><br>- trace coarse grained sand, trace gravel, light brown to brown, moist                                                                                                                                             |                                        | *98-4-2          | ▲                                     |      |       |             |                                    |
|           | <b>ORGANIC CLAY</b><br>- silty, medium plasticity, crumbly, moist to wet<br>- olive brown below 1.8m                                                                                                                                              |                                        | *98-4-3          | ▲                                     |      |       |             |                                    |
| 2         | End of testpit at 1.9m                                                                                                                                                                                                                            |                                        |                  |                                       |      |       |             |                                    |
| 3         |                                                                                                                                                                                                                                                   |                                        |                  |                                       |      |       |             |                                    |
| 4         |                                                                                                                                                                                                                                                   |                                        |                  |                                       |      |       |             |                                    |
| 5         |                                                                                                                                                                                                                                                   |                                        |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                                                                                                                   |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                                                                                                   |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                                                                                                   |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                                                                                                   |                                        |                  |                                       |      |       |             |                                    |



**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE EXCAVATED: 1998 11 18

OBSERVED WATER LEVEL:

LOGGED BY:  
JDT

SHEET 1 OF 1

\* submitted for laboratory analysis

**LEGEND**  
[Pattern] cuttings

|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|--------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | EXCAVATION CONTRACTOR:<br>KEN PALSON ENTERPRISES |  | PROJECT No.:<br>W8140                                                                                                                                                                                         |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD:<br>BACKHOE                    |  | TEST PIT No.:<br>TP98-5                                                                                                                                                                                       |  |
| <b>TEST PIT LOG</b>                               |  | PLOTTED:<br>CAD FILE No.:                        |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                                | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                                 |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, trace coarse grained sand, brown, frozen<br>- not frozen below 0.2m                                             |                                        | *98-5-1          | ▲                                     |      |       |             |                                    |
| 1         | <b>SAND (FILL)</b><br>- medium grained, gravelly, brown, dry to moist<br>- fine to medium grained, some gravel, trace coarse grained sand below 0.5m<br>- dark brown below 0.9m |                                        | 98-5-2           | ▲                                     |      |       |             |                                    |
|           |                                                                                                                                                                                 |                                        | 98-5-3           | ▲                                     |      |       |             |                                    |
| 2         | <b>SILT (FILL)</b><br>- some clay, some organics, trace coarse grained sand, light brown to grey, soft, medium plasticity, moist<br>- silt and clay below 1.8m                  |                                        | 98-5-4           | ▲                                     |      |       |             |                                    |
|           |                                                                                                                                                                                 |                                        | 98-5-5           | ▲                                     |      |       |             |                                    |
| 3         | <b>ORGANIC SILT</b><br>- clayey, light brown, mottled grey and black, firm, medium plasticity                                                                                   |                                        |                  |                                       |      |       |             |                                    |
| 4         | End of testpit at 2.1m                                                                                                                                                          |                                        |                  |                                       |      |       |             |                                    |
| 5         |                                                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |

GROUND SURFACE ELEVATION (m):  
N/A  
 TOP OF CASING ELEVATION (m):  
N/A

DATE EXCAVATED: 1998 11 18  
 OBSERVED WATER LEVEL: N/A  
 LOGGED BY:  
JDT

SHEET 1 OF 1

|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|--------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | EXCAVATION CONTRACTOR:<br>KEN PALSON ENTERPRISES |  | PROJECT No.:<br>W8140                                                                                                                                                                                         |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD:<br>BACKHOE                    |  | TEST PIT No.:<br>TP98-6                                                                                                                                                                                       |  |
| <b>TEST PIT LOG</b>                               |  | PLOTTED:<br>CAD FILE No.:                        |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                               | STRATIGRAPHY<br>PLOT | SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                                |                      |                |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SILT (FILL)</b><br>- some fine grained sand, trace fine grained gravel, trace coarse grained sand, clay chunks, organics, brown to light brown, crumbly, moist, wood pieces | X                    | X              | 98-6-1           |                                       |      |       |             | X                                  |
| 1         | <b>SILT, CLAY, AND SAND (FILL)</b><br>- fine grained sand, light brown to brown, moist                                                                                         |                      |                | 98-6-2           |                                       |      |       |             |                                    |
| 2         |                                                                                                                                                                                |                      |                | *98-6-3          |                                       |      |       |             |                                    |
|           | <b>PEAT</b><br>- clayey, black, moist                                                                                                                                          |                      |                | 98-6-4           |                                       |      |       |             |                                    |
| 3         | End of testpit at 2.8m                                                                                                                                                         |                      |                |                  |                                       |      |       |             |                                    |
| 4         |                                                                                                                                                                                |                      |                |                  |                                       |      |       |             |                                    |
| 5         |                                                                                                                                                                                |                      |                |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                                                |                      |                |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                                |                      |                |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                                |                      |                |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                                |                      |                |                  |                                       |      |       |             |                                    |



**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE EXCAVATED: 1998 11 18

OBSERVED WATER LEVEL: N/A

LOGGED BY:  
JDT

**LEGEND**

 cuttings

SHEET 1 OF 1

|                                                   |  |                                                  |  |                                                                                                                                                                                                                          |  |
|---------------------------------------------------|--|--------------------------------------------------|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | EXCAVATION CONTRACTOR:<br>KEN PALSON ENTERPRISES |  | PROJECT No.:<br>W8140                                                                                                                                                                                                    |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD:<br>BACKHOE                    |  | TEST PIT No.:<br>TP98-7                                                                                                                                                                                                  |  |
| TEST PIT LOG                                      |  | PLOTTED:<br>CAD FILE No.:                        |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                   |  |                                                  |  |                                                                                                                                                                                                                          |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                       | STRATIGRAPHY<br>PLOT | SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|--------------------------------------------------------------------------------------------------------|----------------------|----------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                        |                      |                |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, trace silt, dark brown to black, moist | X                    | X              | *98-7-1          |                                       |      |       |             |                                    |
| 1         | <b>SILT AND CLAY (FILL)</b><br>- trace coarse grained sand, trace gravel, light brown to brown, moist  |                      |                | 98-7-2           |                                       |      |       |             |                                    |
|           | <b>ORGANIC CLAY</b><br>- silty, black to grey, firm to stiff, moist                                    |                      |                | 98-7-3           |                                       |      |       |             |                                    |
| 2         | End of testpit at 1.8m                                                                                 |                      |                |                  |                                       |      |       |             |                                    |
| 3         |                                                                                                        |                      |                |                  |                                       |      |       |             |                                    |
| 4         |                                                                                                        |                      |                |                  |                                       |      |       |             |                                    |
| 5         |                                                                                                        |                      |                |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                        |                      |                |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                        |                      |                |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                        |                      |                |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                        |                      |                |                  |                                       |      |       |             |                                    |

**MORROW  
ENVIRONMENTAL  
CONSULTANTS INC.**

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE EXCAVATED: 1998 11 18

OBSERVED WATER LEVEL: N/A

LOGGED BY:  
JDT

SHEET 1 OF 1

**LEGEND**

cuttings

|                                                   |  |                                                  |  |                                                                                                                                                                                                                |  |
|---------------------------------------------------|--|--------------------------------------------------|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | EXCAVATION CONTRACTOR:<br>KEN PALSON ENTERPRISES |  | PROJECT No.:<br>W8140                                                                                                                                                                                          |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD:<br>BACKHOE                    |  | TEST PIT No.:<br>TP98-8                                                                                                                                                                                        |  |
| TEST PIT LOG                                      |  | PLOTTED:<br>CAD FILE No.:                        |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHALLOW <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                   |  |                                                  |  |                                                                                                                                                                                                                |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                                              | STRATIGRAPHY<br>PLOT | SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                                               |                      |                |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>CLAY (FILL)</b><br>- some silt, trace gravel, trace organics, trace coarse grained sand, dark brown, firm, moist, metal debris<br>- 25mm layer of sulphur at 0.6m<br>- gravelly below 0.9m |                      |                | 98-8-1           |                                       |      |       |             |                                    |
| 1         | - silty, silt inclusions, mottled light brown and black, wet below 1.2m                                                                                                                       |                      |                | 98-8-2           |                                       |      |       |             |                                    |
| 2         |                                                                                                                                                                                               |                      |                | 98-8-3           |                                       |      |       |             |                                    |
|           | <b>CRUSHED GLASS</b><br>- organics, some silt, black, saturated                                                                                                                               |                      |                | 98-8-4           |                                       |      |       |             |                                    |
| 3         | <b>ORGANIC CLAY</b><br>- some silt, black to grey, mottled brown and rust brown, soft, medium to high plasticity, moist<br><br>End of testpit at 3.2m                                         |                      |                | 98-8-5           |                                       |      |       |             |                                    |
| 4         |                                                                                                                                                                                               |                      |                |                  |                                       |      |       |             |                                    |
| 5         |                                                                                                                                                                                               |                      |                |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                                                               |                      |                |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                                               |                      |                |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                                               |                      |                |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                                               |                      |                |                  |                                       |      |       |             |                                    |

GROUND SURFACE ELEVATION (m):  
N/A  
 TOP OF CASING ELEVATION (m):  
N/A

DATE EXCAVATED: 1998 11 18  
 OBSERVED WATER LEVEL: N/A  
 LOGGED BY:  
JDT

SHEET 1 OF 1

|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|--------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | EXCAVATION CONTRACTOR:<br>KEN PALSON ENTERPRISES |  | PROJECT No.:<br>W8140                                                                                                                                                                                         |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD:<br>BACKHOE                    |  | TEST PIT No.:<br>TP98-9                                                                                                                                                                                       |  |
| <b>TEST PIT LOG</b>                               |  | PLOTTED:<br>CAD FILE No.:                        |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                          | STRATIGRAPHY<br>PLOT | SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|-----------------------------------------------------------------------------------------------------------|----------------------|----------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                           |                      |                |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- brown, dry, frozen                                                     | [Pattern]            | X              | 98-9-1           |                                       |      |       | [Pattern]   |                                    |
|           | <b>SAND (FILL)</b><br>- fine to medium grained, trace gravel, brown, moist, metal debris                  |                      |                | 98-9-2           |                                       |      |       |             |                                    |
| 1         | <b>SAND AND GRAVEL (FILL)</b><br>- medium and coarse grained sand, some silt, black, dry to moist         |                      |                | 98-9-3           |                                       |      |       |             |                                    |
|           | <b>CLAY (FILL)</b><br>- silty, trace medium grained sand, trace gravel, light brown to brown, firm, moist |                      |                | X                | 98-9-4                                |      |       |             |                                    |
| 2         | - silt and clay below 1.7m<br>- glass chunks at 1.9m                                                      |                      |                |                  |                                       |      |       |             |                                    |
|           | <b>PEAT</b><br>- silty, trace clay, black, fibrous, wet                                                   |                      |                |                  |                                       |      |       |             |                                    |
| 3         | End of testpit at 2.4m                                                                                    |                      |                |                  |                                       |      |       |             |                                    |
| 4         |                                                                                                           |                      |                |                  |                                       |      |       |             |                                    |
| 5         |                                                                                                           |                      |                |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                           |                      |                |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                           |                      |                |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                           |                      |                |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                           |                      |                |                  |                                       |      |       |             |                                    |



**MORROW  
ENVIRONMENTAL  
CONSULTANTS INC.**

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE EXCAVATED: 1998 11 18

OBSERVED WATER LEVEL: N/A

LOGGED BY:  
JDT

SHEET 1 OF 1

\* submitted for laboratory analysis

LEGEND  
[Pattern] cuttings

|                                                |  |                                               |  |                                                                                                                                                                                                               |  |
|------------------------------------------------|--|-----------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT: CP RAIL                                |  | EXCAVATION CONTRACTOR: KEN PALSON ENTERPRISES |  | PROJECT No.: W8140                                                                                                                                                                                            |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD: BACKHOE                    |  | TEST PIT No.: TP98-10                                                                                                                                                                                         |  |
| <b>TEST PIT LOG</b>                            |  | PLOTTED: CAD FILE No.:                        |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                |  |                                               |  |                                                                                                                                                                                                               |  |

| DEPTH (m)              | SOIL DESCRIPTION                                                                                                  | STRATIGRAPHY PLOT | SAMPLE TYPE | SAMPLE NUMBER | SOIL VAPOUR CONCENTRATION (ppm) |      |       | WATER LEVEL | MONITORING WELL INSTALLATION |
|------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------|-------------|---------------|---------------------------------|------|-------|-------------|------------------------------|
|                        |                                                                                                                   |                   |             |               | 100                             | 1000 | 10000 |             |                              |
| 0                      | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, trace coarse grained sand, brown, frozen          | X                 | X           | 98-10-1       |                                 |      |       |             | X                            |
| 1                      | <b>SILT, SAND, GRAVEL (FILL)</b><br>- medium to coarse grained sand, light brown to brown, moist, concrete pieces |                   |             | 98-10-2       |                                 |      |       |             |                              |
|                        | <b>SILT (FILL)</b><br>- some clay, trace gravel, trace coarse grained sand, light brown, firm, moist              |                   |             | 98-10-3       |                                 |      |       |             |                              |
| 2                      | <b>ORGANIC CLAY</b><br>- trace silt, dark brown to black, mottled olive brown, firm to stiff, moist               |                   |             |               |                                 |      |       |             |                              |
| End of testpit at 1.8m |                                                                                                                   |                   |             |               |                                 |      |       |             |                              |
| 3                      |                                                                                                                   |                   |             |               |                                 |      |       |             |                              |
| 4                      |                                                                                                                   |                   |             |               |                                 |      |       |             |                              |
| 5                      |                                                                                                                   |                   |             |               |                                 |      |       |             |                              |
| 6                      |                                                                                                                   |                   |             |               |                                 |      |       |             |                              |
| 7                      |                                                                                                                   |                   |             |               |                                 |      |       |             |                              |
| 8                      |                                                                                                                   |                   |             |               |                                 |      |       |             |                              |
| 9                      |                                                                                                                   |                   |             |               |                                 |      |       |             |                              |

• submitted for laboratory analysis

**LEGEND**

cuttings

|     |                               |                            |
|-----|-------------------------------|----------------------------|
|     | GROUND SURFACE ELEVATION (m): | DATE EXCAVATED: 1998 11 18 |
|     | N/A                           | OBSERVED WATER LEVEL: N/A  |
|     | TOP OF CASING ELEVATION (m):  | LOGGED BY:                 |
| N/A | JDT                           | SHEET 1 OF 1               |

|                                                |  |                                               |  |                                                                                                                                                                                                               |  |
|------------------------------------------------|--|-----------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT: CP RAIL                                |  | EXCAVATION CONTRACTOR: KEN PALSON ENTERPRISES |  | PROJECT No.: W8140                                                                                                                                                                                            |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD: BACKHOE                    |  | TEST PIT No.: TP98-11                                                                                                                                                                                         |  |
| TEST PIT LOG                                   |  | PLOTTED:                                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                |  | CAD FILE No.:                                 |  |                                                                                                                                                                                                               |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                                            | STRATIGRAPHY PLOT | SAMPLE TYPE | SAMPLE NUMBER | SOIL VAPOUR CONCENTRATION (ppm) |      |       | WATER LEVEL | MONITORING WELL INSTALLATION |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------|---------------|---------------------------------|------|-------|-------------|------------------------------|
|           |                                                                                                                                                                                             |                   |             |               | 100                             | 1000 | 10000 |             |                              |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, trace silt, silt chunks, trace cobbles, brown, moist, wood and metal debris<br>- trace organics, concrete pieces below 0.6m |                   |             | 98-11-1       |                                 |      |       |             |                              |
| 1         |                                                                                                                                                                                             |                   |             | 98-11-2       |                                 |      |       |             |                              |
|           | <b>ORGANIC SILT</b><br>- some clay, black, moist                                                                                                                                            |                   |             | *98-11-3      |                                 |      |       |             |                              |
| 2         | End of testpit at 1.8m                                                                                                                                                                      |                   |             |               |                                 |      |       |             |                              |
| 3         |                                                                                                                                                                                             |                   |             |               |                                 |      |       |             |                              |
| 4         |                                                                                                                                                                                             |                   |             |               |                                 |      |       |             |                              |
| 5         |                                                                                                                                                                                             |                   |             |               |                                 |      |       |             |                              |
| 6         |                                                                                                                                                                                             |                   |             |               |                                 |      |       |             |                              |
| 7         |                                                                                                                                                                                             |                   |             |               |                                 |      |       |             |                              |
| 8         |                                                                                                                                                                                             |                   |             |               |                                 |      |       |             |                              |
| 9         |                                                                                                                                                                                             |                   |             |               |                                 |      |       |             |                              |

\* submitted for laboratory analysis

**LEGEND**

cuttings

|  |                               |                            |
|--|-------------------------------|----------------------------|
|  | GROUND SURFACE ELEVATION (m): | DATE EXCAVATED: 1998 11 18 |
|  | N/A                           | OBSERVED WATER LEVEL: N/A  |
|  | TOP OF CASING ELEVATION (m):  | LOGGED BY:                 |
|  | N/A                           | JDT                        |
|  |                               | SHEET 1 OF 1               |

|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|--------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | EXCAVATION CONTRACTOR:<br>KEN PALSON ENTERPRISES |  | PROJECT No.:<br>W81408                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD:<br>BACKHOE                    |  | TEST PIT No.:<br>TP99-12                                                                                                                                                                                      |  |
| <b>TEST PIT LOG</b>                               |  | PLOTTED:                                         |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                   |  | CAD FILE No.:                                    |  |                                                                                                                                                                                                               |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                 | STRATIGRAPHY<br>PLOT | SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|----------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                  |                      |                |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- some silt, brown, wet<br>- light brown below 0.1m                                             |                      |                | 99-12-1          |                                       |      |       |             |                                    |
|           | <b>SAND (FILL)</b><br>- fine to medium grained sand, some fine grained gravel, grey to black                                     |                      |                | 99-12-2          |                                       |      |       |             |                                    |
|           |                                                                                                                                  |                      |                | 99-12-3          |                                       |      |       |             |                                    |
| 1         | <b>SAND AND GRAVEL (FILL)</b><br>- medium grained sand, trace coarse grained sand, grey, wet<br>- coarse grained sand below 0.8m |                      |                | 99-12-4          |                                       |      |       |             |                                    |
| 2         | <b>ORGANIC SILT</b><br>- trace clay, dark brown to grey, low plasticity, moist                                                   |                      |                |                  |                                       |      |       |             |                                    |
|           | <b>CLAY</b><br>- some silt, light olive brown, soft, medium plasticity, crumbly                                                  |                      |                |                  |                                       |      |       |             |                                    |
| 3         | End of testpit at 1.4m                                                                                                           |                      |                |                  |                                       |      |       |             |                                    |
| 4         |                                                                                                                                  |                      |                |                  |                                       |      |       |             |                                    |
| 5         |                                                                                                                                  |                      |                |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                  |                      |                |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                  |                      |                |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                  |                      |                |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                  |                      |                |                  |                                       |      |       |             |                                    |

\* submitted for laboratory analysis

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE EXCAVATED: 1999 10 07

OBSERVED WATER LEVEL: N/A

LOGGED BY:  
JDT

SHEET 1 OF 1

|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|--------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | EXCAVATION CONTRACTOR:<br>KEN PALSON ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD:<br>BACKHOE                    |  | TEST PIT No.:<br>TP99-13                                                                                                                                                                                      |  |
| <b>TEST PIT LOG</b>                               |  | PLOTTED:                                         |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                   |  | CAD FILE No.:                                    |  |                                                                                                                                                                                                               |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                               | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER                         | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------------------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                        |                                          | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, trace silt, brown, wet<br><br><b>SAND (FILL)</b><br>- fine to medium grained sand, trace silt, light brown, wet<br>- medium grained sand, some gravel, grey below 0.25m<br><br><b>GRAVEL (FILL)</b><br>- sandy (medium and coarse grained), light brown, saturated<br><br><b>CLAY</b><br>- some silt, light olive brown, soft, medium plasticity, crumbly, moist<br><br>End of testpit at 1.5m |                                        | 99-13-1<br>99-13-2<br>99-13-3<br>99-13-4 |                                       |      |       |             |                                    |
| 1         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                        |                                          |                                       |      |       |             |                                    |
| 2         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                        |                                          |                                       |      |       |             |                                    |
| 3         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                        |                                          |                                       |      |       |             |                                    |
| 4         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                        |                                          |                                       |      |       |             |                                    |
| 5         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                        |                                          |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                        |                                          |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                        |                                          |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                        |                                          |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                        |                                          |                                       |      |       |             |                                    |



**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE EXCAVATED: 1999 10 07

OBSERVED WATER LEVEL: N/A

LOGGED BY:  
JDT

SHEET 1 OF 1

**LEGEND**

 cuttings

|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|--------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | EXCAVATION CONTRACTOR:<br>KEN PALSON ENTERPRISES |  | PROJECT No.:<br>WB140B                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD:<br>BACKHOE                    |  | TEST PIT No.:<br>TP99-14                                                                                                                                                                                      |  |
| <b>TEST PIT LOG</b>                               |  | PLOTTED:<br>CAD FILE No.:                        |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                    | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                     |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, trace silt,<br>trace coarse grained sand, brown, moist                              |                                        | 99-14-1          |                                       | ▲    |       |             |                                    |
|           | <b>SAND (FILL)</b><br>- some gravel to gravelly, trace silt, cinders,<br>black, moist, glass pieces                                                 |                                        | 99-14-3          | ▲                                     |      |       |             |                                    |
|           |                                                                                                                                                     |                                        | 99-14-2          |                                       | ▲    |       |             |                                    |
| 1         | <b>GRAVEL (FILL)</b><br>- trace to some sand, trace silt, black,<br>saturated<br>- water running into test pit at 0.5m                              |                                        | *99-14-4         |                                       |      | ▲     |             |                                    |
|           |                                                                                                                                                     |                                        | 99-14-5          |                                       |      | ▲     |             |                                    |
| 2         | <b>CLAY</b><br>- organic, some silt, black, soft, medium<br>plasticity, crumbly, moist<br>- dark olive brown below 0.8m<br>- olive brown below 0.9m |                                        |                  |                                       |      |       |             |                                    |
| 3         | <b>SILT</b><br>- light brown, soft, wet, no plasticity<br><br>End of testpit at 2.1m                                                                |                                        |                  |                                       |      |       |             |                                    |
| 4         |                                                                                                                                                     |                                        |                  |                                       |      |       |             |                                    |
| 5         |                                                                                                                                                     |                                        |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                     |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                     |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                     |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                     |                                        |                  |                                       |      |       |             |                                    |

**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE EXCAVATED: 1999 10 07

OBSERVED WATER LEVEL: N/A

LOGGED BY:  
JDT

SHEET 1 OF 1

\* submitted for laboratory analysis

**LEGEND**  
 cuttings

|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|--------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | EXCAVATION CONTRACTOR:<br>KEN PALSON ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD:<br>BACKHOE                    |  | TEST PIT No.:<br>TP99-15                                                                                                                                                                                      |  |
| <b>TEST PIT LOG</b>                               |  | PLOTTED:<br>CAD FILE No.:                        |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER                         | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------------------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                        |                                          | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>GRAVEL (FILL)</b><br>- trace sand, light brown, moist<br><br><b>SAND (FILL)</b><br>- fine to medium grained sand, some fine grained gravel, trace silt, brown, moist<br>- dark brown below 0.2m<br>- gravelly, rust brown below 0.5m<br><br><b>GRAVEL (FILL)</b><br>- some medium and coarse grained sand, trace silt, grey, saturated<br><br><b>ORGANIC SILT</b><br>- trace fine grained sand, dark brown, soft, moist, no plasticity<br><br><b>CLAY</b><br>- some silt to silty, trace fine grained sand, light brown, soft, medium plasticity, crumbly, moist |                                        | 99-15-1<br>99-15-2<br>99-15-3<br>99-15-4 |                                       |      |       |             |                                    |
| 1         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                        |                                          |                                       |      |       |             |                                    |
| 2         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                        |                                          |                                       |      |       |             |                                    |
| 3         | End of testpit at 1.6m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                        |                                          |                                       |      |       |             |                                    |
| 4         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                        |                                          |                                       |      |       |             |                                    |
| 5         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                        |                                          |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                        |                                          |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                        |                                          |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                        |                                          |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                        |                                          |                                       |      |       |             |                                    |



**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE EXCAVATED: 1999 10 07

OBSERVED WATER LEVEL: N/A

LOGGED BY:  
JDT

**LEGEND**

cuttings

SHEET 1 OF 1

|                                                |  |                                               |  |                                                                                                                                                                                                               |  |
|------------------------------------------------|--|-----------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT: CP RAIL                                |  | EXCAVATION CONTRACTOR: KEN PALSON ENTERPRISES |  | PROJECT No.: W8140B                                                                                                                                                                                           |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD: BACKHOE                    |  | TEST PIT No.: TP99-16                                                                                                                                                                                         |  |
| TEST PIT LOG                                   |  | PLOTTED:                                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                |  | CAD FILE No.:                                 |  |                                                                                                                                                                                                               |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                                          | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                                           |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, fine to coarse grained gravel, clay chunks, some silt, brown to grey, moist, metal debris<br>- concrete pieces below 0.5m |                                        | *99-16-1 ▲       |                                       |      |       |             |                                    |
| 1         |                                                                                                                                                                                           |                                        | 99-16-2 ▲        |                                       |      |       |             |                                    |
| 2         | <b>ORGANIC CLAY</b><br>- some silt, black, firm, medium plasticity, moist<br><br>End of testpit at 1.7m                                                                                   |                                        |                  |                                       |      |       |             |                                    |
| 3         |                                                                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |
| 4         |                                                                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |
| 5         |                                                                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |

\* submitted for laboratory analysis

|                                      |                            |
|--------------------------------------|----------------------------|
| GROUND SURFACE ELEVATION (m):<br>N/A | DATE EXCAVATED: 1999 10 07 |
| TOP OF CASING ELEVATION (m):<br>N/A  | OBSERVED WATER LEVEL: N/A  |
|                                      | LOGGED BY:<br>JDT          |
|                                      | SHEET <u>1</u> OF <u>1</u> |

**LEGEND**

cuttings

|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|--------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | EXCAVATION CONTRACTOR:<br>KEN PALSON ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD:<br>BACKHOE                    |  | TEST PIT No.:<br>TP99-17                                                                                                                                                                                      |  |
| TEST PIT LOG                                      |  | PLOTTED:<br>CAD FILE No.:                        |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHIELD <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                                                                                                                                                                                                                        | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                                                                                                                                                                                                                         |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, fine to coarse grained gravel, trace silt, brown to dark brown, dry to moist, metal debris<br>- clay chunks, concrete pieces below 0.6m<br>- porous rock at 0.9m<br><br><b>ORGANIC CLAY</b><br>- trace silt, black, soft to firm, medium to high plasticity, moist to wet<br><br>End of testpit at 1.8m |                                        | 99-17-1          |                                       |      |       |             |                                    |
| 99-17-2   |                                                                                                                                                                                                                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 99-17-3   |                                                                                                                                                                                                                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 99-17-4   |                                                                                                                                                                                                                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 1         |                                                                                                                                                                                                                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 2         |                                                                                                                                                                                                                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 3         |                                                                                                                                                                                                                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 4         |                                                                                                                                                                                                                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 5         |                                                                                                                                                                                                                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                                                                                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                                                                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                                                                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                                                                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |

**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE EXCAVATED: 1999 10 07

OBSERVED WATER LEVEL: N/A

LOGGED BY:  
JDT

SHEET 1 OF 1

**LEGEND**

cuttings

|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|--------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | EXCAVATION CONTRACTOR:<br>KEN PALSON ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD:<br>BACKHOE                    |  | TEST PIT No.:<br>TP99-18                                                                                                                                                                                      |  |
| <b>TEST PIT LOG</b>                               |  | PLOTTED:<br>CAD FILE No.:                        |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                   | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                                                                                                                                                                                                                                                    |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, fine to coarse grained gravel, trace to some silt, clay chunks, brown, moist, metal and wood debris<br>- concrete pieces below 0.3m<br>- porous rock at 0.6m<br>- clayey below 1.2m<br><br><b>ORGANIC CLAY</b><br>- trace silt, black to grey, soft to firm, medium to high plasticity, moist to wet<br><br>End of testpit at 1.7m |                                        | 99-18-1          |                                       |      |       |             |                                    |
| 99-18-2   |                                                                                                                                                                                                                                                                                                                                                                                                    |                                        |                  |                                       |      |       |             |                                    |
| 99-18-4   |                                                                                                                                                                                                                                                                                                                                                                                                    |                                        |                  |                                       |      |       |             |                                    |
| 99-18-3   |                                                                                                                                                                                                                                                                                                                                                                                                    |                                        |                  |                                       |      |       |             |                                    |
| 1         |                                                                                                                                                                                                                                                                                                                                                                                                    |                                        |                  |                                       |      |       |             |                                    |
| 2         |                                                                                                                                                                                                                                                                                                                                                                                                    |                                        |                  |                                       |      |       |             |                                    |
| 3         |                                                                                                                                                                                                                                                                                                                                                                                                    |                                        |                  |                                       |      |       |             |                                    |
| 4         |                                                                                                                                                                                                                                                                                                                                                                                                    |                                        |                  |                                       |      |       |             |                                    |
| 5         |                                                                                                                                                                                                                                                                                                                                                                                                    |                                        |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                                                                                                                                                                                                                                                                    |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                                                                                                                                                                                                                                                    |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                                                                                                                                                                                                                                                    |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                                                                                                                                                                                                                                                    |                                        |                  |                                       |      |       |             |                                    |

**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE EXCAVATED: 1999 10 07

OBSERVED WATER LEVEL: N/A

LOGGED BY:  
JDT

SHEET 1 OF 1

**LEGEND**

cuttings

|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|--------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | EXCAVATION CONTRACTOR:<br>KEN PALSON ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD:<br>BACKHOE                    |  | TEST PIT No.:<br>TP99-19                                                                                                                                                                                      |  |
| <b>TEST PIT LOG</b>                               |  | PLOTTED:<br>CAD FILE No.:                        |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                       | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER                          | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-------------------------------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                                                                                                                                                                                                                                        |                                        |                                           | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND, GRAVEL &amp; CLAY (FILL)</b><br>- fine to medium grained sand, fine grained gravel, brown, moist<br><br><b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, trace silt, brown, moist, concrete pieces, wood and metal debris<br>- clayey below 1.2m<br><br><b>ORGANIC CLAY</b><br>- peaty, trace silt, black to dark brown, soft, medium plasticity, moist to wet |                                        | 99-19-1<br>*99-19-2<br>99-19-3<br>99-19-4 |                                       |      |       |             |                                    |
| 1         |                                                                                                                                                                                                                                                                                                                                                                                        |                                        |                                           |                                       |      |       |             |                                    |
| 2         | End of testpit at 1.7m                                                                                                                                                                                                                                                                                                                                                                 |                                        |                                           |                                       |      |       |             |                                    |
| 3         |                                                                                                                                                                                                                                                                                                                                                                                        |                                        |                                           |                                       |      |       |             |                                    |
| 4         |                                                                                                                                                                                                                                                                                                                                                                                        |                                        |                                           |                                       |      |       |             |                                    |
| 5         |                                                                                                                                                                                                                                                                                                                                                                                        |                                        |                                           |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                                                                                                                                                                                                                                                        |                                        |                                           |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                                                                                                                                                                                                                                        |                                        |                                           |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                                                                                                                                                                                                                                        |                                        |                                           |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                                                                                                                                                                                                                                        |                                        |                                           |                                       |      |       |             |                                    |

**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE EXCAVATED: 1999 10 07

OBSERVED WATER LEVEL: N/A

LOGGED BY:  
JDT

SHEET 1 OF 1

\* submitted for laboratory analysis

**LEGEND**  
 cuttings

|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|--------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | EXCAVATION CONTRACTOR:<br>KEN PALSON ENTERPRISES |  | PROJECT No.:<br>W81408                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD:<br>BACKHOE                    |  | TEST PIT No.:<br>TP99-20                                                                                                                                                                                      |  |
| <b>TEST PIT LOG</b>                               |  | PLOTTED:                                         |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                   |  | CAD FILE No.:                                    |  |                                                                                                                                                                                                               |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                          | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                           |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, fine to coarse grained gravel, trace silt, clay chunks, dark brown to black, moist, wood and metal debris | X                                      | 99-20-1          | ▲                                     |      |       |             | X                                  |
|           |                                                                                                                                                                           |                                        | 99-20-2          | ▲                                     |      |       |             |                                    |
| 1         | <b>CLAY AND SILT (FILL)</b><br>- sandy (fine to medium grained), trace gravel, brown, low plasticity, moist                                                               |                                        | *99-20-3         |                                       | ▲    |       |             |                                    |
|           | <b>SAND (FILL)</b><br>- fine grained sand, gravelly, some clay, trace coarse grained sand, dark brown to black, moist                                                     |                                        | 99-20-4          |                                       | ▲    |       |             |                                    |
|           | <b>ORGANIC CLAY</b><br>- black to light grey, firm to stiff, high plasticity, moist                                                                                       |                                        | 99-20-5          |                                       | ▲    |       |             |                                    |
| 2         | - some clay to clayey below 1.4m                                                                                                                                          |                                        |                  |                                       |      |       |             |                                    |
| 3         | End of testpit at 1.8m                                                                                                                                                    |                                        |                  |                                       |      |       |             |                                    |
| 4         |                                                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |
| 5         |                                                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                           |                                        |                  |                                       |      |       |             |                                    |

\* submitted for laboratory analysis

**LEGEND**

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|  | GROUND SURFACE ELEVATION (m):<br>N/A | DATE EXCAVATED: 1999 10 07 |
|  | TOP OF CASING ELEVATION (m):<br>N/A  | OBSERVED WATER LEVEL: N/A  |
|  | LOGGED BY:<br>JDT                    |                            |
|  |                                      | SHEET <u>1</u> OF <u>1</u> |

|                                                |  |                                               |  |                                                                                                                                                                                                               |  |
|------------------------------------------------|--|-----------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT: CP RAIL                                |  | EXCAVATION CONTRACTOR: KEN PALSON ENTERPRISES |  | PROJECT No.: W8140B                                                                                                                                                                                           |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD: BACKHOE                    |  | TEST PIT No.: TP99-21                                                                                                                                                                                         |  |
| <b>TEST PIT LOG</b>                            |  | PLOTTED:                                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                |  | CAD FILE No.:                                 |  |                                                                                                                                                                                                               |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                       | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                        |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND (FILL)</b><br>- silty, light brown, dry to moist                                                                                               |                                        | 99-21-1          | ▲                                     |      |       |             |                                    |
|           | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, fine to coarse grained gravel, some silt, trace coarse grained sand, dark brown, moist |                                        | 99-21-2          | ▲                                     |      |       |             |                                    |
| 1         | <b>SAND (FILL)</b><br>- fine to medium grained sand, trace to some gravel, trace silt, grey, moist                                                     |                                        | 99-21-3          | ▲                                     |      |       |             |                                    |
|           | <b>SILT (FILL)</b><br>- trace clay, light brown, firm, low plasticity, moist                                                                           |                                        | 99-21-4          | ▲                                     |      |       |             |                                    |
| 2         | <b>ORGANIC CLAY</b><br>- light grey to black, firm to stiff, moist                                                                                     |                                        | 99-21-5          | ▲                                     |      |       |             |                                    |
| 3         | End of testpit at 2.4m                                                                                                                                 |                                        |                  |                                       |      |       |             |                                    |
| 4         |                                                                                                                                                        |                                        |                  |                                       |      |       |             |                                    |
| 5         |                                                                                                                                                        |                                        |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                        |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                        |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                        |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                        |                                        |                  |                                       |      |       |             |                                    |

**MORROW ENVIRONMENTAL CONSULTANTS INC.**

GROUND SURFACE ELEVATION (m): N/A

TOP OF CASING ELEVATION (m): N/A

DATE EXCAVATED: 1999 10 07

OBSERVED WATER LEVEL: N/A

LOGGED BY: JDT

SHEET 1 OF 1

\* submitted for laboratory analysis

**LEGEND**  
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|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|--------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | EXCAVATION CONTRACTOR:<br>KEN PALSON ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD:<br>BACKHOE                    |  | TEST PIT No.:<br>TP99-22                                                                                                                                                                                      |  |
| <b>TEST PIT LOG</b>                               |  | PLOTTED:                                         |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                   |  | CAD FILE No.:                                    |  |                                                                                                                                                                                                               |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                      | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                       |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, fine to coarse grained gravel, trace silt, brown, moist, concrete pieces, wood debris |                                        | 99-22-1          |                                       |      |       |             |                                    |
|           |                                                                                                                                                       |                                        | 99-22-2          |                                       |      |       |             |                                    |
| 1         | <b>SILT (FILL)</b><br>- some clay, clay chunks, light brown, soft, medium plasticity, moist                                                           |                                        | 99-22-3          |                                       |      |       |             |                                    |
|           | <b>CLAY, SILT &amp; SAND (FILL)</b><br>- fine to medium grained sand, some organics, black to dark brown, soft, low plasticity, moist                 |                                        | 99-22-4          |                                       |      |       |             |                                    |
| 2         | <b>ORGANIC CLAY</b><br>- dark grey to dark brown, stiff, high plasticity, moist                                                                       |                                        |                  |                                       |      |       |             |                                    |
|           | End of testpit at 1.8m                                                                                                                                |                                        |                  |                                       |      |       |             |                                    |
| 3         |                                                                                                                                                       |                                        |                  |                                       |      |       |             |                                    |
| 4         |                                                                                                                                                       |                                        |                  |                                       |      |       |             |                                    |
| 5         |                                                                                                                                                       |                                        |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                       |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                       |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                       |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                       |                                        |                  |                                       |      |       |             |                                    |

**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE EXCAVATED: 1999 10 07

OBSERVED WATER LEVEL: N/A

LOGGED BY:  
JDT

SHEET 1 OF 1

**LEGEND**

cuttings

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|---------------------------------------------------|--|--------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | EXCAVATION CONTRACTOR:<br>KEN PALSON ENTERPRISES |  | PROJECT No.:<br>W81408                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD:<br>BACKHOE                    |  | TEST PIT No.:<br>TP99-23                                                                                                                                                                                      |  |
| <b>TEST PIT LOG</b>                               |  | PLOTTED:                                         |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                   |  | CAD FILE No.:                                    |  |                                                                                                                                                                                                               |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                  | STRATIGRAPHY<br>PLOT | SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                   |                      |                |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, fine to coarse grained gravel, trace silt, trace coarse grained sand, brown, dry  |                      |                | 99-23-1          |                                       |      |       |             |                                    |
| 1         |                                                                                                                                                   |                      |                | 99-23-2          |                                       |      |       |             |                                    |
|           |                                                                                                                                                   |                      |                | 99-23-3          |                                       |      |       |             |                                    |
| 2         | <b>CLAY AND SILT (FILL)</b><br>- trace fine to medium grained sand, light brown to black, firm, medium plasticity, moist<br>- organics below 1.8m |                      |                | 99-23-4          |                                       |      |       |             |                                    |
|           |                                                                                                                                                   |                      |                | 99-23-5          |                                       |      |       |             |                                    |
| 3         | <b>ORGANIC CLAY</b><br>- dark brown to black, stiff, medium to high plasticity, moist<br><br>End of testpit at 2.7m                               |                      |                |                  |                                       |      |       |             |                                    |
| 4         |                                                                                                                                                   |                      |                |                  |                                       |      |       |             |                                    |
| 5         |                                                                                                                                                   |                      |                |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                   |                      |                |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                   |                      |                |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                   |                      |                |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                   |                      |                |                  |                                       |      |       |             |                                    |

**MORROW  
ENVIRONMENTAL  
CONSULTANTS INC.**

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE EXCAVATED: 1999 10 07

OBSERVED WATER LEVEL: N/A

LOGGED BY:  
JDT

SHEET 1 OF 1

**LEGEND**

cuttings

|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|--------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | EXCAVATION CONTRACTOR:<br>KEN PALSON ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD:<br>BACKHOE                    |  | TEST PIT No.:<br>TP99-24                                                                                                                                                                                      |  |
| <b>TEST PIT LOG</b>                               |  | PLOTTED:                                         |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                   |  | CAD FILE No.:                                    |  |                                                                                                                                                                                                               |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                            | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE                                                                                                                                                                                                                      | SAMPLE<br>NUMBER    | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION                                                  |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|---------------------------------------|------|-------|-------------|-------------------------------------------------------------------------------------|
|           |                                                                                                                                             |                                                                                                                                                                                                                                                             |                     | 100                                   | 1000 | 10000 |             |                                                                                     |
| 0         | <b>BALLAST (FILL)</b><br>- crushed rock<br><b>SAND (FILL)</b><br>- fine to medium grained sand, silty, gravelly,<br>trace clay, grey, moist | <br><br> | *99-24-1<br>99-24-2 | ▲                                     |      |       |             |  |
| 1         | <b>SILT</b><br>- trace clay, light brown, firm, low plasticity,<br>dry to moist<br><br>End of testpit at 0.9m                               |                                                                                                                                                                                                                                                             |                     |                                       |      |       |             |                                                                                     |
| 2         |                                                                                                                                             |                                                                                                                                                                                                                                                             |                     |                                       |      |       |             |                                                                                     |
| 3         |                                                                                                                                             |                                                                                                                                                                                                                                                             |                     |                                       |      |       |             |                                                                                     |
| 4         |                                                                                                                                             |                                                                                                                                                                                                                                                             |                     |                                       |      |       |             |                                                                                     |
| 5         |                                                                                                                                             |                                                                                                                                                                                                                                                             |                     |                                       |      |       |             |                                                                                     |
| 6         |                                                                                                                                             |                                                                                                                                                                                                                                                             |                     |                                       |      |       |             |                                                                                     |
| 7         |                                                                                                                                             |                                                                                                                                                                                                                                                             |                     |                                       |      |       |             |                                                                                     |
| 8         |                                                                                                                                             |                                                                                                                                                                                                                                                             |                     |                                       |      |       |             |                                                                                     |
| 9         |                                                                                                                                             |                                                                                                                                                                                                                                                             |                     |                                       |      |       |             |                                                                                     |

\* submitted for laboratory analysis

**LEGEND**

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|  <b>MORROW<br/>ENVIRONMENTAL<br/>CONSULTANTS INC.</b> | GROUND SURFACE ELEVATION (m):<br>N/A | DATE EXCAVATED: 1999 10 28 |
|                                                                                                                                          | TOP OF CASING ELEVATION (m):<br>N/A  | OBSERVED WATER LEVEL: N/A  |
|                                                                                                                                          | LOGGED BY:<br>JDT                    | SHEET 1 OF 1               |

|                                                |  |                                               |  |                                                                                                                                                                                                               |  |
|------------------------------------------------|--|-----------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT: CP RAIL                                |  | EXCAVATION CONTRACTOR: KEN PALSON ENTERPRISES |  | PROJECT No.: W8140B                                                                                                                                                                                           |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD: BACKHOE                    |  | TEST PIT No.: TP99-25                                                                                                                                                                                         |  |
| <b>TEST PIT LOG</b>                            |  | PLOTTED:                                      |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                |  | CAD FILE No.:                                 |  |                                                                                                                                                                                                               |  |

| DEPTH (E) | SOIL DESCRIPTION                                                                                      | STRATIGRAPHY PLOT                                                                 | SAMPLE TYPE                                                                       | SAMPLE NUMBER | SOIL VAPOUR CONCENTRATION (ppm) |      |       | WATER LEVEL                                                                         | MONITORING WELL INSTALLATION |
|-----------|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------|---------------------------------|------|-------|-------------------------------------------------------------------------------------|------------------------------|
|           |                                                                                                       |                                                                                   |                                                                                   |               | 100                             | 1000 | 10000 |                                                                                     |                              |
| 0         | <b>BALLAST (FILL)</b><br>- crushed rock                                                               |  |  | *99-25-1      |                                 |      |       |  |                              |
|           | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, silty, cobbly, gravelly, black, moist |                                                                                   |                                                                                   | 99-25-2       |                                 |      |       |                                                                                     |                              |
| 1         | <b>SILT</b><br>- light brown, low to no plasticity, dry to moist                                      |                                                                                   |                                                                                   | 99-25-3       |                                 |      |       |                                                                                     |                              |
|           | <b>CLAY</b><br>- silty, silt partings, brown, stiff, high plasticity                                  |                                                                                   |                                                                                   |               |                                 |      |       |                                                                                     |                              |
| 2         | End of testpit at 1.4m                                                                                |                                                                                   |                                                                                   |               |                                 |      |       |                                                                                     |                              |
| 3         |                                                                                                       |                                                                                   |                                                                                   |               |                                 |      |       |                                                                                     |                              |
| 4         |                                                                                                       |                                                                                   |                                                                                   |               |                                 |      |       |                                                                                     |                              |
| 5         |                                                                                                       |                                                                                   |                                                                                   |               |                                 |      |       |                                                                                     |                              |
| 6         |                                                                                                       |                                                                                   |                                                                                   |               |                                 |      |       |                                                                                     |                              |
| 7         |                                                                                                       |                                                                                   |                                                                                   |               |                                 |      |       |                                                                                     |                              |
| 8         |                                                                                                       |                                                                                   |                                                                                   |               |                                 |      |       |                                                                                     |                              |
| 9         |                                                                                                       |                                                                                   |                                                                                   |               |                                 |      |       |                                                                                     |                              |



**MORROW ENVIRONMENTAL CONSULTANTS INC.**

GROUND SURFACE ELEVATION (m): N/A

TOP OF CASING ELEVATION (m): N/A

DATE EXCAVATED: 1999 10 28

OBSERVED WATER LEVEL: N/A

LOGGED BY: JDT

**LEGEND**

 cuttings

SHEET 1 OF 1

|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|--------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | EXCAVATION CONTRACTOR:<br>KEN PALSON ENTERPRISES |  | PROJECT No.:<br>W8140B                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD:<br>BACKHOE                    |  | TEST PIT No.:<br>TP99-26                                                                                                                                                                                      |  |
| <b>TEST PIT LOG</b>                               |  | PLOTTED:<br>CAD FILE No.:                        |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                             | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE                                            | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION                                                  |
|-----------|------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------|---------------------------------------|------|-------|-------------|-------------------------------------------------------------------------------------|
|           |                                                                                                                              |                                                                                   |                  | 100                                   | 1000 | 10000 |             |                                                                                     |
| 0         | <b>BALLAST (FILL)</b><br>- crushed rock                                                                                      |  | 99-26-1          |                                       |      |       |             |  |
|           | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, clayey, grey, moist<br>- no clay, concrete pieces below 0.5m |                                                                                   | *99-26-2         | ▲                                     |      |       |             |                                                                                     |
| 1         | <b>SILT</b><br>- trace to no clay, light brown, crumbly, no plasticity, moist                                                |                                                                                   | 99-26-3          | ▲                                     |      |       |             |                                                                                     |
|           |                                                                                                                              |                                                                                   | 99-26-4          | ▲                                     |      |       |             |                                                                                     |
| 2         | End of testpit at 1.3m                                                                                                       |                                                                                   |                  |                                       |      |       |             |                                                                                     |
| 3         |                                                                                                                              |                                                                                   |                  |                                       |      |       |             |                                                                                     |
| 4         |                                                                                                                              |                                                                                   |                  |                                       |      |       |             |                                                                                     |
| 5         |                                                                                                                              |                                                                                   |                  |                                       |      |       |             |                                                                                     |
| 6         |                                                                                                                              |                                                                                   |                  |                                       |      |       |             |                                                                                     |
| 7         |                                                                                                                              |                                                                                   |                  |                                       |      |       |             |                                                                                     |
| 8         |                                                                                                                              |                                                                                   |                  |                                       |      |       |             |                                                                                     |
| 9         |                                                                                                                              |                                                                                   |                  |                                       |      |       |             |                                                                                     |



**MORROW**  
ENVIRONMENTAL  
CONSULTANTS INC.

GROUND SURFACE ELEVATION (m):  
N/A

TOP OF CASING ELEVATION (m):  
N/A

DATE EXCAVATED: 1999 10 28

OBSERVED WATER LEVEL: N/A

LOGGED BY:  
JDT

**LEGEND**

 cuttings

SHEET 1 OF 1

|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|--------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | EXCAVATION CONTRACTOR:<br>KEN PALSON ENTERPRISES |  | PROJECT No.:<br>W81408                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD:<br>BACKHOE                    |  | TEST PIT No.:<br>TP99-27                                                                                                                                                                                      |  |
| <b>TEST PIT LOG</b>                               |  | PLOTTED:                                         |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                   |  | CAD FILE No.:                                    |  |                                                                                                                                                                                                               |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                                     | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER               | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|--------------------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                                      |                                        |                                | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>GRAVEL (FILL)</b><br>- trace fine to medium grained sand, brown, wet<br><b>CLAY (FILL)</b><br>- silty, light brown to greyish brown, stiff, moist<br>- gravelly, sandy below 0.5m |                                        | 99-27-1<br>*99-27-3<br>99-27-2 | ▲                                     | ▲    |       |             |                                    |
| 1         | <b>SILT</b><br>- light brown, crumbly, no plasticity, dry to moist<br>End of testpit at 1.0m                                                                                         |                                        |                                |                                       |      |       |             |                                    |
| 2         |                                                                                                                                                                                      |                                        |                                |                                       |      |       |             |                                    |
| 3         |                                                                                                                                                                                      |                                        |                                |                                       |      |       |             |                                    |
| 4         |                                                                                                                                                                                      |                                        |                                |                                       |      |       |             |                                    |
| 5         |                                                                                                                                                                                      |                                        |                                |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                                                      |                                        |                                |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                                      |                                        |                                |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                                      |                                        |                                |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                                      |                                        |                                |                                       |      |       |             |                                    |

\* submitted for laboratory analysis

**LEGEND**

cuttings

|  |                                      |                            |
|--|--------------------------------------|----------------------------|
|  | GROUND SURFACE ELEVATION (m):<br>N/A | DATE EXCAVATED: 1999 10 28 |
|  | TOP OF CASING ELEVATION (m):<br>N/A  | OBSERVED WATER LEVEL: N/A  |
|  | LOGGED BY:<br>JDT                    | SHEET <u>1</u> OF <u>1</u> |

|                                                |  |                                               |  |                                                                                                                                                                                                               |  |
|------------------------------------------------|--|-----------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT: CP RAIL                                |  | EXCAVATION CONTRACTOR: KEN PALSON ENTERPRISES |  | PROJECT No.: W8140B                                                                                                                                                                                           |  |
| LOCATION: WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD: BACKHOE                    |  | TEST PIT No.: TP99-28                                                                                                                                                                                         |  |
| <b>TEST PIT LOG</b>                            |  | PLOTTED: _____                                |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                |  | CAD FILE No.: _____                           |  |                                                                                                                                                                                                               |  |

| DEPTH (E) | SOIL DESCRIPTION                                                                                                                                                        | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                         |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>SAND AND GRAVEL (FILL)</b><br>- fine to medium grained sand, trace coarse grained sand, brown, dry                                                                   |                                        | 99-28-1          |                                       |      |       |             |                                    |
|           | <b>SILT AND CLAY (FILL)</b><br>- light brown to black, firm to stiff, low to medium plasticity, moist, wood pieces                                                      |                                        | 99-28-2          |                                       |      |       |             |                                    |
|           |                                                                                                                                                                         |                                        | 99-28-3          |                                       |      |       |             |                                    |
| 1         | <b>SAND (FILL)</b><br>- fine to medium grained sand, some clay, trace silt, trace coarse grained sand, trace gravel, black, moist<br>- no clay, glass pieces below 0.9m |                                        | 98-28-4          |                                       |      |       |             |                                    |
|           |                                                                                                                                                                         |                                        | 99-28-5          |                                       |      |       |             |                                    |
|           |                                                                                                                                                                         |                                        | 99-28-6          |                                       |      |       |             |                                    |
| 2         | <b>WASTE PAINT (FILL)</b><br>- dark rust brown, soft, semi-solid, sticky                                                                                                |                                        |                  |                                       |      |       |             |                                    |
|           | <b>SAND (FILL)</b><br>- fine to medium grained sand, trace silt, cinders, black, wet, metal and wood debris                                                             |                                        |                  |                                       |      |       |             |                                    |
| 3         | <b>CLAY</b> some silt, black to brown, stiff, medium plasticity, moist<br><br>End of testpit at 1.8m                                                                    |                                        |                  |                                       |      |       |             |                                    |
| 4         |                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 5         |                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                         |                                        |                  |                                       |      |       |             |                                    |

\* submitted for laboratory analysis

LEGEND

cuttings

|  |                               |                            |
|--|-------------------------------|----------------------------|
|  | GROUND SURFACE ELEVATION (m): | DATE EXCAVATED: 1999 10 28 |
|  | N/A                           | OBSERVED WATER LEVEL: N/A  |
|  | TOP OF CASING ELEVATION (m):  | LOGGED BY:                 |
|  | N/A                           | JDT                        |
|  |                               | SHEET 1 OF 1               |

|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |
|---------------------------------------------------|--|--------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLIENT:<br>CP RAIL                                |  | EXCAVATION CONTRACTOR:<br>KEN PALSON ENTERPRISES |  | PROJECT No.:<br>W81408                                                                                                                                                                                        |  |
| LOCATION:<br>WINNIPEG DIESEL SHOPS & WESTON SHOPS |  | EXCAVATION METHOD:<br>BACKHOE                    |  | TEST PIT No.:<br>TP99-29                                                                                                                                                                                      |  |
| TEST PIT LOG                                      |  | PLOTTED:<br>CAD FILE No.:                        |  | SAMPLE TYPE: <input type="checkbox"/> CORE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> SHELBY <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY |  |
|                                                   |  |                                                  |  |                                                                                                                                                                                                               |  |

| DEPTH (m) | SOIL DESCRIPTION                                                                                                                                                                                 | STRATIGRAPHY<br>PLOT<br>SAMPLE<br>TYPE | SAMPLE<br>NUMBER | SOIL VAPOUR<br>CONCENTRATION<br>(ppm) |      |       | WATER LEVEL | MONITORING<br>WELL<br>INSTALLATION |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------|---------------------------------------|------|-------|-------------|------------------------------------|
|           |                                                                                                                                                                                                  |                                        |                  | 100                                   | 1000 | 10000 |             |                                    |
| 0         | <b>CLAY AND SILT (FILL)</b><br>- light brown to brown, firm, medium plasticity, wet<br><br><b>SAND (FILL)</b><br>- fine to medium grained sand, some gravel, black, moist, wood and metal debris |                                        | 99-29-1          | ▲                                     |      |       |             |                                    |
|           |                                                                                                                                                                                                  |                                        | 99-29-2          | ▲                                     |      |       |             |                                    |
| 1         | <b>CLAY</b><br>- some silt, organics, dark brown to grey, firm, medium plasticity, wet<br><br>End of testpit at 1.2m                                                                             |                                        | 99-29-3          | ▲                                     |      |       |             |                                    |
| 2         |                                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |
| 3         |                                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |
| 4         |                                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |
| 5         |                                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |
| 6         |                                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |
| 7         |                                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |
| 8         |                                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |
| 9         |                                                                                                                                                                                                  |                                        |                  |                                       |      |       |             |                                    |

\* submitted for laboratory analysis

**LEGEND**

cuttings

|  |                                      |                            |
|--|--------------------------------------|----------------------------|
|  | GROUND SURFACE ELEVATION (m):<br>N/A | DATE EXCAVATED: 1999 10 28 |
|  | TOP OF CASING ELEVATION (m):<br>N/A  | OBSERVED WATER LEVEL: N/A  |
|  | LOGGED BY:<br>JDT                    | SHEET 1 OF 1               |

## **APPENDIX VI**

### **Survey Data**



713

Location: CP WESTON YARD, WPG Technician: JDT/SAD

Location: CP WESTON YARD, WPG

Technician: JDT/SAD

correction =  $1 \text{ mm} / 3 \text{ setups} = 0.33 \text{ mm} \therefore \text{NO CORRECTION}$

\* RECOPIED FROM FIELD NOTE BOOK

Date: 981201

Project No.: W8140

Location: CP WESTON YARD, WPG.

Technician: SAO/SDT

RECOPIED FROM FIELD NOTEBOOK



### Reference Elevation Record

Date: 981201

Project No.: W 8140

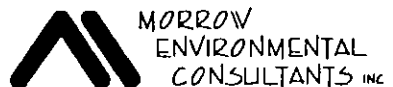
Location: CP WESTON YARD, WPG Technician: SAD/JDT

Technician: SAD/JDT

[illegible]

\* RELOADED FROM FIELD NOTEBOOK

4/13



## Reference Elevation Record \*

Date: 981201

Project No.: W 8140

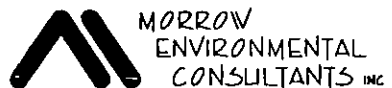
Location: CP WESTON YARD WPG Technician: SAD/JDT

| Station Number  | Backsight (m) | Height of Instrument (m) | Intermediate Foresight (m) | Foresight (m) | Corrected Reading (m) | Elevation (m) | Comments                         |
|-----------------|---------------|--------------------------|----------------------------|---------------|-----------------------|---------------|----------------------------------|
| Bm (24-008)     | 1.628         | 233.739                  |                            |               |                       | 232.111       | City of Wpg Bm 24-008            |
| TBM,            |               |                          |                            | 1.028         |                       | 232.711       | top of rail                      |
| Bm              |               |                          |                            | 1.628         |                       | 232.111       | 24-008                           |
| TBM,            | 1.706         | 234.417                  |                            |               |                       | 232.711       | AS ABOVE                         |
| FH44            |               |                          |                            | 0.747         |                       | 233.670       | FIRE HYDRANT #44, ON 'O' IN OPEN |
| TBM,            |               |                          |                            | 1.706         |                       | 232.711       | AS ABOVE                         |
| FH44            | 0.747         | 234.417                  |                            |               |                       | 233.670       | AS ABOVE                         |
| 98-28           |               |                          | 1.474                      |               |                       | 232.943       | 98-28 g                          |
| 98-28           |               |                          | 1.669                      |               |                       | 232.748       | 98-28 top                        |
| TP <sub>1</sub> | 1.854         | 234.600                  |                            | 1.669         | 1.671                 | 232.746       | 98-28 top                        |
| 98-27           |               |                          | 1.898                      |               |                       | 232.702       | 98-27 g                          |
| 98-27           |               |                          | 2.125                      |               |                       | 232.475       | 98-27 top                        |
| 98-26           |               |                          | 1.783                      |               |                       | 232.817       | 98-26 g                          |
| 98-26           |               |                          | 1.964                      |               |                       | 232.636       | 98-26 top                        |
| 98-25           |               |                          | 1.684                      |               |                       | 232.916       | 98-25 g                          |
| 98-25           |               |                          | 1.854                      |               |                       | 232.746       | 98-25 top                        |
| TP <sub>2</sub> | 1.654         | 234.398                  |                            | 1.854         | 1.856                 | 232.744       | 98-25 top                        |
| FH44            |               |                          |                            | 0.725         | 0.727                 | 233.671       | AS ABOVE                         |
|                 | ΣBS = 4.255   |                          |                            | ΣFS = 4.248   |                       |               |                                  |

\* RECALCULATED FROM FIELD NOTEBOOK

$$\text{error} = \Sigma BS - \Sigma FS = 7 \text{ mm}$$

$$\text{correction} = 7 \text{ mm} / 3 \text{ set ups} = 2.33 \text{ mm USE } 2 \text{ mm}$$



## Reference Elevation Record \*

Date: 981201

Project No.: W 8140

Location: CP WESTON YARD WPG

Technician: SAD/JDT

[illegible]

\* RECORDED FROM FIELD NOTEBOOK

# Reference Elevation Record \*

Date: 981201

Project No.: W 8140

Location: CP WESTON YARD, WPG

Technician: SAD/JDT

6/13

| Station Number         | Backsight (m)       | Height of Instrument (m)                                                            | Intermediate Foresight (m) | Foresight (m)       | Corrected Reading (m) | Elevation (m) | Comments                         |
|------------------------|---------------------|-------------------------------------------------------------------------------------|----------------------------|---------------------|-----------------------|---------------|----------------------------------|
| FH43                   | 0.541               | 234.106                                                                             |                            |                     |                       | 233.565       | AS BEFORE                        |
| TP <sub>1</sub> (FH40) | 0.832               | 234.132                                                                             |                            | 0.806               |                       | 233.300       | FIRE HYDRANT #40, ON 'O' IN OPEN |
| TBM <sub>1</sub>       |                     |                                                                                     | 1.485                      |                     |                       | 232.647       | SWITCH W55, TOP OF SOUTH BOLT.   |
| TP <sub>2</sub>        | 0.844               | 234.123                                                                             |                            | 0.853               |                       | 233.279       |                                  |
|                        |                     |                                                                                     |                            | 0.557               |                       | 233.566       |                                  |
|                        | $\Sigma BS = 2.217$ |                                                                                     |                            | $\Sigma FS = 2.216$ |                       |               |                                  |
|                        | error =             | $\Sigma BS - \Sigma FS = 1 \text{ mm}$                                              |                            |                     |                       |               |                                  |
|                        | correction =        | $1 \text{ mm} / 3 \text{ setups} = 0.33 \text{ mm} \therefore \text{NO CORRECTION}$ |                            |                     |                       |               |                                  |
| TBM <sub>1</sub>       | 1.725               | 234.372                                                                             |                            |                     |                       | 232.647       | AS ABOVE                         |
| 98-33                  |                     |                                                                                     | 1.725                      |                     |                       | 232.647       | 98-33 g                          |
| 98-33                  |                     |                                                                                     | 1.940                      |                     |                       | 232.432       | 98-33 cap                        |
| FH34(TP <sub>1</sub> ) | 0.565               | 234.195                                                                             |                            | 0.743               | 0.742                 | 233.630       | FIRE HYDRANT #34, ON 'O' IN OPEN |
| TBM <sub>1</sub>       |                     |                                                                                     |                            | 1.549               | 1.548                 | 232.647       | AS ABOVE                         |
|                        | $\Sigma BS = 2.290$ |                                                                                     |                            | $\Sigma FS = 2.292$ |                       |               |                                  |
|                        | error =             | $\Sigma BS - \Sigma FS = 2 \text{ mm}$                                              |                            |                     |                       |               |                                  |
|                        | correction =        | $2 \text{ mm} / 2 \text{ setups} = 1 \text{ mm}$                                    |                            |                     |                       |               |                                  |

\* RECORDED FROM FIELD NOTEBOOK

# Reference Elevation Record \*

Date: 981201

Project No.: W8140

Location: CP WESTON YARD, WPG

Technician: SAD/JDT

| Station Number         | Backsight (m)                                                                          | Height of Instrument (m) | Intermediate Foresight (m) | Foresight (m) | Corrected Reading (m) | Elevation (m) | Comments                         |
|------------------------|----------------------------------------------------------------------------------------|--------------------------|----------------------------|---------------|-----------------------|---------------|----------------------------------|
| FH34                   | 0.765                                                                                  | 234.395                  |                            |               |                       | 233.630       | AS BEFORE                        |
| TP <sub>1</sub>        | 0.597                                                                                  | 234.227                  |                            | 1.765         |                       | 232.630       |                                  |
| FH32(TP <sub>2</sub> ) | 0.890                                                                                  | 234.288                  |                            | 0.829         |                       | 233.398       | FIRE HYDRANT #32, ON '0' IN OPEN |
| TP <sub>3</sub>        | 0.302                                                                                  | 234.208                  |                            | 0.382         |                       | 233.906       |                                  |
| 98-20                  |                                                                                        |                          | 1.622                      |               |                       | 232.586       | 98-20 g                          |
| 98-20                  |                                                                                        |                          | 1.772                      |               |                       | 232.436       | 98-20 top                        |
| TP <sub>4</sub>        | 1.873                                                                                  | 234.309                  |                            | 1.772         |                       | 232.436       | 98-20 top                        |
| 98-34                  |                                                                                        |                          | 1.600                      |               |                       | 232.709       | 98-34 g                          |
| 98-34                  |                                                                                        |                          | 1.828                      |               |                       | 232.481       | 98-34 top                        |
| TP <sub>5</sub>        | 1.616                                                                                  | 234.290                  |                            | 1.635         |                       | 232.674       |                                  |
| TP <sub>6</sub>        | 0.744                                                                                  | 234.363                  |                            | 0.671         |                       | 233.619       |                                  |
| TP <sub>7</sub>        | 0.493                                                                                  | 234.228                  |                            | 0.628         |                       | 233.735       |                                  |
| TP <sub>8</sub>        | 1.502                                                                                  | 234.325                  |                            | 1.405         |                       | 232.823       |                                  |
| FH34                   |                                                                                        |                          |                            | 0.694         |                       | 233.631       | AS BEFORE                        |
|                        | ΣBS = 9.782                                                                            |                          |                            | ΣFS = 9.781   |                       |               |                                  |
|                        | Error = ΣBS - ΣFS = 1 mm                                                               |                          |                            |               |                       |               |                                  |
|                        | correction = $\frac{1 \text{ mm}}{9 \text{ setups}} = 0.11 \text{ mm}$ ∴ NO CORRECTION |                          |                            |               |                       |               |                                  |
|                        |                                                                                        |                          |                            |               |                       |               |                                  |
|                        |                                                                                        |                          |                            |               |                       |               |                                  |
|                        |                                                                                        |                          |                            |               |                       |               |                                  |
|                        |                                                                                        |                          |                            |               |                       |               |                                  |
|                        |                                                                                        |                          |                            |               |                       |               |                                  |
|                        |                                                                                        |                          |                            |               |                       |               |                                  |

\* RECORDED FROM FIELD NOTEBOOK

Date: 981201 Project No.: W 8140

Location: CP WESTON YARD WPG Technician: SAD/JDT

\* RECORDED FROM FIELD NOTEBOOK

# Reference Elevation Record \*

Date: 981202

Project No.: W8140

Location: CP WESTON YARD, WPG

Technician: SAD/JDT

| Station Number   | Backsight (m)        | Height of Instrument (m)           | Intermediate Foresight (m) | Foresight (m)        | Corrected Reading (m) | Elevation (m) | Comments                                                       |
|------------------|----------------------|------------------------------------|----------------------------|----------------------|-----------------------|---------------|----------------------------------------------------------------|
| BM(36-006)       | 1.204                | 233.570                            |                            |                      |                       | 232.366       | CITY OF WPG BM (36-006)                                        |
| TP <sub>1</sub>  | 1.765                | 233.997                            |                            | 1.338                |                       | 232.232       |                                                                |
| TP <sub>2</sub>  | 1.325                | 233.814                            |                            | 1.508                |                       | 232.489       |                                                                |
| TP <sub>3</sub>  | 1.508                | 233.591                            |                            | 1.731                |                       | 232.083       |                                                                |
| TBM <sub>1</sub> |                      |                                    | 0.498                      |                      |                       | 233.093       | FIRE HYDRANT @ SW CORNER OF JARVIS + McPHILLIPS ON 'O' IN OPEN |
| TP <sub>4</sub>  | 1.741                | 233.824                            |                            | 1.508                |                       | 232.083       |                                                                |
| TP <sub>5</sub>  | 1.713                | 234.199                            |                            | 1.338                |                       | 232.486       |                                                                |
| TP <sub>6</sub>  | 1.410                | 233.644                            |                            | 1.965                |                       | 232.234       |                                                                |
| Bm(36-006)       |                      |                                    |                            | 1.278                |                       | 232.366       | AS ABOVE                                                       |
|                  | $\Sigma BS = 10.666$ |                                    |                            | $\Sigma FS = 10.666$ |                       |               |                                                                |
|                  |                      | $\Sigma BS = \Sigma FS \therefore$ | NO                         | CORRECTION           |                       |               |                                                                |
| TBM <sub>1</sub> | 0.520                | 233.613                            |                            |                      |                       | 233.093       | AS ABOVE                                                       |
| TP <sub>1</sub>  | 1.691                | 234.356                            |                            | 0.947                | 0.948                 | 232.665       |                                                                |
| FA36A            |                      |                                    | 0.488                      |                      |                       | 233.868       | FIRE HYDRANT #36A ON 'O' IN OPEN                               |
| TP <sub>2</sub>  | 1.120                | 233.783                            |                            | 1.692                | 1.693                 | 232.663       |                                                                |
| TBM <sub>1</sub> |                      |                                    |                            | 0.690                | 0.691                 | 233.092       | AS ABOVE                                                       |
|                  | $\Sigma BS = 3.331$  |                                    |                            | $\Sigma FS = 3.329$  |                       |               |                                                                |
|                  | error =              | $\Sigma BS - \Sigma FS = 2mm$      |                            |                      |                       |               |                                                                |
|                  | CORRECTION =         | $2mm / 3 setups = 0.66mm$          |                            | USE                  | 1mm                   |               |                                                                |

\* RECOPIED FROM FIELD NOTE BOOK

# Reference Elevation Record \*

Date: 981202

Project No.: W8140

Location: CP WESTON YARD, WPG

Technician: SAD/JDT

| Station Number        | Backsight (m)                     | Height of Instrument (m) | Intermediate Foresight (m) | Foresight (m) | Corrected Reading (m) | Elevation (m) | Comments                        |
|-----------------------|-----------------------------------|--------------------------|----------------------------|---------------|-----------------------|---------------|---------------------------------|
| FH36A                 | 0.598                             | 234.466                  |                            |               |                       | 233.868       | AS BEFORE                       |
| TP <sub>1</sub> (FH5) | 0.502                             | 234.466                  |                            | 0.502         |                       | 233.964       | FIRE HYDRANT #15 ON 'D' IN OPEN |
| FH36A                 |                                   |                          |                            | 0.598         |                       | 233.868       | AS BEFORE                       |
| FH36A                 | 0.668                             | 234.536                  |                            |               |                       | 233.868       | AS BEFORE                       |
| 98-17                 |                                   |                          | 1.550                      |               |                       | 232.986       | g                               |
| 98-17                 |                                   |                          | 1.759                      |               |                       | 232.777       | top                             |
| 98-16                 |                                   |                          | 1.580                      |               |                       | 232.947       | g                               |
| 98-16                 |                                   |                          | 1.753                      |               |                       | 232.783       | top                             |
| 98-15                 |                                   |                          | 1.615                      |               |                       | 232.921       | g                               |
| 98-15                 |                                   |                          | 1.827                      |               |                       | 232.709       | top                             |
| TP <sub>1</sub>       | 1.642                             | 234.683                  |                            | 1.494         | 1.495                 | 233.041       |                                 |
| 98-19                 |                                   |                          | 1.684                      |               |                       | 232.999       | g                               |
| 98-19                 |                                   |                          | 1.863                      |               |                       | 232.820       | top                             |
| 98-18                 |                                   |                          | 1.726                      |               |                       | 232.957       | g                               |
| 98-18                 |                                   |                          | 1.904                      |               |                       | 232.779       | top                             |
| TP <sub>2</sub>       | 1.835                             | 234.613                  |                            | 1.904         | 1.905                 | 232.778       | 98-18 top                       |
|                       |                                   |                          |                            |               |                       |               | AS BEFORE                       |
| FH36A                 |                                   |                          |                            | 0.744         | 0.745                 | 233.868       |                                 |
|                       | ΣBS=4.145                         |                          |                            | ΣFS=4.142     |                       |               |                                 |
|                       | error = ΣBS - ΣFS = 3mm           |                          |                            |               |                       |               |                                 |
|                       | Correction = 3mm / 3 setups = 1mm |                          |                            |               |                       |               |                                 |

\* RECOPIED FROM FIELD NOTE BOOK

# Reference Elevation Record \*

Date: 981202

Project No.: W8140

Location: CP WESTON YARD, WPG

Technician: SAD/JDT

| Station Number | Backsight (m) | Height of Instrument (m) | Intermediate Foresight (m) | Foresight (m) | Corrected Reading (m) | Elevation (m) | Comments  |
|----------------|---------------|--------------------------|----------------------------|---------------|-----------------------|---------------|-----------|
| FH15           | 0.267         | 234.231                  |                            |               |                       | 233.964       | AS BEFORE |
| 98-1           |               |                          | 1.425                      |               |                       | 232.806       | g         |
| 98-1           |               |                          | 1.614                      |               |                       | 232.617       | top       |
| 98-2           |               |                          | 1.781                      |               |                       | 232.450       | g         |
| 98-2           |               |                          | 2.052                      |               |                       | 232.179       | top       |
| 98-6           |               |                          | 1.492                      |               |                       | 232.739       | g         |
| 98-6           |               |                          | 1.828                      |               |                       | 232.403       | top       |
| 98-9           |               |                          | 1.262                      |               |                       | 232.969       | g         |
| 98-9           |               |                          | 1.609                      |               |                       | 232.622       | top       |
| TP1            | 1.547         | 234.168                  |                            | 1.609         | 1.610                 | 232.621       | 98-9 top  |
| 98-7           |               |                          | 1.611                      |               |                       | 232.557       | g         |
| 98-7           |               |                          | 1.960                      |               |                       | 232.208       | top       |
| 98-8           |               |                          | 1.600                      |               |                       | 232.568       | g         |
| 98-8           |               |                          | 1.958                      |               |                       | 232.210       | top       |
| 98-5           |               |                          | 1.538                      |               |                       | 232.630       | g         |
| 98-5           |               |                          | 1.807                      |               |                       | 232.361       | top       |
| 98-4           |               |                          | 1.511                      |               |                       | 232.657       | g         |
| 98-4           |               |                          | 1.778                      |               |                       | 232.390       | top       |
| 98-3           |               |                          | 1.455                      |               |                       | 232.713       | g         |
| 98-3           |               |                          | 1.703                      |               |                       | 232.465       | top       |
| FH15           |               |                          |                            | 0.203         | 0.204                 | 233.964       | AS BEFORE |
|                | ΣBS=1.814     |                          |                            | ΣFS=1.812     |                       |               |           |

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ERROR:  $\Sigma BS - \Sigma FS = 2 \text{ mm}$

CORRECTION =  $\frac{2 \text{ mm}}{2 \text{ setups}} = 1 \text{ mm}$



MORROW  
ENVIRONMENTAL  
CONSULTANTS INC.

# Reference Elevation Record \*

Date: 981202

Project No.: W8140

Location: CP WESTON YARD, WPG

Technician: SAD/JDT

| Station Number  | Backsight (m)       | Height of Instrument (m) | Intermediate Foresight (m) | Foresight (m)       | Corrected Reading (m) | Elevation (m) | Comments   |
|-----------------|---------------------|--------------------------|----------------------------|---------------------|-----------------------|---------------|------------|
| FH15            | 0.374               | 234.338                  |                            |                     |                       | 233.964       | AS BEFORE  |
| 98-13           |                     |                          | 1.543                      |                     |                       | 232.775       | g          |
| 98-13           |                     |                          | 1.692                      |                     |                       | 232.646       | top        |
| 98-10           |                     |                          | 1.566                      |                     |                       | 232.772       | g          |
| 98-10           |                     |                          | 1.769                      |                     |                       | 232.569       | top        |
| TP <sub>1</sub> | 1.679               | 234.248                  |                            | 1.769               |                       | 232.569       | 98-10 top  |
| 98-12           |                     |                          | 1.475                      |                     |                       | 232.773       | g          |
| 98-12           |                     |                          | 1.630                      |                     |                       | 232.618       | top        |
| 98-11           |                     |                          | 1.380                      |                     |                       | 232.868       | g          |
| 98-11           |                     |                          | 1.639                      |                     |                       | 232.609       | top        |
| 98-14           |                     |                          | 2.022                      |                     |                       | 232.226       | g          |
| 98-14           |                     |                          | 2.341                      |                     |                       | 231.907       | top        |
| TP <sub>2</sub> | 2.079               | 234.450                  |                            | 1.877               |                       | 232.371       |            |
| FH15            |                     |                          |                            | 0.486               |                       | 233.964       | AS BEFORE. |
|                 | $\Sigma BS = 4.132$ |                          |                            | $\Sigma FS = 4.132$ |                       |               |            |
|                 |                     | $\Sigma BS = \Sigma FS$  | ∴ NO CORRECTION            |                     |                       |               |            |
|                 |                     |                          |                            |                     |                       |               |            |
|                 |                     |                          |                            |                     |                       |               |            |
|                 |                     |                          |                            |                     |                       |               |            |
|                 |                     |                          |                            |                     |                       |               |            |
|                 |                     |                          |                            |                     |                       |               |            |
|                 |                     |                          |                            |                     |                       |               |            |
|                 |                     |                          |                            |                     |                       |               |            |

\* RECOPIED FROM FIELD NOTE BOOK

Date: 981202 Project No.: W8140

Location: CP WESTON YARD, WPG

Technician: SAD/JDT

\* RELOPIED FROM FIELD NOTE BOOK

## Reference Elevation Record

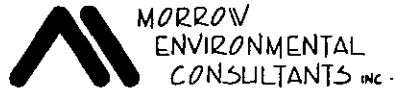
Date: 99 08 31

Project No.: W8140B

Location: CP WESTON, WINNIPEG, MB Technician: JDT/SAD

| Station Number  | Backsight (m) | Height of Instrument (m)                                       | Intermediate Foresight (m) | Foresight (m) | Corrected Reading (m) | Elevation (m)   | Comments                           |
|-----------------|---------------|----------------------------------------------------------------|----------------------------|---------------|-----------------------|-----------------|------------------------------------|
| FH 15           | 0.253         | 234.217                                                        |                            |               |                       | 233.964         | FIRE HYDRANT #15<br>ON "O" IN OPEN |
| 99-36           |               |                                                                | 1.425                      |               |                       | 232.792         | g                                  |
| 99-36           |               |                                                                | 1.576                      |               |                       | 232.641         | top                                |
| TP <sub>1</sub> | 1.570         | 234.330                                                        |                            | 1.458         | 1.457                 | 232.760         |                                    |
| 99-42           |               |                                                                | 1.881                      |               |                       | 232.449         | g                                  |
| 99-42           |               |                                                                | 2.043                      |               |                       | 232.287         | Top                                |
| 99-41           |               |                                                                | 1.475                      |               |                       | 232.855         | g                                  |
| 99-41           |               |                                                                | 1.675                      |               |                       | 232.655         | top                                |
| TP <sub>2</sub> | 1.303         | 234.389                                                        |                            | 1.245         | 1.244                 | 233.086         |                                    |
| 99-44           |               |                                                                | 1.642                      |               |                       | 232.747         | g                                  |
| 99-44           |               |                                                                | 1.771                      |               |                       | 232.618         | top                                |
| 99-43           |               |                                                                | 1.723                      |               |                       | 232.666         | g                                  |
| 99-43           |               |                                                                | 1.845                      |               |                       | 232.544         | top                                |
| TP <sub>3</sub> | 1.410         | 234.441                                                        |                            | 1.359         | 1.358                 | 233.031         |                                    |
| TP <sub>H</sub> | 1.191         | 234.403                                                        |                            | 1.230         | 1.229                 | 233.212         |                                    |
| FH 15           |               |                                                                |                            | 0.442         | 0.441                 | 233.962         | AS ABOVE                           |
|                 | ΣBS = 5.727   |                                                                |                            | ΣFS = 5.734   |                       |                 |                                    |
|                 |               | ERROR = ΣBS - ΣFS = -7 mm                                      |                            |               |                       |                 |                                    |
|                 |               | CORRECTION = $\frac{-7\text{mm}}{5 \text{ SET UPS}}$ = -1.4 mm |                            |               |                       | <u>USE -1mm</u> |                                    |
|                 |               |                                                                |                            |               |                       |                 |                                    |
|                 |               |                                                                |                            |               |                       |                 |                                    |

\* RECOPIED FROM FIELD BOOK



### Reference Elevation Record

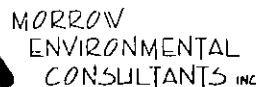
Date: 99 09 01 Project No.: W8140B

Location: CP WESTON, WINNIPEG, MB Technician: JDT/SAD

[illegible]

\* RECOPIED FROM FIELD BOOK





Location: CP WESTON YARD, WPA. Technician: JDT/SAD

\* RECOPIED FROM FIELD NOTEBOOK

## **APPENDIX VII**

### **Grain-Size Distribution Curves**

## **APPENDIX VII: Grain-Size Analyses**

|                        |                  |                  |
|------------------------|------------------|------------------|
| Borehole No.:          | 99-43            | 99-61            |
| Sample No.:            | BH99-43-3-990714 | BH99-61-3-990720 |
| Depth (m):             | 1.7              | 2.1              |
| Parameter              |                  |                  |
| <200 mesh or <0.075 mm | 93.2             | 97.3             |
| >200 mesh or >0.075 mm | 6.8              | 2.7              |

Results are expressed in %.



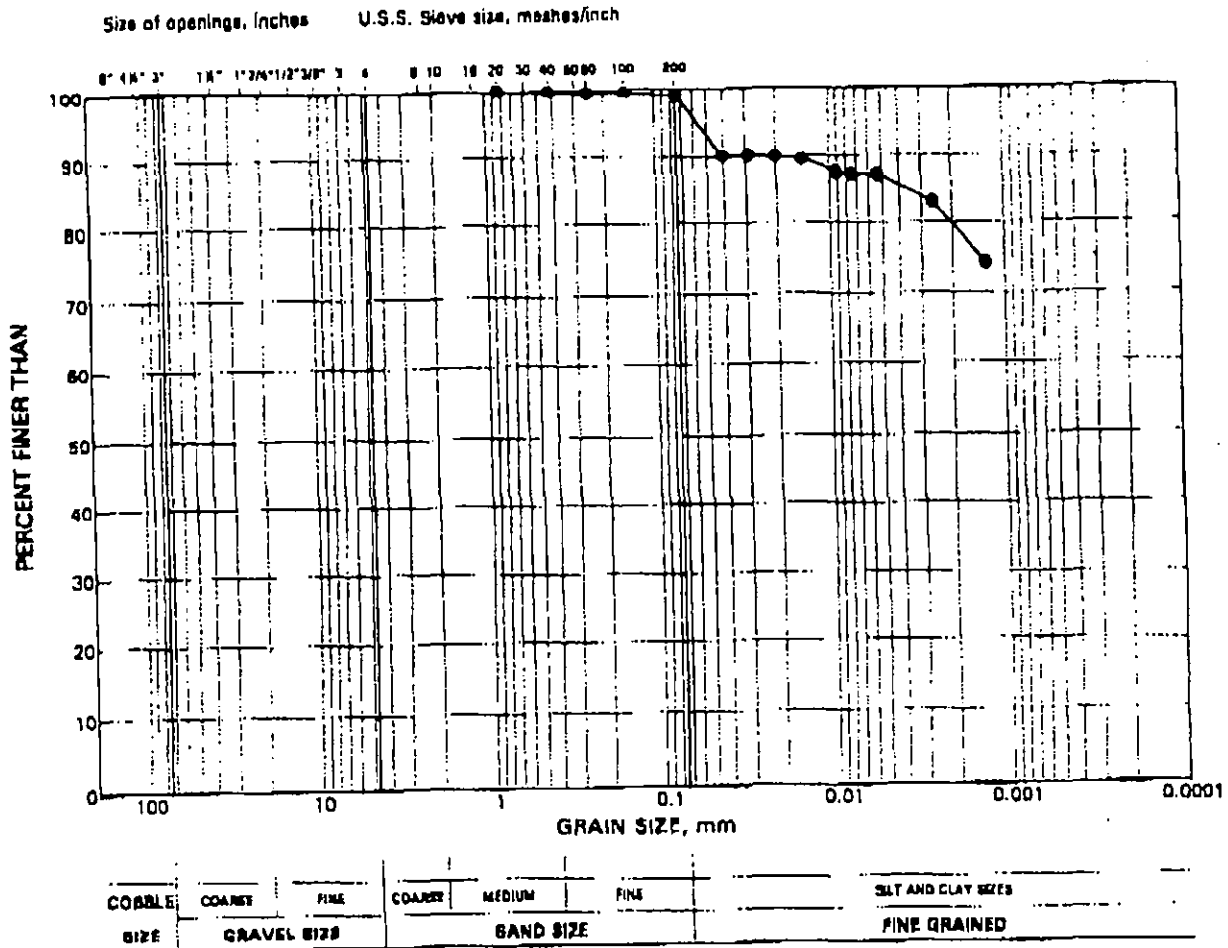
DEC-01-98 09:37 From: GOLDER ASSOCIATES LTD

905-587-8581

T-559 P.02/02 Job-585

## GRAIN SIZE DISTRIBUTION

Postnet  
Fax Note R7673  
To Alex Mann  
Fax 204-477-9194  
From Ref #W28140  
Phone



## LEGEND

SYMBOL      BOREHOLE      SAMPLE      DEPTH(m)

•      98-24-5      S00062332      -

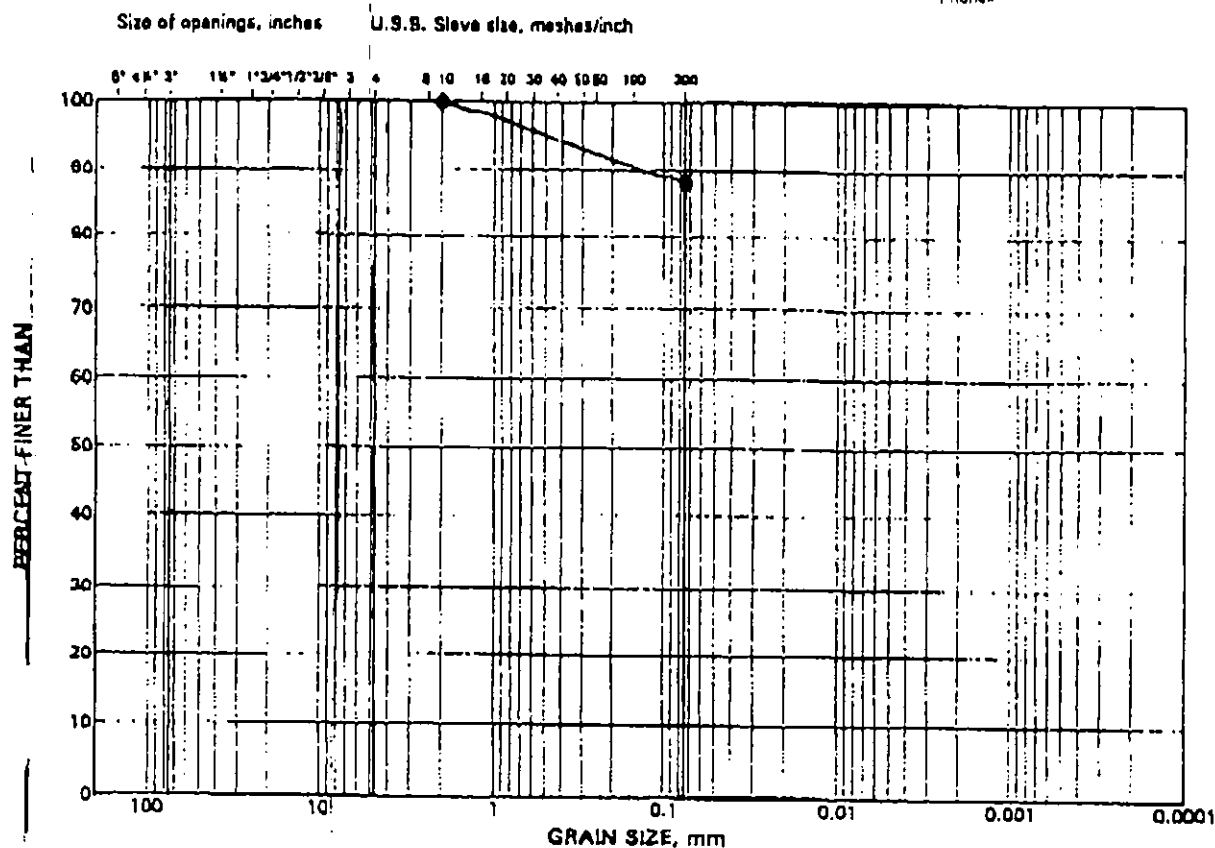
NOV-25-88 12 14 From: GOLDER ASSOCIATES LTD

905-567-0561

T-410 P.04/05 Job-236

# GRAIN SIZE DISTRIBUTION

Post/Kit  
Fax Note R7673  
To Alex Mann  
Fax 204-477-9194  
From Ref # W8140  
Phone#



|        |             |           |        |        |              |                     |
|--------|-------------|-----------|--------|--------|--------------|---------------------|
| COBBLE | COARSE      | FINE      | COARSE | MEDIUM | FINE         | SILT AND CLAY SIZES |
| SIZE   | GRAVEL SIZE | SAND SIZE |        |        | FINE GRAINED |                     |

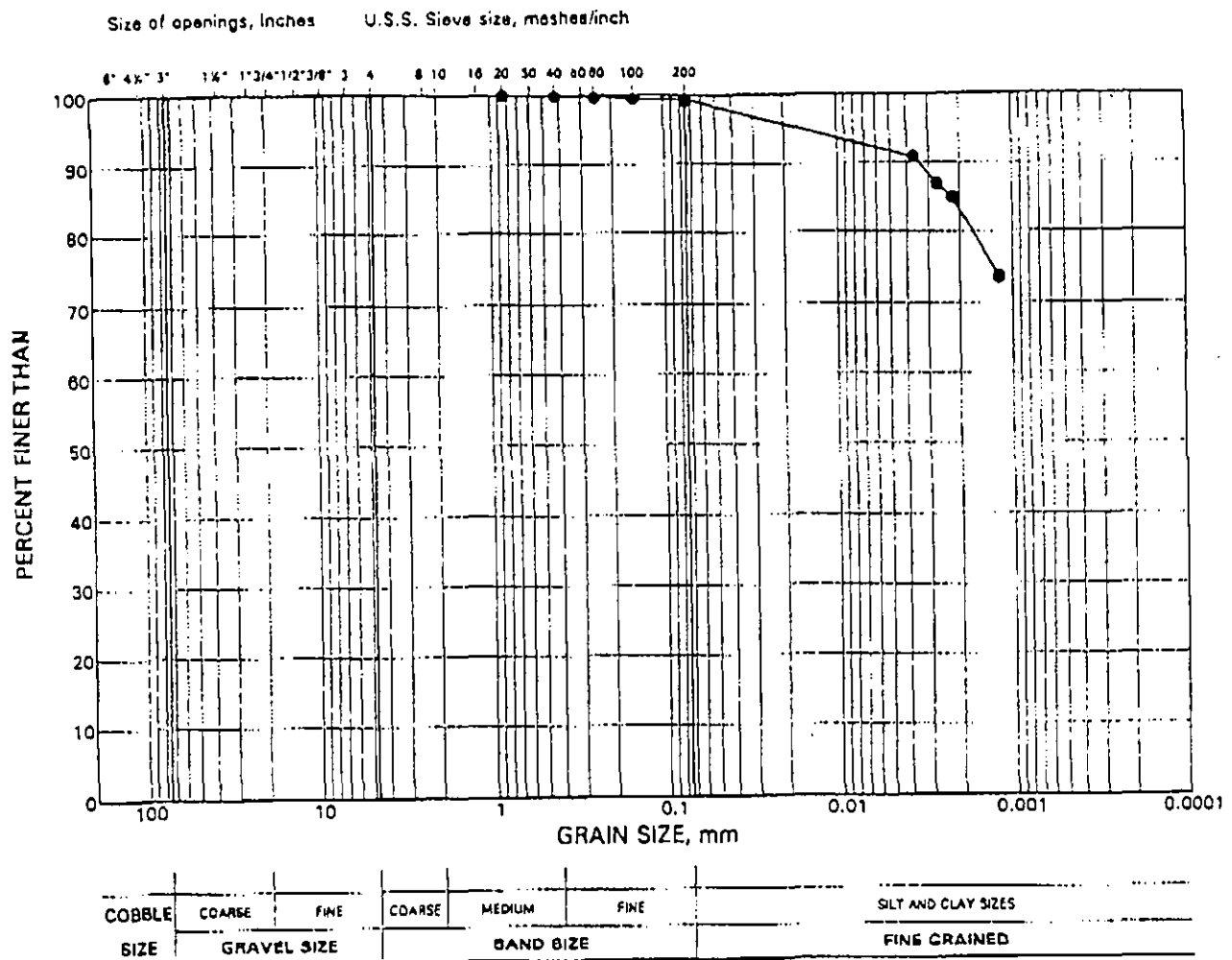
## LEGEND

| SYMBOL | BOREHOLE | SAMPLE | DEPTH(m) |
|--------|----------|--------|----------|
|--------|----------|--------|----------|

|   |         |           |   |
|---|---------|-----------|---|
| • | 98-33-3 | S00061276 | - |
|---|---------|-----------|---|

## GRAIN SIZE DISTRIBUTION

FIGURE



## LEGEND

SYMBOL      BOREHOLE      SAMPLE      DEPTH(m)

•      98-33-5      S00061277      -

## **APPENDIX VIII**

### **Monitoring Results**

**APPENDIX VIII: Monitoring Results (1998 12 01 and 02)**

| Monitoring Well | Ground Surface Elevation (m) | Top of Casing Elevation (m) | Depth to Liquid Hydrocarbons <sup>1</sup> (m) | Depth to Groundwater <sup>1</sup> (m) | Apparent Thickness of Liquid Hydrocarbons (mm) | Groundwater Surface Elevation* (m) | Monitoring Well Vapour Concentration <sup>2</sup> (ppm) | Remarks       |
|-----------------|------------------------------|-----------------------------|-----------------------------------------------|---------------------------------------|------------------------------------------------|------------------------------------|---------------------------------------------------------|---------------|
| 98-1            | 232.806                      | 232.617                     | -                                             | 0.723                                 | 0                                              | 231.894                            | >10,000                                                 |               |
| 98-2            | 232.450                      | 232.179                     | -                                             | 0.377                                 | 0                                              | 231.802                            | 550                                                     |               |
| 98-3            | 232.713                      | 232.465                     | -                                             | 1.000                                 | 0                                              | 231.465                            | 1,200                                                   |               |
| 98-4            | 232.657                      | 232.390                     | -                                             | 1.732                                 | 0                                              | 230.658                            | >10,000                                                 |               |
| 98-5            | 232.630                      | 232.361                     | -                                             | 1.626                                 | 0                                              | 230.735                            | 275                                                     |               |
| 98-6            | 232.739                      | 232.403                     | -                                             | 0.509                                 | 0                                              | 231.894                            | 300                                                     |               |
| 98-7            | 232.557                      | 232.208                     | -                                             | 0.539                                 | 0                                              | 231.669                            | >10,000                                                 |               |
| 98-8            | 232.568                      | 232.210                     | -                                             | 0.474                                 | 0                                              | 231.736                            | >10,000                                                 |               |
| 98-9            | 232.969                      | 232.622                     | -                                             | 0.493                                 | 0                                              | 232.129                            | 275                                                     |               |
| 98-10           | 232.772                      | 232.569                     | 1.946                                         | 2.290                                 | 344                                            | 230.537                            | 450                                                     | bailed 1.7 L  |
| 98-11           | 232.868                      | 232.609                     | -                                             | 1.355                                 | 0                                              | 231.254                            | 180                                                     |               |
| 98-12           | 232.773                      | 232.618                     | -                                             | 5.703                                 | 0                                              | 226.915                            | >10,000                                                 |               |
| 98-13           | 232.795                      | 232.646                     | 3.038                                         | 3.042                                 | 4                                              | 229.607                            | 550                                                     | bailed 100 ml |
| 98-14           | 232.226                      | 231.907                     | -                                             | 0.423                                 | 0                                              | 231.484                            | 370                                                     |               |
| 98-15           | 232.921                      | 232.709                     | -                                             | 0.808                                 | 0                                              | 231.901                            | 100                                                     |               |
| 98-16           | 232.947                      | 232.783                     | -                                             | 0.899                                 | 0                                              | 231.884                            | 75                                                      |               |
| 98-17           | 232.986                      | 232.777                     | -                                             | 0.886                                 | 0                                              | 231.891                            | 415                                                     |               |
| 98-18           | 232.957                      | 232.779                     | -                                             | 0.882                                 | 0                                              | 231.897                            | 30                                                      |               |
| 98-19           | 232.999                      | 232.820                     | -                                             | 0.934                                 | 0                                              | 231.886                            | 170                                                     |               |
| 98-20           | 232.586                      | 232.436                     | -                                             | 0.572                                 | 0                                              | 231.864                            | 60                                                      |               |
| 98-21           | 232.727                      | 232.593                     | -                                             | 1.150                                 | 0                                              | 231.443                            | 200                                                     |               |
| 98-22           | 232.727                      | 232.554                     | -                                             | 0.951                                 | 0                                              | 231.603                            | 240                                                     |               |
| 98-23           | 232.705                      | 232.503                     | -                                             | 1.015                                 | 0                                              | 231.488                            | 230                                                     |               |
| 98-24           | 232.669                      | 232.485                     | -                                             | 2.099                                 | 0                                              | 230.386                            | 170                                                     |               |

**APPEDIX VIII: Monitoring Results (1998 12 01 and 02)**

| Monitoring Well | Ground Surface Elevation (m) | Top of Casing Elevation (m) | Depth to Liquid Hydrocarbons <sup>1</sup> (m) | Depth to Groundwater <sup>1</sup> (m) | Apparent Thickness of Liquid Hydrocarbons (mm) | Groundwater Surface Elevation* (m) | Monitoring Well Vapour Concentration <sup>2</sup> (ppm) | Remarks |
|-----------------|------------------------------|-----------------------------|-----------------------------------------------|---------------------------------------|------------------------------------------------|------------------------------------|---------------------------------------------------------|---------|
| 98-25           | 232.916                      | 232.746                     | -                                             | 1.329                                 | 0                                              | 231.417                            | 350                                                     |         |
| 98-26           | 232.817                      | 232.636                     | -                                             | 0.925                                 | 0                                              | 231.711                            | 360                                                     |         |
| 98-27           | 232.702                      | 232.475                     | -                                             | 0.636                                 | 0                                              | 231.839                            | 110                                                     |         |
| 98-28           | 232.943                      | 232.748                     | -                                             | 0.781                                 | 0                                              | 231.967                            | 175                                                     |         |
| 98-29           | 232.850                      | 233.625                     | -                                             | 1.903                                 | 0                                              | 231.722                            | 125                                                     |         |
| 98-30           | 233.279                      | 234.066                     | -                                             | 2.302                                 | 0                                              | 231.764                            | 120                                                     |         |
| 98-31           | 233.582                      | 234.585                     | -                                             | 3.459                                 | 0                                              | 231.126                            | 225                                                     |         |
| 98-32           | 232.653                      | 232.458                     | -                                             | 3.592                                 | 0                                              | 228.866                            | 190                                                     |         |
| 98-33           | 232.647                      | 232.432                     | -                                             | 4.374                                 | 0                                              | 228.058                            | 600                                                     |         |
| 98-34           | 232.709                      | 232.481                     | -                                             | 0.674                                 | 0                                              | 231.807                            | 130                                                     |         |
| 98-35           | 232.713                      | 232.596                     | -                                             | 1.726                                 | 0                                              | 230.870                            | 45                                                      |         |

<sup>1</sup> - measured from top of monitoring well

<sup>2</sup> - measured using a Gastech hydrocabon vapour analyser with no methane response

\* - corrected groundwater elevation if phase-separated liquids are present at the water table

**APPENDIX VIII: Monitoring Results (1999 08 31 and 1999 09 01)**

| Monitoring Well | Ground Surface Elevation (m) | Top of Casing Elevation (m) | Depth to Liquid Hydrocarbons <sup>1</sup> (m) | Depth to Groundwater <sup>1</sup> (m) | Apparent Thickness of Liquid Hydrocarbons (mm) | Groundwater Surface Elevation* (m) | Monitoring Well Vapour Concentration <sup>2</sup> (ppm) | Remarks          |
|-----------------|------------------------------|-----------------------------|-----------------------------------------------|---------------------------------------|------------------------------------------------|------------------------------------|---------------------------------------------------------|------------------|
| 98-1            | 232.806                      | 232.617                     | -                                             | 0.383                                 | 0                                              | 232.234                            | >10,000                                                 |                  |
| 98-2            | 232.450                      | 232.179                     | -                                             | 0.437                                 | 0                                              | 231.742                            | >10,000                                                 |                  |
| 98-3            | 232.713                      | 232.465                     | 0.347                                         | 0.352                                 | 5                                              | 232.117                            | 1,540                                                   | bailed 10 mL     |
| 98-4            | 232.657                      | 232.390                     | 1.535                                         | 1.563                                 | 28                                             | 230.848                            | 550                                                     | bailed 30 mL     |
| 98-5            | 232.630                      | 232.361                     | -                                             | 0.900                                 | 0                                              | 231.461                            | 100                                                     |                  |
| 98-6            | 232.739                      | 232.403                     | NM                                            | NM                                    | -                                              | -                                  | NM                                                      |                  |
| 98-7            | 232.557                      | 232.208                     | -                                             | 0.117                                 | 0                                              | 232.091                            | 660                                                     |                  |
| 98-8            | 232.568                      | 232.210                     | -                                             | 0.082                                 | 0                                              | 232.128                            | 275                                                     |                  |
| 98-9            | 232.969                      | 232.622                     | -                                             | 0.994                                 | 0                                              | 231.628                            | 400                                                     |                  |
| 98-10           | 232.772                      | 232.569                     | 1.700                                         | 1.797                                 | 97                                             | 230.845                            | 4,620                                                   | bailed 105 mL    |
| 98-11           | 232.868                      | 232.609                     | -                                             | 0.726                                 | 0                                              | 231.883                            | 100                                                     |                  |
| 98-12           | 232.773                      | 232.618                     | -                                             | 2.089                                 | 0                                              | 230.529                            | 550                                                     |                  |
| 98-13           | 232.795                      | 232.646                     | 2.235                                         | 2.765                                 | 530                                            | 230.279                            | 1,540                                                   | bailed 1.2 L     |
| 98-14           | 232.226                      | 231.907                     | NM                                            | NM                                    | -                                              | -                                  | NM                                                      | covered in water |
| 98-15           | 232.921                      | 232.709                     | -                                             | 0.390                                 | 0                                              | 232.319                            | 20                                                      |                  |
| 98-16           | 232.947                      | 232.783                     | -                                             | 0.468                                 | 0                                              | 232.315                            | 20                                                      |                  |
| 98-17           | 232.986                      | 232.777                     | -                                             | 0.480                                 | 0                                              | 232.297                            | 25                                                      |                  |
| 98-18           | 232.957                      | 232.779                     | -                                             | 0.576                                 | 0                                              | 232.203                            | <5                                                      |                  |
| 98-19           | 232.999                      | 232.820                     | -                                             | 0.525                                 | 0                                              | 232.295                            | <5                                                      | vented           |
| 98-20           | 232.586                      | 232.436                     | -                                             | 0.353                                 | 0                                              | 232.083                            | 25                                                      |                  |
| 98-21           | 232.727                      | 232.593                     | -                                             | 0.611                                 | 0                                              | 231.982                            | 20                                                      |                  |
| 98-22           | 232.727                      | 232.554                     | -                                             | 0.775                                 | 0                                              | 231.779                            | 80                                                      |                  |
| 98-23           | 232.705                      | 232.503                     | -                                             | 0.971                                 | 0                                              | 231.532                            | 20                                                      |                  |
| 98-24           | 232.669                      | 232.485                     | -                                             | 1.371                                 | 0                                              | 231.114                            | 30                                                      |                  |
| 98-25           | 232.916                      | 232.746                     | -                                             | 0.927                                 | 0                                              | 231.819                            | 80                                                      |                  |
| 98-26           | 232.817                      | 232.636                     | -                                             | 0.442                                 | 0                                              | 232.194                            | 25                                                      |                  |
| 98-27           | 232.702                      | 232.475                     | -                                             | 0.230                                 | 0                                              | 232.245                            | 10                                                      |                  |

**APPENDIX VIII: Monitoring Results (1999 08 31 and 1999 09 01)**

| Monitoring Well | Ground Surface Elevation (m) | Top of Casing Elevation (m) | Depth to Liquid Hydrocarbons <sup>1</sup> (m) | Depth to Groundwater <sup>1</sup> (m) | Apparent Thickness of Liquid Hydrocarbons (mm) | Groundwater Surface Elevation* (m) | Monitoring Well Vapour Concentration <sup>2</sup> (ppm) | Remarks              |
|-----------------|------------------------------|-----------------------------|-----------------------------------------------|---------------------------------------|------------------------------------------------|------------------------------------|---------------------------------------------------------|----------------------|
| 98-28           | 232.943                      | 232.748                     | -                                             | 0.392                                 | 0                                              | 232.356                            | 75                                                      |                      |
| 98-29           | 232.850                      | 233.625                     | -                                             | 1.467                                 | 0                                              | 232.158                            | <5                                                      |                      |
| 98-30           | 233.279                      | 234.066                     | -                                             | 2.041                                 | 0                                              | 232.025                            | 5                                                       |                      |
| 98-31           | 233.582                      | 234.585                     | -                                             | 3.082                                 | 0                                              | 231.503                            | 25                                                      |                      |
| 98-32           | 232.653                      | 232.458                     | -                                             | 1.033                                 | 0                                              | 231.425                            | 50                                                      |                      |
| 98-33           | 232.647                      | 232.432                     | -                                             | 2.079                                 | 0                                              | 230.353                            | 130                                                     |                      |
| 98-34           | 232.709                      | 232.481                     | -                                             | 0.405                                 | 0                                              | 232.076                            | <5                                                      |                      |
| 98-35           | 232.713                      | 232.596                     | -                                             | 1.686                                 | 0                                              | 230.910                            | 25                                                      |                      |
| 99-36           | 232.792                      | 232.641                     | -                                             | 0.596                                 | 0                                              | 232.045                            | >10,000                                                 |                      |
| 99-41           | 232.855                      | 232.655                     | -                                             | 2.015                                 | 0                                              | 230.640                            | 85                                                      |                      |
| 99-42           | 232.449                      | 232.287                     | -                                             | 1.840                                 | 0                                              | 230.447                            | 50                                                      |                      |
| 99-43           | 232.666                      | 232.544                     | -                                             | 2.434                                 | 0                                              | 230.110                            | >10,000                                                 |                      |
| 99-44           | 232.747                      | 232.618                     | -                                             | 1.986                                 | 0                                              | 230.632                            | >10,000                                                 |                      |
| 99-55           | 232.883                      | 232.726                     | -                                             | 1.800                                 | 0                                              | 230.926                            | 110                                                     |                      |
| 99-56           | 232.727                      | 232.608                     | -                                             | 2.132                                 | 0                                              | 230.476                            | 50                                                      | DTB=4.14 m           |
| 99-59           | 232.606                      | 232.532                     | -                                             | 2.262                                 | 0                                              | 230.270                            | 20                                                      | DTB=4.42 m           |
| 99-60           | 232.671                      | 232.625                     | -                                             | 1.719                                 | 0                                              | 230.906                            | 35                                                      | DTB=3.97 m           |
| 99-61           | 232.688                      | 232.629                     | -                                             | 1.718                                 | 0                                              | 230.911                            | 40                                                      | DTB=4.67 m           |
| 99-62           | 232.679                      | 232.601                     | -                                             | 1.687                                 | 0                                              | 230.914                            | 25                                                      | DTB=4.55 m           |
| 99-63           | 232.705                      | 232.633                     | -                                             | 1.845                                 | 0                                              | 230.788                            | 40                                                      | DTB=4.55 m           |
| 99-66           | 232.684                      | 232.473                     | 0.860                                         | 0.861                                 | 1                                              | 231.613                            | >10,000                                                 | monitored 1999 11 26 |
| 99-67           | 232.645                      | 232.558                     | -                                             | 0.688                                 | 0                                              | 231.870                            | >10,000                                                 | monitored 1999 11 26 |
| 99-68           | 232.604                      | 232.496                     | -                                             | 0.584                                 | 0                                              | 231.912                            | 2,640                                                   | monitored 1999 11 26 |

NM - not monitored

\* - corrected groundwater elevation if phase-separated liquids are present at the water table

<sup>1</sup> - measured from top of monitoring well

DTB - depth to the bottom of the monitoring well

<sup>2</sup> - measured using a Gastech hydrocarbon vapour analyser with no methane response

## **APPENDIX IX**

### **Hydraulic Conductivity Test Data**

## Monitoring Well Response Test Analysis - Water Table Well

### Monitoring Well 98-2

Client: CP Rail                      Location: CP Weston Yard, Winnipeg, MB  
MECI Personnel: JDT                      Test Date: 1998 12 03

### Field Response Test Data

| Time t<br>(s) | Depth to<br>Water<br>(m) | Drawdown<br>y<br>(m) | Normalised<br>Drawdown<br>y/y0 |
|---------------|--------------------------|----------------------|--------------------------------|
| Static        | 0.377                    | 0.000                |                                |
| 0             | 5.368                    | 4.991                | 1.00                           |
| 60            | 5.052                    | 4.675                | 0.94                           |
| 180           | 4.734                    | 4.357                | 0.87                           |
| 300           | 4.581                    | 4.204                | 0.84                           |
| 660           | 4.407                    | 4.030                | 0.81                           |
| 840           | 4.335                    | 3.958                | 0.79                           |
| 2400          | 4.162                    | 3.785                | 0.76                           |
| 5280          | 4.052                    | 3.675                | 0.74                           |
| 7320          | 4.009                    | 3.632                | 0.73                           |
| 10560         | 3.960                    | 3.583                | 0.72                           |

# Monitoring Well Response Test Analysis - Water Table Well

## Monitoring Well 98-2

### Bouwer and Rice Analysis

|                                                                                                                       |    |       |
|-----------------------------------------------------------------------------------------------------------------------|----|-------|
| Borehole Radius $r_w$ (m):                                                                                            |    | 0.065 |
| Casing Inside Radius $r_c$ (m):                                                                                       |    | 0.025 |
| Assumed Sandpack Drained Porosity $n_d$ :                                                                             |    | 0.25  |
| (use $n_d=0$ if lowered water level is above base of seal or $n_d=0.25$ if lowered water level is below base of seal) |    |       |
| Effective Casing Radius $r_c' = [(n_d)r_w^2 + (1-n_d)r_c^2]^{0.5}$ (m):                                               |    | 0.039 |
| Unconfined Aquifer Saturated Thickness $H$ (m):                                                                       |    | 5.70  |
| Base of Screen Below Water Table $L_w$ (m):                                                                           |    | 5.70  |
| Length of Screen $L_e$ (m):                                                                                           |    | 4.70  |
| $L_e/r_w$ :                                                                                                           |    | 72.3  |
| $L_w = H$ ? (0 = no):                                                                                                 |    | 1     |
| Dimensionless Parameters (calculated from $L_e/r_w$ ):                                                                | A: | 3.7   |
|                                                                                                                       | B: | 0.60  |
|                                                                                                                       | C: | 3.4   |
| $\ln(R_e/r_w)$ : (estimated from A and B if $L_w < H$ or C if $L_w = H$ )                                             |    | 3.41  |

#### Points Defining Straight Line Segment of Graph:

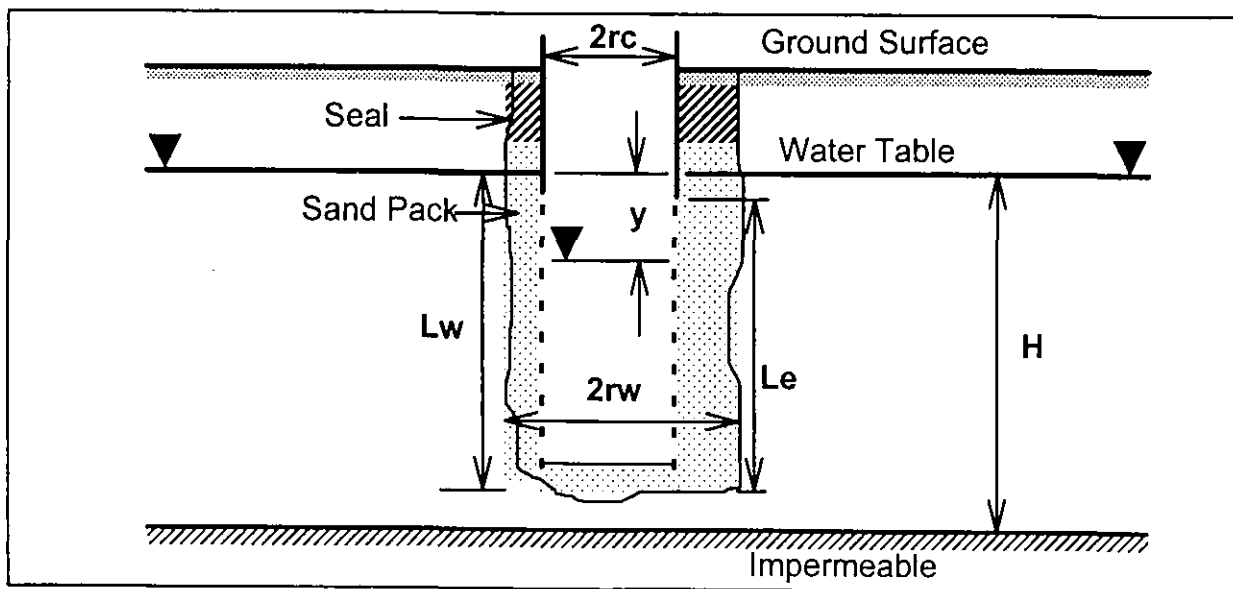
|          |            |      |                        |       |
|----------|------------|------|------------------------|-------|
| Point 1: | $t_1$ (s): | 660  | $y_1 = h_1 - h_0$ (m): | 4.030 |
| Point 2: | $t_2$ (s): | 7320 | $y_2 = h_2 - h_0$ (m): | 3.632 |

#### Estimated Horizontal Hydraulic Conductivity

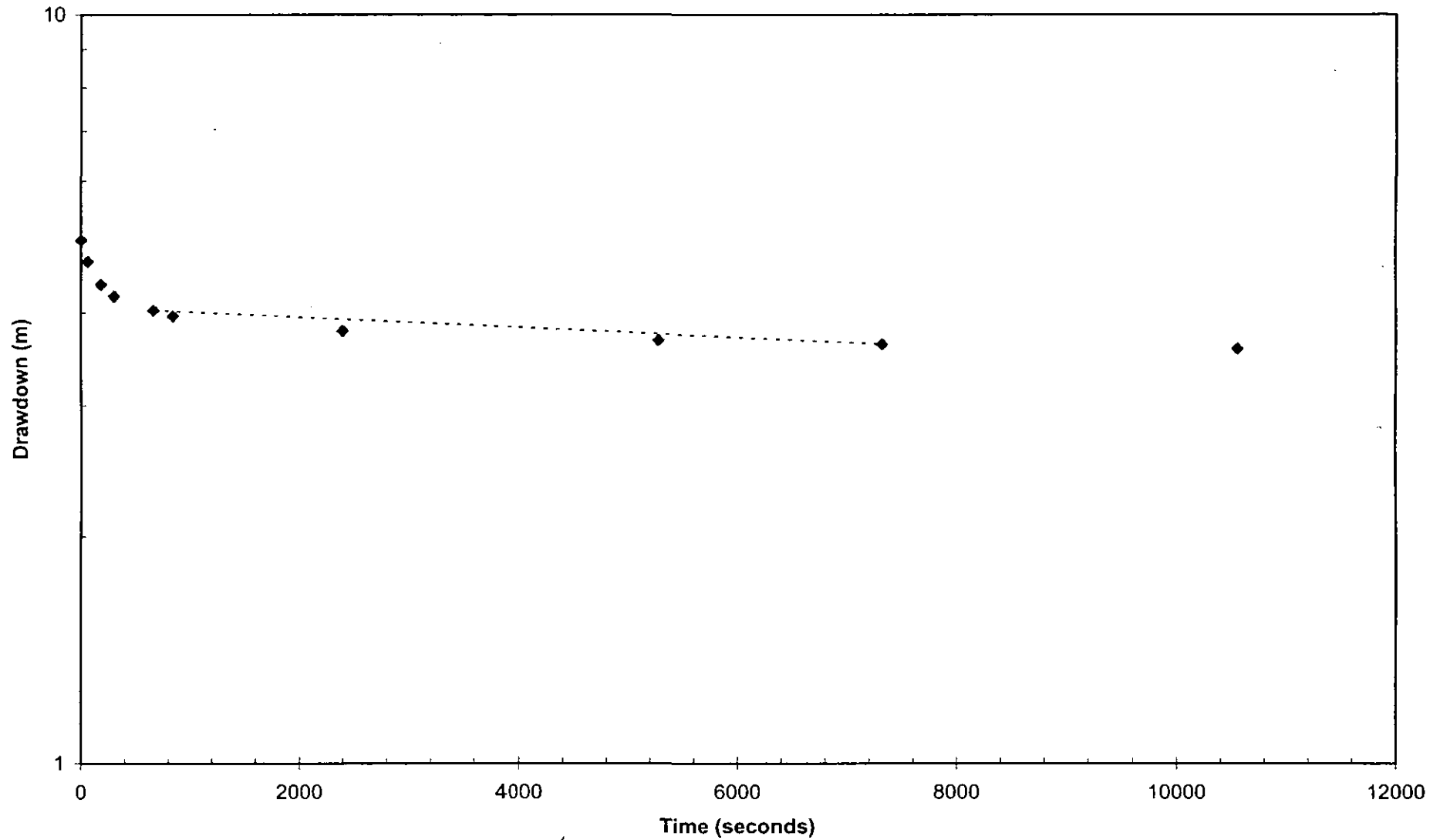
$$K = [r_c'^2 \ln(R_e/r_w)] / [2 L_e (t_2 - t_1)] \times \ln(y_1/y_2) \text{ (m/s):} \quad 8.6E-09$$

Reference: Bouwer, H., 1989. The Bouwer and Rice Slug Test - An Update.  
Ground Water, V. 27, No. 3, pp. 304-309.

#### Definition of Parameters:



MW 98-2 Response Test Analysis 1998 12 03



## Monitoring Well Response Test Analysis - Water Table Well

### Monitoring Well 98-9

Client: CP Rail                      Location: CP Weston Yard, Winnipeg, MB  
MECI Personnel: JDT                      Test Date: 1999 10 29

### Field Response Test Data

| Time t<br>(s) | Depth to<br>Water<br>(m) | Drawdown<br>y<br>(m) | Normalised<br>Drawdown<br>y/y0 |
|---------------|--------------------------|----------------------|--------------------------------|
| Static        | 1.193                    | 0.000                |                                |
| 0             | 5.430                    | 4.237                | 1.00                           |
| 30            | 5.256                    | 4.063                | 0.96                           |
| 60            | 5.046                    | 3.853                | 0.91                           |
| 120           | 4.695                    | 3.502                | 0.83                           |
| 240           | 4.465                    | 3.272                | 0.77                           |
| 360           | 4.377                    | 3.184                | 0.75                           |
| 600           | 4.279                    | 3.086                | 0.73                           |
| 900           | 4.206                    | 3.013                | 0.71                           |
| 1800          | 4.105                    | 2.912                | 0.69                           |
| 3855          | 4.002                    | 2.809                | 0.66                           |
| 5930          | 3.920                    | 2.727                | 0.64                           |
| 8750          | 3.811                    | 2.618                | 0.62                           |
| 11525         | 3.710                    | 2.517                | 0.59                           |

# Monitoring Well Response Test Analysis - Water Table Well

## Monitoring Well 98-9

### Bouwer and Rice Analysis

|                                                                                                                       |    |       |
|-----------------------------------------------------------------------------------------------------------------------|----|-------|
| Borehole Radius $r_w$ (m):                                                                                            |    | 0.065 |
| Casing Inside Radius $r_c$ (m):                                                                                       |    | 0.025 |
| Assumed Sandpack Drained Porosity $n_d$ :                                                                             |    | 0.25  |
| (use $n_d=0$ if lowered water level is above base of seal or $n_d=0.25$ if lowered water level is below base of seal) |    |       |
| Effective Casing Radius $r_c' = [(n_d)r_w^2 + (1-n_d)r_c^2]^{0.5}$ (m):                                               |    | 0.039 |
| Unconfined Aquifer Saturated Thickness $H$ (m):                                                                       |    | 4.60  |
| Base of Screen Below Water Table $L_w$ (m):                                                                           |    | 4.60  |
| Length of Screen $L_e$ (m):                                                                                           |    | 4.30  |
| $L_e/r_w$ :                                                                                                           |    | 66.2  |
| $L_w = H$ ? (0 = no):                                                                                                 |    | 1     |
| Dimensionless Parameters (calculated from $L_e/r_w$ ):                                                                | A: | 3.5   |
|                                                                                                                       | B: | 0.57  |
|                                                                                                                       | C: | 3.2   |
| $\ln(R_e/r_w)$ : (estimated from A and B if $L_w < H$ or C if $L_w = H$ )                                             |    | 3.26  |

#### Points Defining Straight Line Segment of Graph:

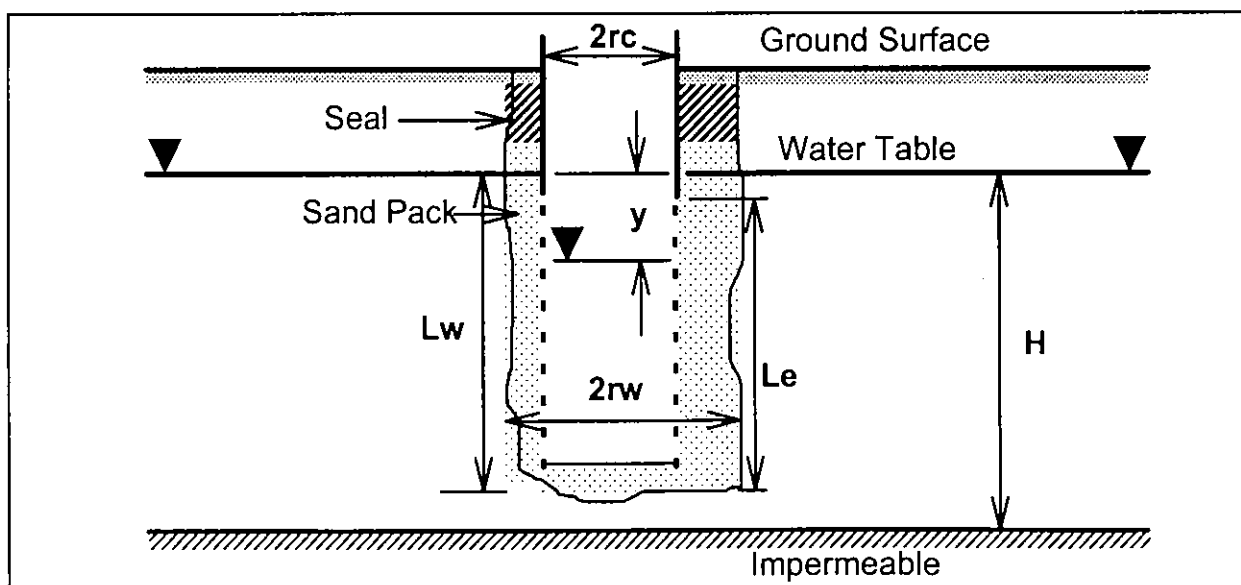
|          |            |      |                        |       |
|----------|------------|------|------------------------|-------|
| Point 1: | $t_1$ (s): | 600  | $y_1 = h_1 - h_0$ (m): | 3.086 |
| Point 2: | $t_2$ (s): | 8750 | $y_2 = h_2 - h_0$ (m): | 2.618 |

#### Estimated Horizontal Hydraulic Conductivity

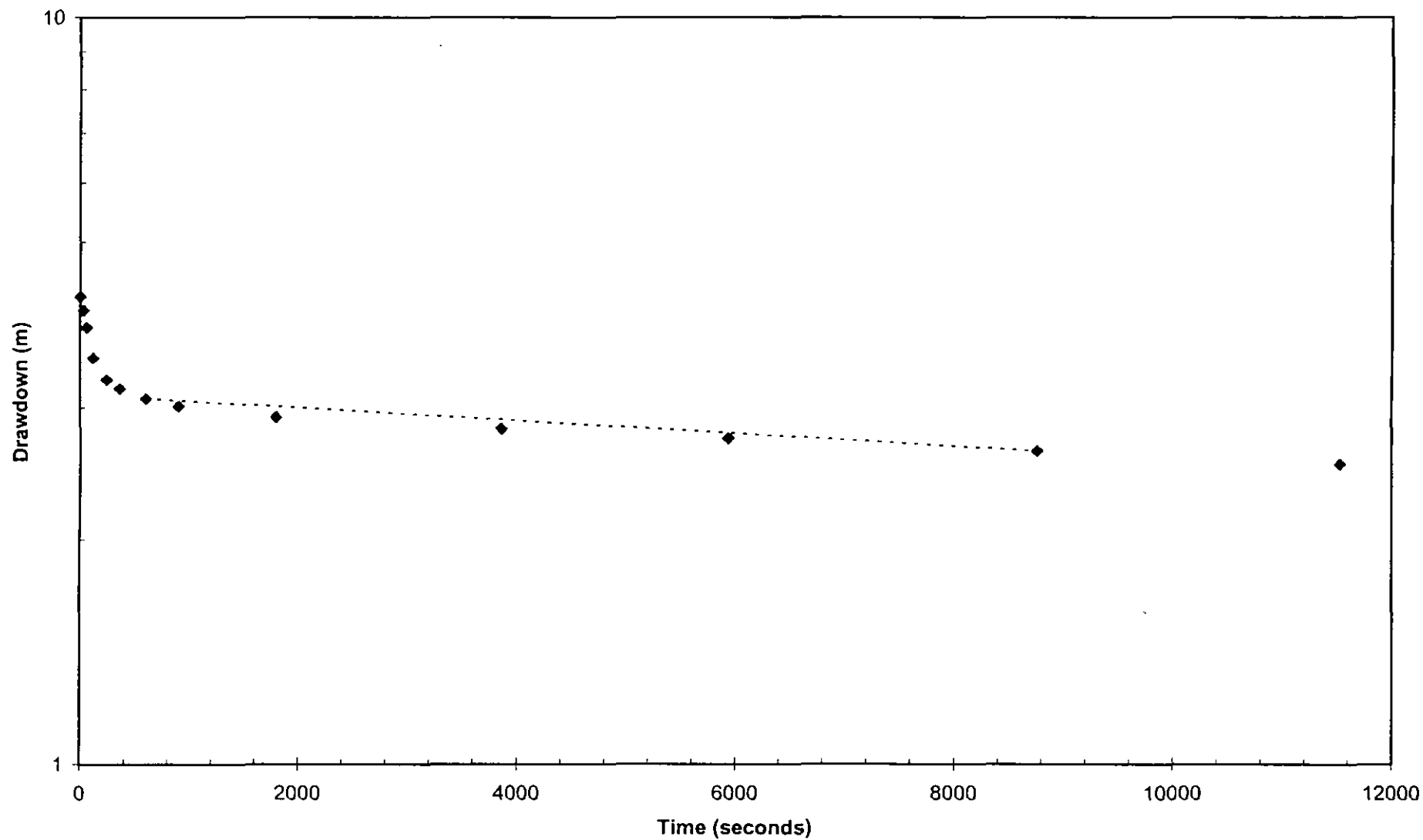
$$K = [r_c'^2 \ln(R_e/r_w)] / [2 L_e (t_2 - t_1)] \times \ln(y_1/y_2) \text{ (m/s):} \quad 1.2E-08$$

Reference: Bouwer, H., 1989. The Bouwer and Rice Slug Test - An Update. Ground Water, V. 27, No. 3, pp. 304-309.

#### Definition of Parameters:



# MW 98-9 Response Test Analysis 1999 10 29



## Monitoring Well Response Test Analysis - Water Table Well

### Monitoring Well 98-24

Client: CP Rail Location: CP Weston Yard, Winnipeg, MB  
MECI Personnel: JDT Test Date: 1998 12 03

### Field Response Test Data

| Time t<br>(s) | Depth to<br>Water<br>(m) | Drawdown<br>y<br>(m) | Normalised<br>Drawdown<br>y/y0 |
|---------------|--------------------------|----------------------|--------------------------------|
| Static        | 2.103                    | 0.000                |                                |
| 0             | 4.466                    | 2.363                | 1.00                           |
| 180           | 4.330                    | 2.227                | 0.94                           |
| 240           | 4.235                    | 2.132                | 0.90                           |
| 420           | 4.025                    | 1.922                | 0.81                           |
| 660           | 3.780                    | 1.677                | 0.71                           |
| 960           | 3.391                    | 1.288                | 0.55                           |
| 1140          | 3.232                    | 1.129                | 0.48                           |
| 5280          | 2.115                    | 0.012                | 0.01                           |
| 10740         | 2.112                    | 0.009                | 0.00                           |

# Monitoring Well Response Test Analysis - Water Table Well

## Monitoring Well 98-24

### Bouwer and Rice Analysis

|                                                                                                                       |    |       |
|-----------------------------------------------------------------------------------------------------------------------|----|-------|
| Borehole Radius $r_w$ (m):                                                                                            |    | 0.065 |
| Casing Inside Radius $r_c$ (m):                                                                                       |    | 0.025 |
| Assumed Sandpack Drained Porosity $n_d$ :                                                                             |    | 0.25  |
| (use $n_d=0$ if lowered water level is above base of seal or $n_d=0.25$ if lowered water level is below base of seal) |    |       |
| Effective Casing Radius $r_c' = [(n_d)r_w^2 + (1-n_d)r_c^2]^{0.5}$ (m):                                               |    | 0.039 |
| Unconfined Aquifer Saturated Thickness $H$ (m):                                                                       |    | 2.80  |
| Base of Screen Below Water Table $L_w$ (m):                                                                           |    | 2.80  |
| Length of Screen $L_e$ (m):                                                                                           |    | 3.00  |
| $L_e/r_w$ :                                                                                                           |    | 46.2  |
| $L_w = H$ ? (0 = no):                                                                                                 |    | 1     |
| Dimensionless Parameters (calculated from $L_e/r_w$ ):                                                                | A: | 3.0   |
|                                                                                                                       | B: | 0.47  |
|                                                                                                                       | C: | 2.5   |
| $\ln(R_e/r_w)$ : (estimated from A and B if $L_w < H$ or C if $L_w = H$ )                                             |    | 2.88  |

### Points Defining Straight Line Segment of Graph:

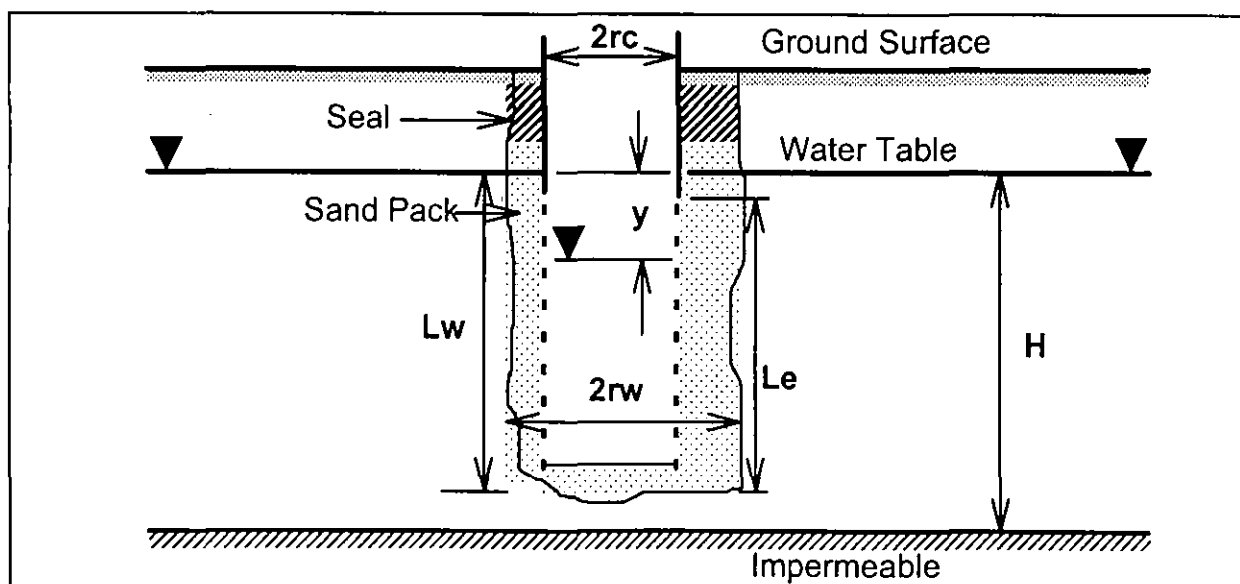
|          |            |      |                        |       |
|----------|------------|------|------------------------|-------|
| Point 1: | $t_1$ (s): | 1140 | $y_1 = h_1 - h_0$ (m): | 1.129 |
| Point 2: | $t_2$ (s): | 5280 | $y_2 = h_2 - h_0$ (m): | 0.012 |

### Estimated Horizontal Hydraulic Conductivity

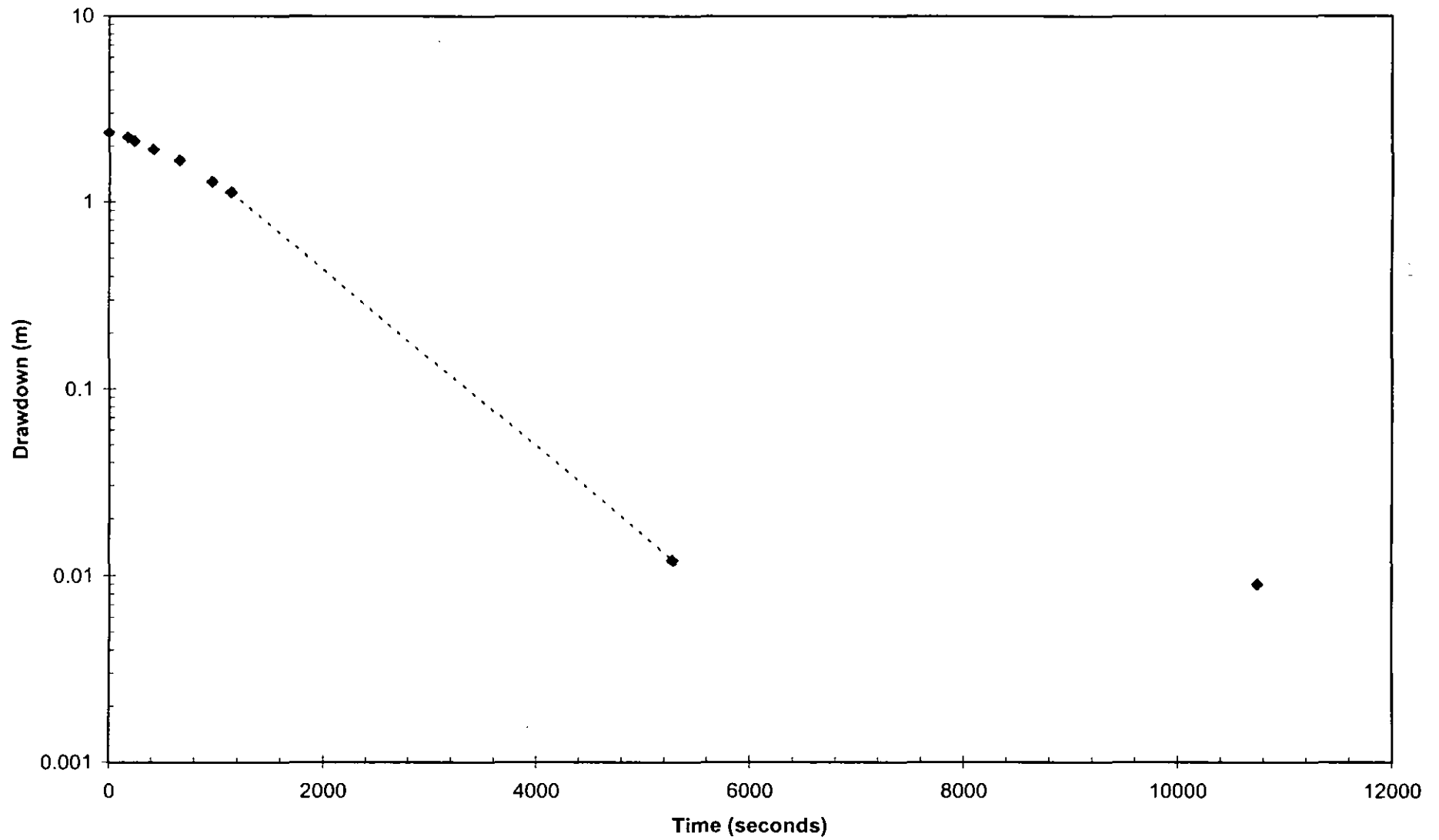
$$K = [r_c'^2 \ln(R_e/r_w)] / [2 L_e (t_2 - t_1)] \times \ln(y_1/y_2) \text{ (m/s):} \quad 8.0E-07$$

Reference: Bouwer, H., 1989. The Bouwer and Rice Slug Test - An Update. Ground Water, V. 27, No. 3, pp. 304-309.

### Definition of Parameters:



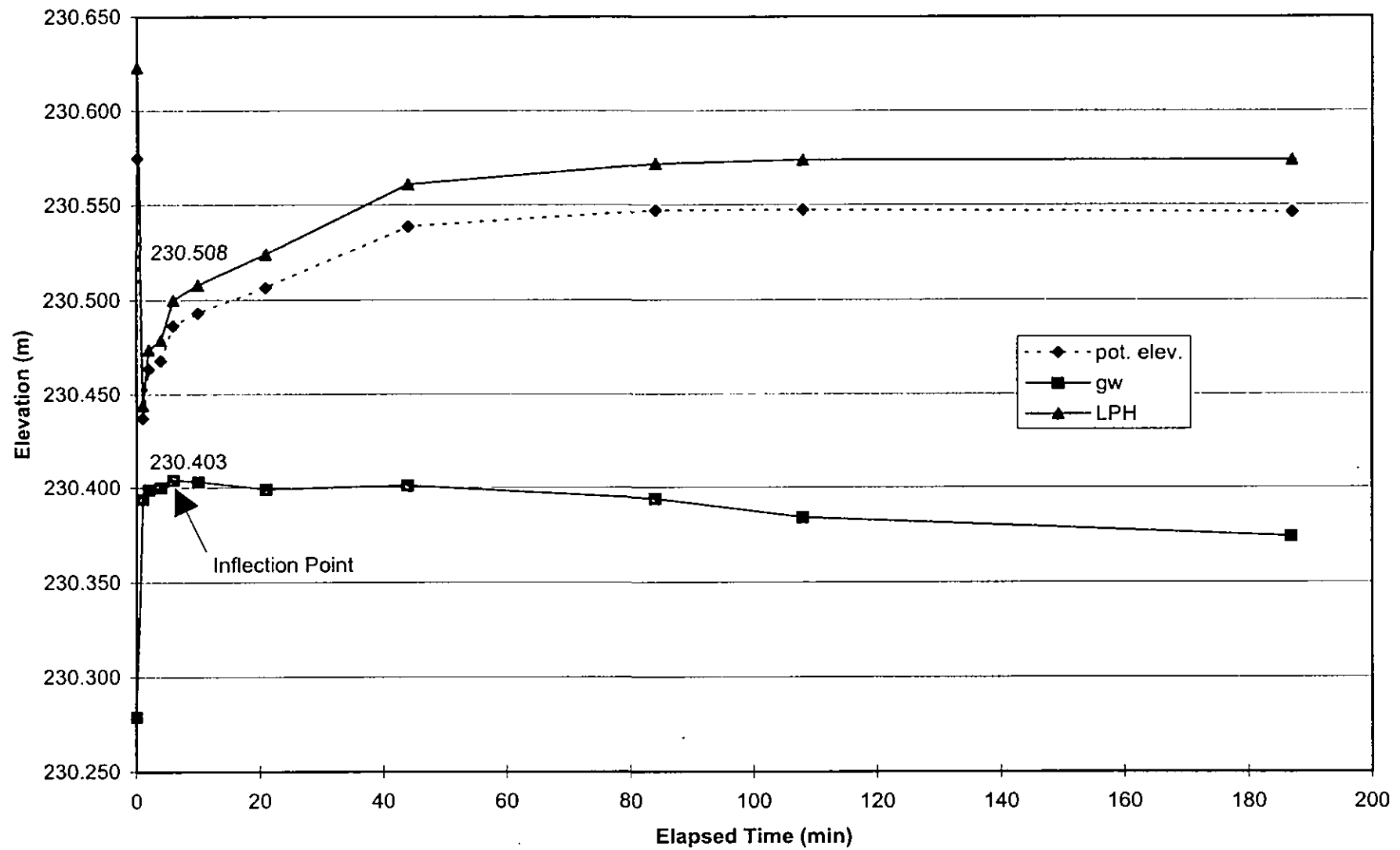
MW 98-24 Response Test Analysis 1998 12 03



## **APPENDIX X**

### **LPH Baildown Test Data**

Figure 1. LPH Baildown Test MW98-10 (1998 12 03)



## Monitoring Well Response Test Analysis - Water Table Well

### Monitoring Well 98-10

Client: CP Rail                      Location: CP Weston Yard, Winnipeg, MB  
MECI Personnel: JDT                      Test Date: 1998 12 03

### Field Response Test Data

| Time t<br>(s) | Depth to<br>LPH<br>(m) | Drawdown<br>y<br>(m) | Normalised<br>Drawdown<br>y/y0 |
|---------------|------------------------|----------------------|--------------------------------|
| Static        | 1.946                  | 0.000                |                                |
| 0             | 2.125                  | 0.179                | 1.00                           |
| 120           | 2.095                  | 0.149                | 0.83                           |
| 240           | 2.090                  | 0.144                | 0.80                           |
| 360           | 2.069                  | 0.123                | 0.69                           |
| 600           | 2.061                  | 0.115                | 0.64                           |
| 1260          | 2.045                  | 0.099                | 0.55                           |
| 2640          | 2.008                  | 0.062                | 0.35                           |
| 5040          | 1.997                  | 0.051                | 0.28                           |
| 6480          | 1.995                  | 0.049                | 0.27                           |
| 11220         | 1.995                  | 0.049                | 0.27                           |

## Monitoring Well Response Test Analysis - Water Table Well

### Monitoring Well 98-10

### Bouwer and Rice Analysis

|                                                                                                               |    |       |
|---------------------------------------------------------------------------------------------------------------|----|-------|
| Borehole Radius $r_w$ (m):                                                                                    |    | 0.065 |
| Casing Inside Radius $r_c$ (m):                                                                               |    | 0.025 |
| Assumed Sandpack Drained Porosity $n_d$ :                                                                     |    | 0.30  |
| (use $n_d=0$ if lowered water level is above base of seal or $n_d=0.25$ if lowered water level is below base) |    |       |
| Effective Casing Radius $r_c' = \{(n_d)r_w^2 + (1-n_d)r_c^2\}^{0.5}$ (m):                                     |    | 0.041 |
| Unconfined Aquifer Saturated Thickness $H$ (m):                                                               |    | 2.50  |
| Base of Screen Below Water Table $L_w$ (m):                                                                   |    | 2.50  |
| Length of Screen $L_e$ (m):                                                                                   |    | 2.50  |
| $L_e/r_w$ :                                                                                                   |    | 38.5  |
| $L_w = H$ ? (0 = no):                                                                                         |    | 1     |
| Dimensionless Parameters (calculated from $L_e/r_w$ ):                                                        | A: | 2.8   |
|                                                                                                               | B: | 0.43  |
|                                                                                                               | C: | 2.3   |
| $\ln(R_e/r_w)$ : (estimated from A and B if $L_w < H$ or C if $L_w = H$ )                                     |    | 2.78  |

#### Points Defining Straight Line Segment of Graph:

|          |            |      |                        |       |
|----------|------------|------|------------------------|-------|
| Point 1: | $t_1$ (s): | 0    | $y_1 = h_1 - h_0$ (m): | 0.136 |
| Point 2: | $t_2$ (s): | 3290 | $y_2 = h_2 - h_0$ (m): | 0.053 |

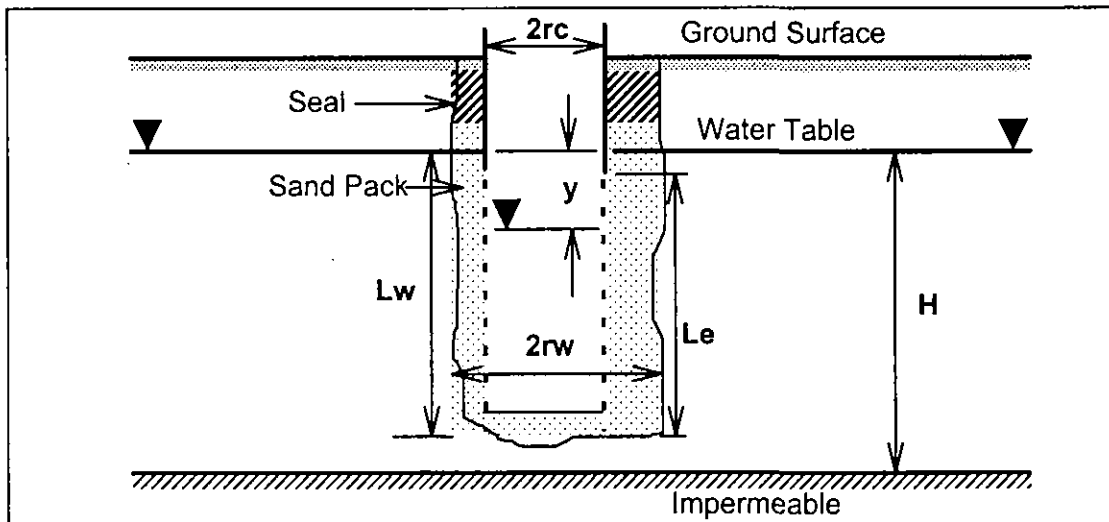
#### Estimated Horizontal Hydraulic Conductivity

$$K = [r_c'^2 \ln(R_e/r_w)] / [2 L_e (t_2 - t_1)] \times \ln(y_1/y_2) \text{ (m/s):} \quad 2.7E-07$$

$$T(\text{LPH}) = KH(1/(1-0.85)) \text{ (m}^2/\text{s)} \quad 4.50E-06$$

Reference: Bouwer, H., 1989. The Bouwer and Rice Slug Test - An Update.  
Ground Water, V. 27, No. 3, pp. 304-309.

#### Definition of Parameters:



# MW 98-10 Response Test Analysis 1998 12 03

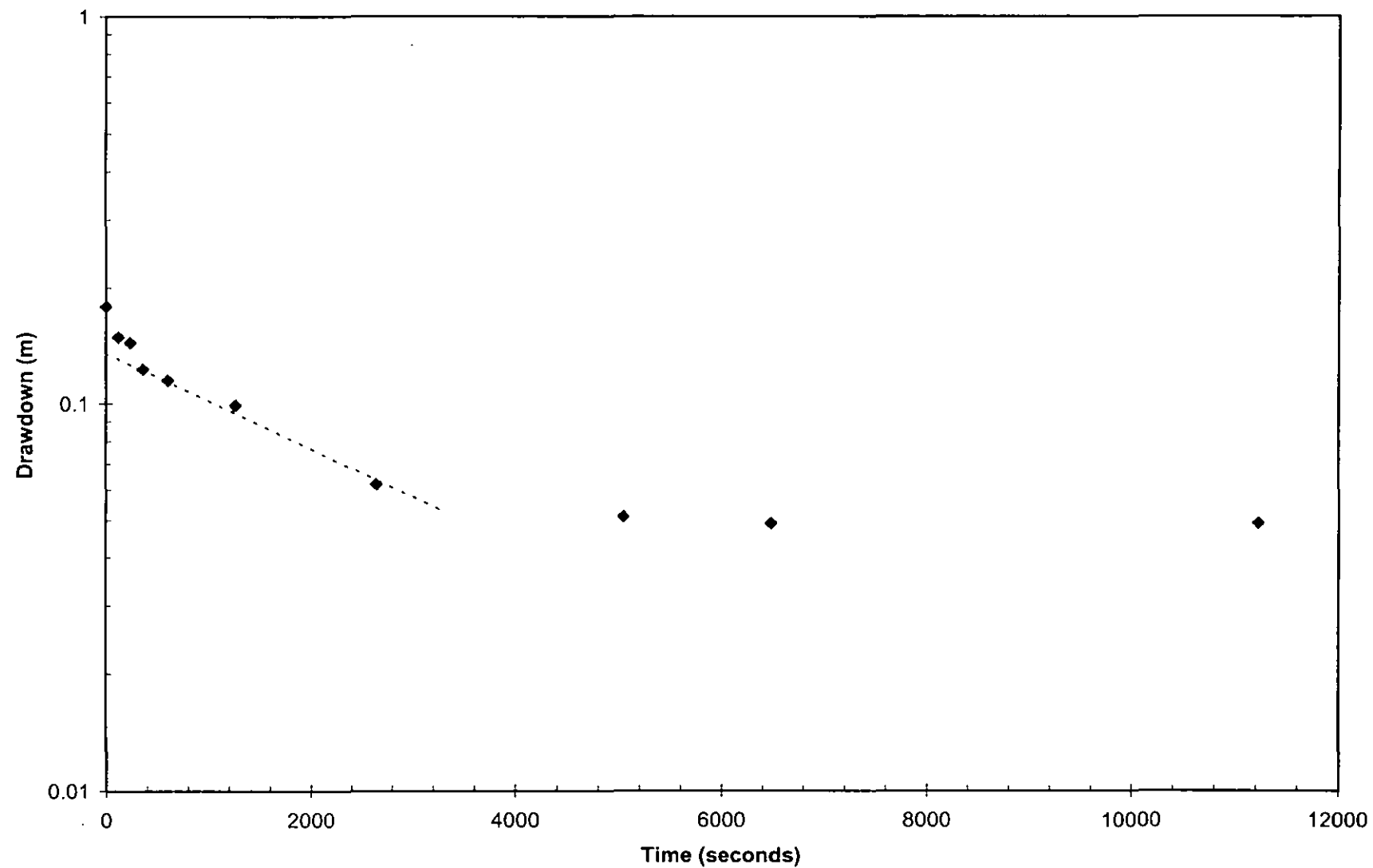
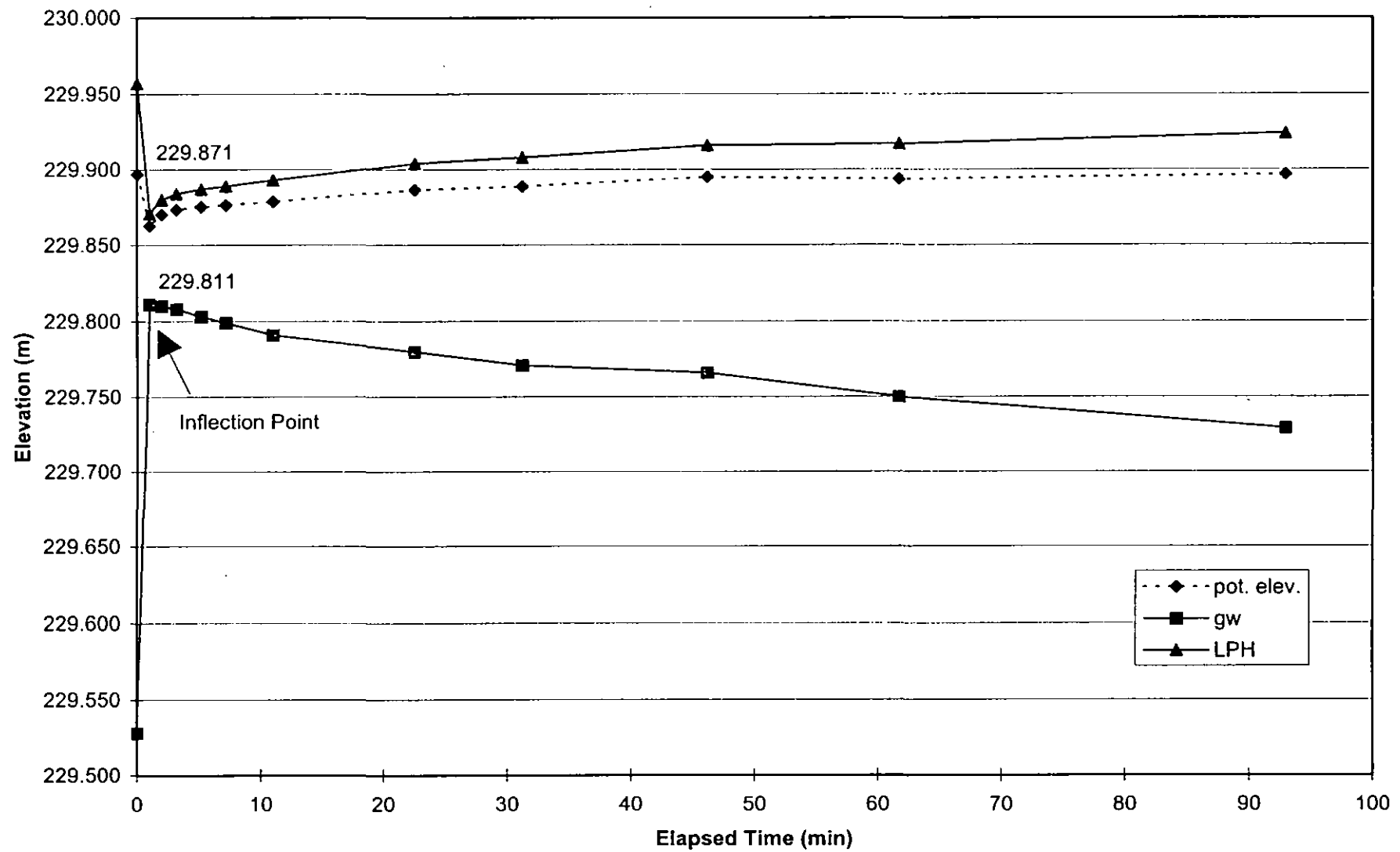


Figure 2. LPH Baildown Test MW98-13 (1999 10 29)



## Monitoring Well Response Test Analysis - Water Table Well

### Monitoring Well 98-13

Client: CP Rail                      Location: CP Weston Yard, Winnipeg, MB  
MECI Personnel: JDT                      Test Date: 1999 10 29

### Field Response Test Data

| Time t<br>(s) | Depth to<br>LPH<br>(m) | Drawdown<br>y<br>(m) | Normalised<br>Drawdown<br>y/y0 |
|---------------|------------------------|----------------------|--------------------------------|
| Static        | 2.689                  | 0.000                |                                |
| 0             | 2.775                  | 0.086                | 1.00                           |
| 60            | 2.766                  | 0.077                | 0.90                           |
| 130           | 2.762                  | 0.073                | 0.85                           |
| 250           | 2.759                  | 0.070                | 0.81                           |
| 370           | 2.757                  | 0.068                | 0.79                           |
| 600           | 2.753                  | 0.064                | 0.74                           |
| 1295          | 2.742                  | 0.053                | 0.62                           |
| 1815          | 2.738                  | 0.049                | 0.57                           |
| 2715          | 2.730                  | 0.041                | 0.48                           |
| 3645          | 2.729                  | 0.040                | 0.47                           |
| 5520          | 2.722                  | 0.033                | 0.38                           |
| 7740          | 2.718                  | 0.029                | 0.34                           |

## Monitoring Well Response Test Analysis - Water Table Well

### Monitoring Well 98-13

#### Bouwer and Rice Analysis

Borehole Radius  $r_w$  (m): 0.065  
 Casing Inside Radius  $r_c$  (m): 0.025  
 Assumed Sandpack Drained Porosity  $n_d$ : 0.30  
 (use  $n_d=0$  if lowered water level is above base of seal or  $n_d=0.25$  if lowered water level is below base)  
 Effective Casing Radius  $r_c' = [(n_d)r_w^2 + (1-n_d)r_c^2]^{0.5}$  (m): 0.041  
 Unconfined Aquifer Saturated Thickness  $H$  (m): 1.30  
 Base of Screen Below Water Table  $L_w$  (m): 1.30  
 Length of Screen  $L_e$  (m): 1.30  
 $L_e/r_w$ : 20.0  
 $L_w = H$ ? (0 = no): 1  
 Dimensionless Parameters (calculated from  $L_e/r_w$ ):  
     A: 2.2  
     B: 0.34  
     C: 1.6  
 $\ln(R_e/r_w)$ : (estimated from A and B if  $L_w < H$  or C if  $L_w = H$ ) 2.24

#### Points Defining Straight Line Segment of Graph:

|          |            |      |                        |       |
|----------|------------|------|------------------------|-------|
| Point 1: | $t_1$ (s): | 0    | $y_1 = h_1 - h_0$ (m): | 0.061 |
| Point 2: | $t_2$ (s): | 7890 | $y_2 = h_2 - h_0$ (m): | 0.025 |

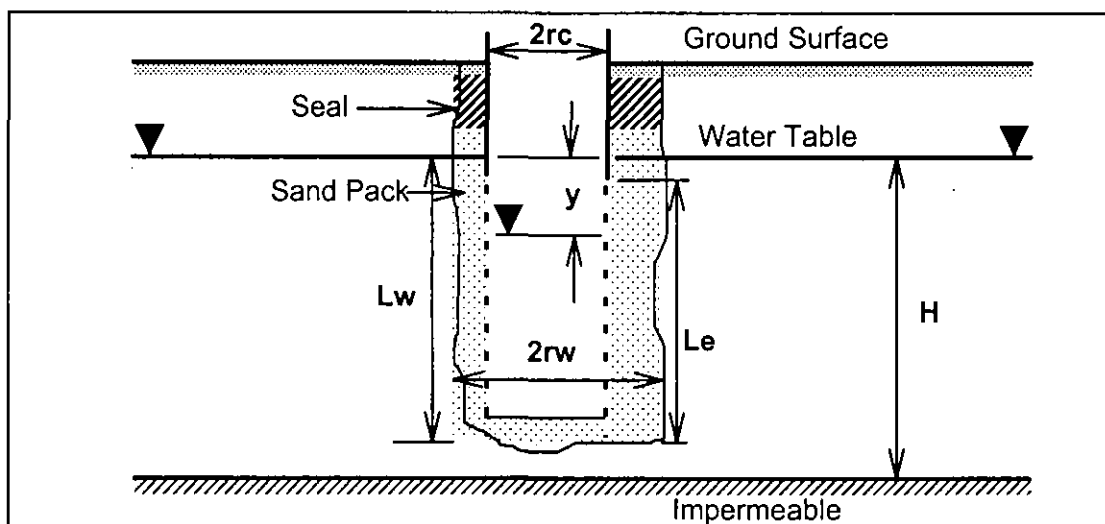
#### Estimated Horizontal Hydraulic Conductivity

$K = [r_c'^2 \ln(R_e/r_w)] / [2 L_e (t_2 - t_1)] \times \ln(y_1/y_2)$  (m/s): 1.6E-07

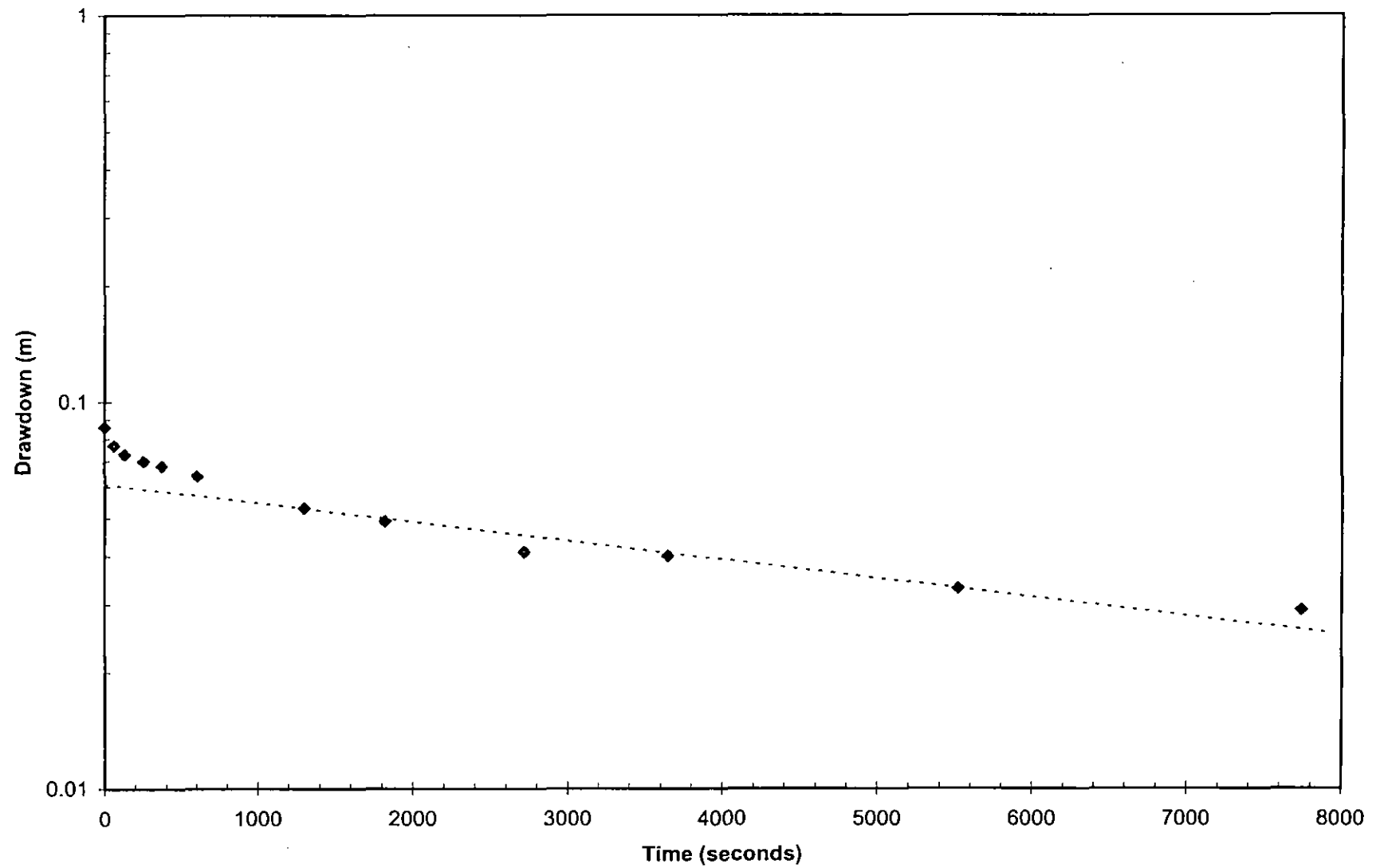
$T(\text{LPH}) = KH(1/(1-0.85))$  (m<sup>2</sup>/s): 1.40E-06

Reference: Bouwer, H., 1989. The Bouwer and Rice Slug Test - An Update.  
 Ground Water, V. 27, No. 3, pp. 304-309.

#### Definition of Parameters:



# MW 98-13 Response Test Analysis 1999 10 29



## **APPENDIX XI**

### **Corrective Action Reports**

Date 1998 12 18  
Number of pages including cover sheet 2To: Ron Corkum  
Company: Philip Services Corp.  
Phone: 1-800-263-9040  
Fax Phone: \_\_\_\_\_  
CC: \_\_\_\_\_From: J. Derek Trinke  
Project: Weston Yard, Wpg, MB  
MECI File #: W8140  
Subject: Corrective Action Report  
Phone: 204-475-4133  
Fax Phone: 204-477-9194  
Email: dtrinke@morrowenv.com**REMARKS:**☐ Urgent ☐ For your review ☒ Reply ASAP ☐ Please comment

Morrow Environmental Consultants Inc. (MECI) is completing an Environmental Site Assessment (ESA) at a site located in Winnipeg, MB. Lab analysis was performed and reported by Philip Services Corporation (PSC) in Mississauga, ON. During the ESA, the laboratory Quality Assurance/Quality Control results (QA/QC) are reviewed to ensure all laboratory QA/QC methods fall within the limits established by the laboratory. Upon review, it was observed that the % recovery for one of the spiked method blanks was unacceptable. Included is a Corrective Action Report for issues concerning the poor recovery. Please review the data in question and your QA/QC with PSC personnel. Also comment as to any causes or plans to correct or prevent any future reoccurrence of the poor recovery. Please complete and return the CAR as it will be included in the formal report.

If you have any questions, please call the undersigned.



J. Derek Trinke



MORROW  
ENVIRONMENTAL  
CONSULTANTS INC.

## CORRECTIVE ACTION REPORT

|               |                      |               |                           |
|---------------|----------------------|---------------|---------------------------|
| DATE:         | 98 12 18             | PROJECT NO:   | W8140                     |
| MECI CONTACT: | J. Derek Trinke      | PROJECT NAME: | Phase II ESA              |
| LAB:          | Philip - Mississauga | LOCATION:     | Weston Yard, Winnipeg, MB |
| LAB CONTACT:  | Ron Corkum           |               |                           |

### DESCRIPTION OF PROBLEM (including when, which samples affected):

Soil samples were sent to Philip for the above referenced project on 98 11 13 and were received by Philip on 1998 11 14. VOC analysis was performed on the following samples: BH98-25-2-981113 and BH98-26-1-981113. The Philip work order no. is G984466V.

The issue we are concerned with is the poor recovery for:

- the m-xylene and p-xylene in the spiked method blank for Sample BH98-26-1-981113.

### ROOT CAUSE:

### CORRECTIVE ACTION (Plan To Prevent Reoccurrence):

### IMPLEMENTATION (Stages, Timing, etc. If not identified above)

### CLOSURE (To be signed after implementation and review for effectiveness)

SIGNATURE

DATE



December 18, 1998

Mr. Derek Trinke  
Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Avenue  
Winnipeg, Manitoba  
R3T 1T6

Re: Project No. W8140 - Philip Report for Volatile Organic Compounds No. G984466V

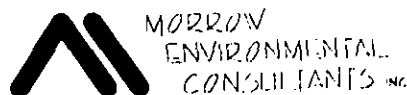
A typographical error was discovered on the original report for the recovery of m/p-xylene in the Spiked Method Blank. The recovery was stated as 14% whereas the correct value was 104%. Although every report is independently cross-checked prior to release of the final report, in this case the typographical error was not corrected.

A revised final report is enclosed. My apologies for any inconvenience this may have caused.

Sincerely,

A handwritten signature in cursive script, appearing to read 'Ron Corkum', is written over a horizontal line.

Ron Corkum  
Manager, Mass Spectrometry Services



# FAX

Morrow Environmental Consultants Inc.  
Unit E, 1420 Clarence Avenue  
Winnipeg, Manitoba  
Canada  
R3T 1T6

Date 1999 07 22

Number of pages including cover sheet 2

To: Elaine Grant  
Company: Philip Services Corp.  
Phone: 1-800-263-9040  
Fax Phone: \_\_\_\_\_  
CC: \_\_\_\_\_

From: J. Derek Trinke  
Project: Weston Yard, Wpg, MB  
MECI File #: W8140B  
Subject: Corrective Action Report  
Phone: 204-475-4133  
Fax Phone: 204-477-9194  
Email: dtrinke@morrowenv.com

## REMARKS:

☐ Urgent ☐ For your review ☒ Reply ASAP ☐ Please comment

Morrow Environmental Consultants Inc. (MECI) is completing an Environmental Site Assessment (ESA) at a site located in Winnipeg, MB. Lab analysis was performed and reported by Philip Analytical Services Corporation (PASC) in Mississauga, ON. During the ESA, Quality Assurance/Quality Control procedures (QA/QC) were undertaken to ensure that all field and laboratory data collected for soil samples provide reliable information for the characterization of site conditions. MECI staff has followed set field QA procedures during the ESA. Lab analysis on a blind duplicate sample is above MECI QA Relative Percent Difference limits. Included is a Corrective Action Report for issues concerning the poor reproducibility of lab analysis. Please review the data in question and your QA/QC with PASC personnel. Also comment as to any causes or plans to correct or prevent any future reoccurrence of the poor reproducibility. Please complete and return the CAR as it will be included in the formal report.

If you have any questions, please call the undersigned.

J. Derek Trinke

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MORROW  
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CONSULTANTS INC

## CORRECTIVE ACTION REPORT

|               |                      |               |                            |
|---------------|----------------------|---------------|----------------------------|
| DATE:         | 1999 07 22           | PROJECT NO:   | W8140B                     |
| MECI CONTACT: | J. Derek Trinke      | PROJECT NAME: | Supplementary Phase II ESA |
| LAB:          | Philip - Mississauga | LOCATION:     | Weston Yard, Winnipeg, MB  |
| LAB CONTACT:  | Elaine Grant         |               |                            |

### DESCRIPTION OF PROBLEM (including when, which samples affected):

Soil samples were sent to Philip for the above referenced project on 1999 07 14 and were received by Philip on 1999 07 15. BTEX, LH and TEH analyses was performed on the following samples: BH99-36-3-990713 and its blind duplicate BH99-36-8-990713. The Philip work order no. is G992806.

### The issue we are concerned with is:

- the poor reproducibility for the ethylbenzene, xylenes, and LH components comparing the duplicate samples.

### ROOT CAUSE:

### CORRECTIVE ACTION (Plan To Prevent Reoccurrence):

### IMPLEMENTATION (Stages, Timing, etc. If not identified above)

### CLOSURE (To be signed after implementation and review for effectiveness)

SIGNATURE

DATE



5735 McAdam Road  
Mississauga, Ont. L4Z 1N9  
Tel: (905) 890-8566  
Fax: (905) 890-8575  
Toll Free: 1-800-263-9040

### Fax Cover Sheet

DATE: 28-Oct-99

COMPANY: Morrow Environmental Consultants Inc.

TO: Derek Trinke

FAX NUMBER: 204-477-8194

E-Mail: \_\_\_\_\_

FROM: Valerie Geldert x276

E-Mail: vgeldert@philipinc.com

Number of pages including cover sheet: 2

Originals Sent By:

☐

Courier

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Mail

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Not Sent

#### Message:

Dear Derek,

PASC Job No

C802808

Morrow Ref.

WB1408

With respect to your "corrective action report" dated 1998-07-02, the discrepancy noted in the analytical results for blind duplicate samples BH88-38-3-000713 and BH88-38-8-000713 was due to sample non-homogeneity.

If you require anything further, just let me know.

Yours truly,

Valerie

Following material is intended for use only by the person to whom it is specifically addressed above and should not be read by, or delivered to, any other person. Such material may contain privileged or confidential information, the disclosure or other use of which by other than the intended recipient may be in the breach of certain laws or the infringement of rights of third parties. If you have received this similar in error, please notify us immediately by calling our office. We thank you in advance for your cooperation and assistance.



MORROW  
ENVIRONMENTAL  
CONSULTANTS INC.

**CORRECTIVE ACTION REPORT**

|               |                      |               |                            |
|---------------|----------------------|---------------|----------------------------|
| DATE:         | 1999 07 22           | PROJECT NO:   | W8140B                     |
| MECI CONTACT: | J. Derek Trinke      | PROJECT NAME: | Supplementary Phase II ESA |
| LAB:          | Philip - Mississauga | LOCATION:     | Weston Yard, Winnipeg, MB  |
| LAB CONTACT:  | Elaine Grant         |               |                            |

**DESCRIPTION OF PROBLEM (including when, which samples affected)**

Soil samples were sent to Philip for the above referenced project on 1999 07 14 and were received by Philip on 1999 07 15. BTEX, LH and TEH analyses was performed on the following samples: BH99-36-3-990713 and its blind duplicate BH99-36-8-990713. The Philip work order no. is G992808.

The issue we are concerned with is:

- the poor reproducibility for the ethylbenzene, xylenes, and LH components comparing the duplicate samples.

**ROOT CAUSE**

Sample inhomogeneity.

**CORRECTIVE ACTION (Plan To Prevent Recurrence)****IMPLEMENTATION (Stages, Timing etc. if not identified above)****CLOSURE (To be signed after implementation and review for effectiveness)**

SIGNATURE *W. Adams*

DATE

Date 1999 10 20Number of pages including cover sheet 2

To: Elaine Grant  
Company: Philip Services Corp.  
Phone: 1-800-263-9040  
Fax Phone: \_\_\_\_\_  
CC: \_\_\_\_\_

From: J. Derek Trinke  
Project: Weston Shops, Wpg, MB  
MECI File #: W8140B  
Subject: Corrective Action Report  
Phone: 204-475-4133  
Fax Phone: 204-477-9194  
Email: dtrinke@morrowenv.com

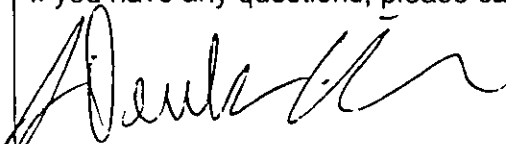
## REMARKS:

☐ Urgent ☐ For your review ☒ Reply ASAP ☐ Please comment

Morrow Environmental Consultants Inc. (MECI) is completing an Environmental Site Assessment (ESA) at a site located in Winnipeg, MB. Lab analysis was performed and reported by Philip Analytical Services Corporation (PASC) in Mississauga, ON. During the ESA, Quality Assurance/Quality Control procedures (QA/QC) were undertaken to ensure that all field and laboratory data collected for soil samples provide reliable information for the characterization of site conditions. MECI staff has followed set field QA procedures during the ESA. Lab analysis on a blind duplicate water sample is above MECI QA Relative Percent Difference limits. Included is a Corrective Action Report for issues concerning the poor reproducibility of lab analysis. Please review the data in question and your QA/QC with PASC personnel. Also comment as to any causes or plans to correct or prevent any future reoccurrence of the poor reproducibility. Please complete and return the CAR as it will be included in the formal report.

In addition, I faxed you a CAR on 1999 07 22 regarding some soil sample duplicates. I have not received any response to date.

If you have any questions, please call the me.



J. Derek Trinke



MORROW  
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CONSULTANTS INC.

## CORRECTIVE ACTION REPORT

|               |                      |               |                            |
|---------------|----------------------|---------------|----------------------------|
| DATE:         | 1999 10 20           | PROJECT NO:   | W8140B                     |
| MECI CONTACT: | J. Derek Trinke      | PROJECT NAME: | Supplementary Phase II ESA |
| LAB:          | Philip - Mississauga | LOCATION:     | Weston Shops, Winnipeg, MB |
| LAB CONTACT:  | Elaine Grant         |               |                            |

### DESCRIPTION OF PROBLEM (including when, which samples affected):

Water samples were sent to Philip for the above referenced project on 1999 09 14 and were received by Philip on 1999 09 15. Dissolved metals analysis was performed on the following samples: MW99-59-990914 and its blind duplicate MW99-82-990914. The Philip work order no. is G993888.

The issue we are concerned with is:

- the poor reproducibility for the barium and zinc components comparing the duplicate samples.

### ROOT CAUSE:

### CORRECTIVE ACTION (Plan To Prevent Reoccurrence):

### IMPLEMENTATION (Stages, Timing, etc. If not identified above)

### CLOSURE (To be signed after implementation and review for effectiveness)

SIGNATURE

DATE



## Fax Cover Sheet

Urgent Fax

DATE: 11/3/99



PRIORITY FAX

COMPANY: Morrow Environmental Consultants Inc.

TO: Derek Trinke

FAX NUMBER: 204-477-9194

FROM: Elaine Grant

EMAIL: egrant@philipinc.com

Number of pages including cover sheet:

2

Originals Sent By:

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Courier

☐

Mall

☒

Not Sent

### Message:

Derek,

As discussed samples MW-99-59-990914 and its blind duplicate MW99-82-990914 were re-analyzed, results confirmed data reported under PASC reference number 6993888.

#### Please note:

In the case of the Zinc re-analysis: results were identical to original report.

In the case of the Barium re-analysis: the concentration in both samples reported at a value lower than the original report. The samples contained appreciable amounts of Sulfur, as a result Barium Sulfate may be forming. Barium Sulfate is insoluble and easily drops out of solution. This may explain the change in the Barium results.

As a result of : data review and re-analysis PASC can find no analytical explanation for the difference in Zinc and Barium concentrations between the two sample bottles. The analysis indicates that the samples containers contain differing amounts of both Zinc and Barium.

Elaine Grant  
Account Manager

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Philip Analytical Services Corporation

3736 McAdam Road, Mississauga, Ontario, Canada L4Z 1N9 Tel: (905) 890-8508 Fax: (905) 890-8575 Web: 1-800-283-0040



MORROW  
ENVIRONMENTAL  
CONSULTANTS INC.

**CORRECTIVE ACTION REPORT**

|               |                       |               |                            |
|---------------|-----------------------|---------------|----------------------------|
| DATE:         | 1999 10 20            | PROJECT NO:   | W8140B                     |
| MECI CONTACT: | J. Derek Trinke       | PROJECT NAME: | Supplementary Phase II ESA |
| LAB:          | Phillip - Mississauga | LOCATION:     | Weston Shops, Winnipeg, MB |
| LAB CONTACT:  | Elaine Grant          |               |                            |

**DESCRIPTION OF PROBLEM (including when, where, what, samples, etc.)**

Water samples were sent to Phillip for the above referenced project on 1999 09 14 and were received by Phillip on 1999 09 15. Dissolved metals analysis was performed on the following samples: MW99-69-990914 and its blind duplicate MW99-82-990914. The Phillip work order no. is G993888.

**The issue we are concerned with is:**

- the poor reproducibility for the barium and zinc components comparing the duplicate samples.

→ Re-analysis confirms results reported in G993888.

- See cover.

**ROOT CAUSE****CORRECTIVE ACTION (To be Implemented)****IMPLEMENTATION (Steps, Timing, etc. If not identified above)****CLOSURE (To be signed after implementation and review for effectiveness)**

SIGNATURE

DATE

October 28/99.

TOTAL P.02