Phase II Environmental Site Assessment
Historic Waste Disposal Site
Red Deer Motors
The City of Red Deer

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EXECUTIVE SUMMARY

On behalf of The City of Red Deer, Tiamat Environmental Consultants Ltd. (Tiamat) presents this Phase II Environmental Site Assessment for a historic waste disposal site designated as the Red Deer Motors Site.

This historic waste material (site) lies within the neighbourhood of South Hill. The site is currently zoned A2 – Environmental Preservation (Land Use Bylaw 3357/2006). The objective of this ESA is to assess the environmental quality of the subsurface soil and groundwater underlying the site. This report presents the scope of work, a summary of the results and our professional opinion respecting the environmental quality of the site.

The key results of this ESA are as follow:

- Surrounding land uses include hotels, automotive related businesses and a college. There are no obvious activities which pose a high potential to adversely impact the site from activities on adjacent developments.

- The interpreted plan area of the historic waste is estimated to be 11,180 m^2 (2.76 ac), more or less with a maximum observed depth of 4.6 m (15 feet). Subsurface soil contaminated by petroleum hydrocarbons was encountered in the northwest quadrant of the site to a depth of 5.2 m (17 feet) below the ground surface. The waste and contaminated soil extend beyond the subdivided lot onto a portion of the 32 Street right-of-way, refer to Figure 2.

- Groundwater quality testing shows impact to the local groundwater with a potential for the contaminated groundwater to connect to Waskasoo Creek.

- Soil vapour samples from three soil vapour wells indicate three broad groups of VOCs, aliphatic and aromatic hydrocarbons and siloxanes. The relative concentrations are considered to be low to mild and may potentially create an adverse level of exposure to deep utilities (sanitary and storm sewers). The measured soil vapours are not at a level that is considered to be an environmental concern to the adjacent land uses.

The concerns for environmental and human health hazards stemming from the proximity of this historic waste site will persist for the foreseeable future. The potential to adversely impact future development is viewed to be limited and manageable.

Any use of the local groundwater may create an emission or potential exposure to various VOC compounds resulting from VOCs degassing from the extracted groundwater. Accordingly, local groundwater should not be used for either human consumption or for any other purposes.

To better understand the off-site environmental risks associated with this historic waste disposal site, several recommendations are presented in this report.

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1.0 INTRODUCTION

On behalf of The City of Red Deer, Tiamat Environmental Consultants Ltd. (Tiamat) presents this Phase II Environmental Site Assessment (ESA) report for a historic waste disposal site designated as the Red Deer Motors Site.

The objectives of this Phase II ESA are to consolidate results from previous investigations by others and to characterize the composition of the leachate and the subsurface plume of soil vapour sourced from the historic waste material. This report presents the scope of work, a summary of the results and our professional opinion respecting the subsurface environmental conditions associated with the historic waste materials. This report is intended to complement the Phase I ESA dated September 24, 2013.

1.1 Scope of Work

A summary of the key tasks for this Phase II ESA are outlined below:

Fieldwork

- Identify and locate underground utilities within the work areas on the site;
- Supervise the drilling of testholes (THs) located within the legal property lines of the site;
- Collect the soil samples for laboratory analyses of benzene, toluene, ethylbenzene, xylenes (BTEX), petroleum hydrocarbon fractions F1 (C_6-C_{10}), F2 (>C_{10}-C_{16}), F3 (>C_{16}-C_{34}), F4 (>C_{34}), EPA 8260 list of volatile organic compounds (VOCs), metals, chlorides (Cl^-) and nitrates/nitrites (NO_3^-/NO_2^-);
- Screen the soil cuttings to determine the feasibility to dispose of drill cuttings at a Class II landfill facility. Acceptance parameters for disposal include laboratory analyses of pH, soil flash point, paint filter, total organic carbon (TOC) and TCLP assay for BTEX compounds and metals;
- Each TH is completed with either a groundwater (MW) or vapour (VW) monitoring well or backfilled and abandoned;
- Collect groundwater samples for laboratory analyses of BTEX, hydrocarbon fractions F1, F2, VOCs, total and dissolved metals, Cl^-, sulfate (SO_4), ammonium (NH_4-N), phosphorus (P), TOC, chemical oxygen demand (COD), biochemical oxygen demand (BOD), NO_3^-/NO_2^-, total nitrogen (N), pH, electrical conductivity (EC), adsorbable organic halides (AOXs) and volatile fatty acids;

- Collect vapour samples for laboratory analyses of VOCs, oxygen (O_2), carbon monoxide (CO), carbon dioxide (CO_2), methane (CH_4), nitrogen (N), volatile hydrocarbons and siloxanes or volatile organic silicon compounds (VOSCs);

- Survey each test location for horizontal and vertical control relative to an established ASCM (Alberta Survey Control Marker) datum within The City of Red Deer.

Report

- Prepare a report summarising the results including figures, tabulated data and our interpretation of the subsurface environmental conditions resulting from the historic waste disposal site.

2.0 SITE DESCRIPTION & ENVIRONMENTAL SETTING

This section provides general information of the site including a brief description of the location, surrounding land use(s), regional geology, hydrogeology and notable environmental conditions specific to the site.

2.1 Site Description and Environmental Setting

The historic waste material (site) lies within the neighbourhood of South Hill with a legal description, Lot 3MR Block 2 Plan 842 2279 and lies within the SE 08-38-27 W4M. The site is currently zoned A2 – Environmental Preservation (Land Use Bylaw 3357/2006). The site is bounded on the north and west by 32 Street and Taylor Drive, respectively. Surrounding land uses include hotels, automotive related businesses and a college.

Presently, the site is vacant and undeveloped. The City Parks Department maintains the grassy field at the site. The site reflects a wedge-shaped configuration and tapers to a point at the south end. Overhead electrical lines cross the site in an east-west orientation in the central section of the site. Two groundwater wells, previously installed by Alberta Environment, are present near the east boundary of the site. Growth of bushes and trees envelop both monitoring wells. The nearest residential housing is north of 32 Street and the Community of West Park is to the northwest. A site plan showing the surrounding land uses is presented as Figure 1.

Waskasoo Creek bounds the west perimeter of the site, flowing north parallel to the east side of Taylor Drive. The creek meanders for about 5.7 km, more or less to a confluence at the Red Deer River. The Red Deer River is approximately 1.7 km north of the site.

The West Park Community and Area Redevelopment Plan (ARP), Bylaw 3488/2013, describes extensive improvements and upgrades intended to be implemented in the community. The ARP acknowledges the 300 m setback to potentially restrict any

redevelopment in the southeast portion of the community. This historic waste site will potentially affect land uses for single and multi-family residential developments, food services, park space and municipal infrastructure (road and utilities).

A review of historical information indicates the historic waste disposal activity was conducted with agreement between the provincial regulatory authorities and The City of Red Deer, refer to the September 24, 2013 Phase I ESA.

2.2 Notable Environmental Conditions for Special Consideration

Within the immediate area of the historic waste there is no noted direction of principal overland flow or surface run-off control measures. There are no obvious environmental concerns for surface water run-off or run-on throughout this area. This area is mapped outside of the 100-year flood fringe (Environment Canada and Alberta Environmental Protection, Edition 1, 1995). Following the recent severe June 2013 flood event, it is recognized the flood fringe may be updated following a review by the provincial authority.

A buried electrical cable runs parallel to the south curb of 32 Street and bounds the north side of the site. A storm sewer traverses near the south end of the site with an outfall into Waskasoo Creek. The relative locations of the underground municipal utilities are shown on Figure 1.

Currently, with the exception of Waskasoo Creek, there are no other environmental conditions associated with the site requiring special consideration.

Potential environmental concerns arising from the historic waste site are grouped into three broad categories:

- Ground stability issue where the historic waste lies;
- Continual generation of soil vapour from the decomposing waste materials; and
- Lateral transport of groundwater, which passes through the waste material and potentially discharges to Waskasoo Creek and ultimately into the Red Deer River.

Several geochemical processes and physical settlement occurs as the buried historic waste materials decompose. There is visual evidence the soil cover for the historic waste has settled in an irregular manner. The grass and underlying loam lies in an uneven mat across areas underlain by the historic waste. Site observations indicate differential settlement has occurred and is indicative of the instability of the ground surface overlying the historic waste.

As surface infiltration percolates through the historic waste materials and contacts the groundwater table, leachate is formed. This leachate is a potentially polluting liquid that can adversely affect the environmental quality of the local groundwater system. A potential exists for impacted groundwater to discharge into Waskasoo Creek.

Landfill gas is a by-product of a geochemical process associated with the decomposing waste materials. The soil vapours comprising of constituents from landfill gas can migrate in the subsurface. The geochemical process also yields soluble hydrocarbons to the groundwater system with some volatile components capable of degassing into the soil vapour regime.

Elements of testing in this Phase II ESA are to confirm the extents of the historic waste and an initial assessment of the subsurface conditions for soil vapour and leachate associated with this historic waste site.

2.3 Regional Geology and Hydrogeology

Waskasoo Creek and the Red Deer River are situated west and north of the historic waste site, respectively. The site and immediate area are interpreted to lie within a zone of groundwater recharge with a downward component of flow. Ground topography suggests the groundwater would trend to the north-northwest.

A summary of the published geological and hydrogeological information is presented in the September 24, 2013 Phase I ESA report.

2.4 Previous Investigations & Historic Perspective

Prior to this Phase II ESA, previous environmental assessments for the site include:

- Summary Report Former City Landfill, Red Deer Motors Site, Part of SE 8-38-27-W4M, March 2007. Prepared by Stantec Consulting Ltd. and Parkland Geotechnical Consulting Limited.

- Phase I Environmental Site Assessment, Historic Waste Disposal Sites, Red Deer Motors Site, September 24, 2013, prepared by Tiamat.

The March 2007 Summary Report was provided to Tiamat by The City of Red Deer. The report was perused and discussed in the Phase I ESA report (Tiamat, 2013).

The historic waste disposal activity at the site occurred over a period of about three years, beginning in 1968. Documentation indicates conflicting information regarding the estimated footprint of the landfill and when the waste disposal activity ceased.

The key results of the 2013 Phase I ESA are as follows:

- Historical records indicate the present configuration of the site has been largely unchanged since the original plan of subdivision in March 1968. The lot designation has been amended on several occasions. Currently, the site is zoned as a municipal reserve.

- Historic information suggests the past disposal of municipal (sanitary) waste materials started in 1968. There was conflicting information concerning when the disposal of waste was terminated. A plausible termination of the waste disposal at the site may have coincided with the start of waste disposal at the Red Deer College land on or about 1970.

- There was no confirming information concerning the placement of commercial and/or mixed industrial waste at the site.

- Anecdotal information suggests some burial of construction waste (concrete rubble, asphalt, rebar and timber) may have been placed along a portion of the elevated plateau bounding the east margin of the site.

- Records from regulatory agencies do not indicate any outstanding environmental concern on the site. Other than basic landscaping and an overhead electrical line, there were no noted activities or structures on this site.

- Commercial properties are located north of the site, across 32 Street and bounding the south and east margins. The commercial activities east of the site are on an elevated plateau. The campus of the Red Deer College is west of the site, across Taylor Drive. There are presently no obvious activities on the adjacent lands that are interpreted as an environmental concern relative to the site.

The findings of the 2013 Phase I ESA identify several uncertainties associated with this historic waste disposal site. In consultation with the Management of The City of Red Deer, a Phase II ESA was developed to further characterize the leachate and soil vapour relative to the present urban developments and land uses. It is understood this information would assist the City with the future management of environmental risks which are associated with this historic waste disposal site.

3.0 FIELDWORK

This section describes the fieldwork for this Phase II ESA. A description of the field methods and data quality assurance implemented by Tiamat for this Phase II ESA is provided in Appendix A. Testhole logs from the drilling program are provided in Appendix B. Select photographs of the testholes and monitoring wells are presented in Appendix C.

3.1 Underground Line Locates and Testhole Drilling

The two existing groundwater monitoring wells were assessed and found to be in reasonable condition. The wells are protected by a 76 mm diameter PVC casing. The 51 mm diameter PVC monitoring well was not capped. Tiamat installed a lockable well cap and a padlock to secure each groundwater monitoring well.

The drilling program is intended to better define the footprint and the profile of the historic waste material. Prior to drilling, public and private underground utilities within the work area were identified and marked. The subsurface investigation commenced on Wednesday, June 26 and was completed on Friday, June 28, 2013.

A representative of Tiamat supervised an auger drill mounted on a truck rig from Earth Drilling Co. of Calgary, Alberta to advance 152 mm diameter test holes at various locations across the site. The testhole locations were selected with consideration of access for the drill rig.

Attempts to install a groundwater monitoring well on the west and south sides of the site without encountering waste material could not be undertaken due to the thickness of the bush and trees. There is no accessible route for the drill onto the site from Taylor Drive.

Each testhole was drilled vertically to depths ranging between 3.5 m to 7.6 m below the ground surface. On completion of drilling, either a groundwater monitoring well or soil vapour well was installed, or the testhole was backfilled and abandoned.

Each groundwater monitoring well consists of a 51 mm diameter PVC machine slotted screen section and a solid section of pipe. The annulus of the borehole was backfilled with Sil-9 sand to approximately 0.3 m above the screen section followed by granular bentonite to about 0.3 m from the surface. Each well was protected by either an above-ground lockable steel casing or flush-mount steel bolt-down road box. Subsequent to establishing the depth of the testhole for a soil vapour well, a dedicated soil vapour well was assembled. Typically the soil vapour well consists of a 30 cm 0.020 PVC screen and a 25 mm diameter PVC solid standpipe. The screen section and brass value assembly are mechanically threaded with stainless steel locking set screws.

A summary of the well completion details is presented in Table 1 and shown on the testhole logs in Appendix B. Each test location was surveyed for horizontal and vertical control by a local survey firm. To ensure the survey coordinates and elevations (via the GPS) of each test location are reasonably accurate, multiple ASCM markers located throughout the city and in proximity to the site were referenced. Elevations for each test location are relative to an established geodetic datum for the ASCM as established by the Alberta Survey Control Network. A copy of the specified ASCM information sheets are provided in Appendix A.

The soil profile was visually classified during drilling and bulk grab samples were retrieved at approximately 0.6 m intervals for field screening. In the event significant MSW (municipal solid waste) material was encountered, an RKI Eagle 2 capable of simultaneously measuring the combustible and volatile vapour in the testhole at the surface was used. This field assessment was undertaken to determine whether potential methane and other VOCs were emanating from the testhole at concentrations deemed potentially hazardous for drilling operations. For example, should combustible vapours exceed the lower explosive limit or elevated VOCs greater than 35 ppm be encountered, drilling would temporarily cease until the level of vapours have subsided. Each on-site worker had a dedicated half-mask respirator with organic vapour filter as part of their respective personal protective equipment during drilling.

The drilling protocol for testhole(s) encountering MSW was to advance the drill such that contact is made with the underlying undisturbed native soil. At locations where no MSW was found, the testhole was advanced to an appropriate depth to install either a soil vapour well or a groundwater well. Solid stem tooling was used in order to properly install the monitoring well as the encountered soil consisted mainly of clay and sand. Drill cuttings were stored in 1 cubic meter capacity tote bags for off-site disposal.

The principal elevations of each test location are summarised in Table 1 and the relative test locations are shown on Figure 2.

3.2 Site Monitoring and Groundwater Sampling

To allow the subsurface conditions to re-equilibrate from the drilling disturbance, the groundwater and soil vapour wells were allowed to “rest” for a period. On Saturday, August 3, 2013, the monitoring wells were field tested. Field measurements consisted of measurement of headspace vapours and the depth to the liquid level. Groundwater samples were collected from the three installed monitoring wells.

4.0 RESULTS

The nearby residential Communities of West Park and South Hill, located north of 32 Street are identified to be potentially the most sensitive environmental receptors. Accordingly, the residential/parkland criteria have been referenced to assess the environmental quality of the subsurface soil and groundwater beneath the site. It should be noted the assessment is to illustrate the relative environmental quality and is not intended to infer remedial objectives.

This section summarizes the field observations during drilling and field testing for this Phase II ESA. For clarity, the analytical results for soil, groundwater and soil vapours are discussed in Section 5.

4.1 Soil Profile

Testholes which did not encounter buried waste material was generally consistent. Surface material was sod or organic clay over a sand or clay fill material. The thickness of the fill material without MSW was observed to be about 3.0 to 4.6 m. At some testhole locations, MSW lies immediately beneath the sod (about 3 cm thickness) with the maximum depth of waste observed to be about 4.6 m (15 feet) at TH-03, in the central area of the historic waste. The waste material was observed to be bedded on native clay. Bedrock was not encountered to the maximum depth of investigation, 7.6 m (25 feet).

The MSW was within a mixture of silty sand and clay. The composition of the observed sanitary waste appears to be of a typical waste material consisting of plastics, tin cans, remnants of paper, scrap metal, wire and pieces of glass and rubber. In addition, at some locations, trace construction debris was noted as fragments of timber, masonry brick and concrete. The interpreted footprint of the historic waste area is shown on Figure 2.

Subjectively, a moderate to strong pungent odour was noted during drilling at TH-06 and TH-08. Mild petroleum hydrocarbon odours and grey hydrocarbon staining were encountered at depths of 3 m to 5.2 m at MW-01, 3 m at VW-01, 1.5 m to 2.1 m at TH-03 and 1.5 m to 3.2 m at TH-09.

Auger refusal was encountered at TH-06, TH-07 and TH-08 in the south half of the site. The refusal of the auger drill bit at each of these testholes is suspected to be a boulder.

Select cross sections depicting the interpreted soil stratigraphy are presented as Figure 3. A copy of the testhole logs is presented in Appendix B. Select photographs of the drilling are presented in Appendix C.

To better understand the chemical composition of the MSW interacting with the underlying native soil, a sample of soil which the MSW is situated on was collected for laboratory testing. A composite soil sample from the soil bag was submitted for screening purposes to determine whether the soil bags can be transferred to The City of Red Deer Waste Management Facility. Analytical results are tabulated in Tables 3A to 3C and discussed in Section 5.1.

4.2 Groundwater Conditions

Static depth to groundwater was measured at each monitoring well. The relative groundwater elevations are presented on Table 2. On Saturday, August 3, 2013, the average depth to groundwater was approximately 4.2 m below the ground surface. The two groundwater monitoring wells are insufficient to triangulate the local pattern of the groundwater. However, the measured elevation at MW-01 and MW-02 suggest a local groundwater flow direction to the northwest with a horizontal gradient of about 2%.
The purged water was mildly murky and trace petroleum hydrocarbon odour was noted at

MW-01. General water quality indices were measured during purging and at the time of sampling. A summary of the field measured indices is presented as Table 4A.

Water samples were preserved and submitted to the laboratory for analysis. The results of groundwater tests are presented in Tables 4B to 4D and discussed in Section 5.2.

4.3 Headspace Vapours

A summary of the concentration of soil vapours as interpreted from headspace measurements from the groundwater monitoring wells and the soil vapour wells are tabulated in Table 2.

Combustible vapours and volatile vapours measured from the headspace at MW-01 were 250 ppm and 43 ppm, respectively. Vapours were not detected at MW-02.

Combustible vapours from the headspace of the groundwater monitoring wells ranged between 20 ppm (VW-02) and 1,600 ppm (VW-01). Volatile vapours from the headspace ranged from 2 ppm (VW-03) to 64 ppm (VW-01). Laboratory results for a soil vapour sample are discussed in Section 5.3.

5.0 SUMMARY OF ASSESSMENT

This section discusses our interpretation of the observations made from the fieldwork and the laboratory results with respect to the potentials for an adverse environmental impact.

The areal footprint of the historic waste disposal area is practically the entire subdivided lot and extends onto the 32 Street road right-of-way (refer to Survey Plan 6296 NY, in the Phase I ESA, September, 24 2013). The north boundary parallels 32 Street. The east and west limits are defined by thick bush and tree lines on either side. The plan area of the historic waste is calculated to be approximately 9,600 m^2 (2.37 ac) more or less on the site and the off-site area is estimated to be approximately 1,580 m^2 (0.39 ac). The MSW was noted to extend to a maximum depth of 4.6 m (15 feet), more or less.

5.1 Quality of Subsurface Soil

The surface topography overlying the waste clearly shows differential settlement. The ground settlement appears to be occurring in an irregular manner. Observations indicate other than the sod, there is practically no notable soil cover over the waste. This implies the ability of the cover material to effectively direct surface water away from the underlying waste material and resist seasonal infiltration is severally hampered.

For this Phase II ESA, samples were analyzed following the laboratory package using the US EPA 8260 list of VOCs. This list includes a greater number of VOCs relative to the VOC list published in the referenced Tier 1 Guideline.

Analytical results for the soil bag indicate the drill cuttings satisfy the acceptance guidelines for disposal at The City of Red Deer Class II Waste Management Facility, refer to Table 3A.

The analytical results from a select soil sample collected from MW-01 at 5.2 m shows no notable heavy metals exceeding the referenced Tier 1 Guidelines, refer to Table 3B.

Analytical results for organic compounds in soil are summarised in Table 3C. Semi-volatile petroleum hydrocarbon fraction F3 (C_6 – C_{10}) and 1,2,4-trimethylbenzene were detected in the soil sample, but did not exceed Tier 1 Guidelines. It is noted the reported laboratory limit of method of detection for carbon tetrachloride, chloroform, 1,2-dichloroethane, hexachlorobutadiene, and vinyl chloride exceed the referenced Tier 1 Guideline. A copy of the laboratory reports for soil is provided in Appendix A.

5.2 Quality of Local Groundwater

For this initial Phase II ESA, two test locations were sampled for groundwater, namely MW-01 and MW-02, located along the interpreted up-gradient and down gradient margins for groundwater entering and leaving the historic waste disposal area. MW-03 was not sampled due to its proximity to MW-02.

Field measured water quality indices were recorded during purging and at the time of sampling (August 3, 2013, sunny, no precipitation prior to or during). The groundwater indices at MW-01 indicate the local groundwater is near an anoxic state with a negative redox potential. The field measured groundwater indices are presented in Table 4A.

General Water Quality parameters are summarised in Table 4B. Generally, the water quality at MW-01 appears to be of lower quality relative to MW-02. Cadmium and ammonia (as nitrogen) exceeds the referenced Tier 1 Guideline at MW-01 and the concentrations of chlorides, sulphates, total nitrogen and Kjeldahl nitrogen are notably higher at MW-01 relative to MW-02. The analytical result for conductivity was about 1.5 times the field measured values; the discrepancy is presently unknown.

The reported alkalinity ranges from 490 mg/L to 570 mg/L while the field measured pH was less than 8. Typical groundwater has an alkalinity not more than about 100 mg/L and seldom exceeds 300 mg/L in a natural setting. Similarly, the concentration of bicarbonates in the groundwater samples may also infer a higher concentration of carbon dioxide in the subsurface. The composition of the fill material within the test locations may be influencing the environmental quality of the local groundwater. The estimated age (over 40 years old) of the buried waste materials has likely attained a quasi-steady rate of decomposition.

Concentrations of total metals in MW-01 exhibited an exceedance to the referenced Tier 1 Guidelines for numerous metals. Concentrations of total metals in MW-02 exceeded Tier 1 Guidelines for aluminum, iron, and manganese. The companion concentration for dissolved metal species was low or less than the limit of method detection. The Tier 1 Guidelines do not have published values for dissolved metals. The results suggest the concentration of total metals is likely from minerals in the soil and not their soluble forms. The results for total and dissolved metals are summarised in Table 4C.

It should be noted, the complexity arising from multi-parameter reactions in a non-equilibrium condition introduces significant uncertainty to identifying specific source(s) leading to the reducing condition. Notwithstanding, the landfill leachate reduces (oxidizes) the local groundwater regime with a corresponding increase in the organic content, ammonia and other similar reduction reactions such as nitrite to nitrogen, ferric iron (III) to ferrous iron (II), sulphate to sulphide, carbon dioxide to methane and depletion of dissolved oxygen in the natural system. Generally, the water quality at the down gradient test location (MW-01) suggests constituents in the leachate will extend beyond the boundary of the site. The initial data suggest the impacted groundwater would likely connect to Waskasoo Creek.

Table 4D is a summary of organic hydrocarbon and volatile compounds. The results of this initial test event show no detectable organic compounds in the groundwater at the up gradient test location (MW-02). Conversely, at the down gradient location (MW-01), petroleum derived hydrocarbons and some volatile chlorinated organic compounds were detected. Trace concentrations of benzene, xylenes, cis-1,2-dichloroethene, trans-1,2-dichloroethene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene and vinyl chloride were detected at MW-01. The concentration of vinyl chloride exceeds the referenced Tier 1 Guidelines.

It should be noted that these initial interpretations are solely from the initial readings. To better understand the plume of leachate constituents, further measurements would be necessary. To determine whether this contaminated groundwater is discharging into Waskasoo Creek, testing of surface water samples from up gradient and down gradient locations would be necessary.

5.3 Interpretation of Soil Vapours

For this Phase II ESA, an initial evaluation of the soil vapour was performed at two locations analogous to the groundwater tests. This approach was undertaken to develop a “snap-shot assessment” of the local groundwater and soil vapour relationship. A soil vapour sample (VW-02) near the south end of the site was also tested.

To reduce uncertainties concerning the assessment of soil vapour, the construction of soil vapour wells, sample collection and laboratory testing of soil vapour was performed in accordance with a standardized practice. Specifically, ASTM D5314-92(2006) Standard Guide for Soil Gas Monitoring in the vadose zone.

Field measurements during purging of vapours in the well headspace at each well include the measurement of ambient barometric pressure. The field measurements are summarised in Table 5A. There was a slight negative pressure gradient at VW-01 and VW-03 and a small positive differential at VW-02. These initial readings may imply a dynamic soil vapour plume. However, further measurements would be required to better understand these initial findings.

Sample collection consisted of two methods of collection at each soil vapour well. One 1.4 L laboratory certified Summa Canisters® and one sterile 1 L Tedlar Bag® samples were collected. The sample collected by the Summa Canister® was analysed for general air indices (oxygen, carbon dioxide, carbon monoxide, nitrogen and methane) and a suite of VOCs in accordance with US EPA TO14A for toxic organic compounds in air. The sample collected in the Tedlar Bag® was analysed for volatile organic silicon compounds (VOSCs), commonly referred as siloxanes.

General analytical indices for soil vapour are presented in Table 5B. As shown, the general composition of the soil vapour showed methane to be about 26% by volume at VW-01 and less than the limit of quantification (0.3% v/v) at VW-02 and VW-03. The reported proportions of the main components: oxygen, nitrogen, carbon dioxide and methane appear to be acceptable, total aggregate 100%, more or less.

Table 5C summarises the results of volatile organic compounds measured in the soil vapour samples. Petroleum hydrocarbon constituents included BTEX compounds, various VOCs and chlorinated hydrocarbons were detected. The specific chemicals include:

<u>Petroleum hydrocarbons</u>
Total BTEX compounds ranging from non-detect to 13.83 ppb
Volatile aliphatic compounds ranging from less than 0.5 ppm to 141.96 ppm (421.3 µg/m^3 to 141,964 µg/m^3)
Extractable aromatic compounds ranging from non-detect to less than 0.2 ppm (123.2 µg/$m^{3)}$

<u>Chlorinated hydrocarbons</u>
1,2-dichlorotetrafluoroethane, chloromethane, vinyl chloride, Freon 11, Freon 12, 1,1-dichloroethylene, cis-1,2-dichloroethylene, Trans-1,2-dichloroethylene, methylene chloride, chloroform, 1,1,1-trichloroethane, trichloroethylene (TCE), and tetrachloroethylene (PCE) each less than 519 ppb.

<u>Other VOCs</u>
Ethanol, 2-propanol, 2-propanone, methyl ethyl ketone, styrene, 1,3,5-trimethylbenzene, 1,2,4-trimethylbenzene, hexane, heptane, cyclohexane, propene, 2,2,4-trimethylpentane and carbon disulfide each less than 17,800 ppb.

As shown on Table 5D, generally volatile aliphatic petroleum hydrocarbons to carbon chain 16 were detected. Aromatic hydrocarbon compounds between carbon chain 8 and 12 were relatively low. Semi-volatile petroleum hydrocarbon vapours are present in the subsurface at varying concentrations. It is noted, trace concentrations of BTEX compounds were detected in the groundwater at MW-01. However, BTEX compounds were not detected in the soil sample from the zone of groundwater and the soil vapour sample. This discrepancy is unclear and follow-up testing may be necessary.

It should be noted the measured concentrations are influenced by climatic conditions, ground conditions (frozen versus frost-free) and moisture content in the vadose zone, natural biodegradation and geochemical reactions. Furthermore, the noted results do not imply the composition of the soil vapour is a constant as subsurface biodegradation and geochemical reactions are continuous along with influences by climatic factors.

Light molecular weight petroleum gases (ethane, ethylene, methane, n-butane, n-pentane, propane, and propene) were detected at low concentrations. This suggests either the measured soil vapours are not influenced by petroleum exploration or production activities and/or these highly volatile vapours are preferentially venting to the atmosphere.

Approximately, 52% of the total (64) VOCs assayed were detected from the Summa Canister® samples. The 33 VOCs identified in the soil vapour samples include a variety of chlorinated and other halogenated hydrocarbons, ketones and other oxygenated volatile hydrocarbons. The results indicate constituents in the soil gas are likely attributed to the petroleum hydrocarbon contaminated soil, landfill gas and the decomposing waste materials.

Results for analyses of siloxanes are tabulated in Table 5D. As shown, trimethysilanol and siloxanes D3, D4, D5 and D6 were identified in each soil vapour sample with the maximum concentration of 192.7 ppb. Currently, there are no regulatory guidelines or standards for siloxanes compounds in soil vapour. Volatile siloxane compounds are considered a significant component of landfill gas. Ongoing toxicity studies have implicated exposure to siloxanes by inhalation to be linked to adverse effects to humans. It is anticipated, regulatory guidelines will be developed in the future as further research and toxicity information becomes available.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The results of the Phase II ESA confirm the presence of petroleum hydrocarbon contaminated soil within the area of the sanitary waste material. The waste material extends beyond the lot boundary onto the right-of-way of 32 Street. The petroleum hydrocarbon contamination appears to extend to a depth of 5.2 m (17 feet) below the ground surface and lies within the northwest quadrant of the site. The hydrocarbon impacts are observed and illustrated on Figure 3, Cross Section A-A.' The hydrocarbons extends southward onto the site. The total areal area of the waste material and

contaminated soil is estimated to be 20,680 m^2 (5.11 ac). It should be noted, the lateral extent of the subsurface soil contaminated with petroleum hydrocarbons may extend beneath the adjoining portion of 32 Street and the intersection (Taylor Drive).

The results for soil vapour tests indicate various constituents of landfill gas are present in the subsurface. It must be acknowledged, this summer sampling event likely reflects muted concentrations which would likely increase due to the lack of natural venting from the soil under frozen ground conditions.

In order to better understand the off-site environmental risks associated with this historic waste disposal site, several aspects of the data presented in this Phase II ESA deserve some further attention. It is recommended Management at The City of Red Deer consider the following actions:

- Collect groundwater elevations and soil vapour data at a bi-annual interval for at least one standard hydrogeological cycle. This information is to better understand the local flow pattern and what risks are presented to the river.

- In consultation with ESRD, determine whether surface water testing is implemented along with additional groundwater monitoring locations to better define the flow pattern and environmental risks to Waskasoo Creek and whether a concern exists for the Red Deer River.

- Collect a second data set consisting of soil vapour and groundwater chemistry, groundwater levels and headspace measurements during the winter period. The information obtained from this second event would attempt to illustrate the best/worst case for seasonal variability of the soil vapours.

- Develop a site specific risk management plan (RMP) addressing the identified environmental concerns with consideration of the potential future land development opportunities with an emphasis on lands which are deemed down gradient and on lands in proximity to the historic waste disposal area.

- Review all additional data to develop and (when necessary) update/amend the site specific RMP in light of new information.

7.0 STATEMENT OF LIMITATIONS

This Phase II Environmental Site Assessment was conducted on the dates presented within this report. The conditions prevalent and noted at this time must be recognized as having a limited life. Should activities be introduced or practices change, either of which may not be deemed to comply with generally accepted environmental practices, the site conditions would be altered sufficiently for this report to be invalid. This report has been prepared for the use of The City of Red Deer and the approved designates for the specific application described in Section 1.0.

The report has been based in part with information obtained by others. Verification of the results presented by others has not been done. This report has been prepared in accordance with generally accepted environmental engineering practice and no other warranty is made, either expressed or implied. The opinions, conclusions and recommendations presented herein reflect the best judgment of Tiamat As such, Tiamat reserves the right to re-evaluate our conclusions and recommendations presented in this report should new information become available.

Any use by a third party of this report or any reliance by a third party upon the information, records or documents in this report is undertaken solely at the risk and responsibility of such third party. Tiamat shall not in any way be responsible for any damages suffered by a third party due to decisions or actions taken by a third party on the basis of this report.

This report was issued electronically in an encrypted PDF format. Notwithstanding, the file encryption, Tiamat cannot guarantee the contents of this report has not been altered. Should an authenticated copy be required, the reader should contact The City of Red Deer and our office.

8.0 CLOSURE

We trust the information presented herein satisfies your present requirements. Should you have any questions, we invite the reader to contact our office at (403) 640-9009.

Respectfully submitted,
Tiamat Environmental Consultants Ltd.

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/kjs

The Association of Professional Engineers and Geoscientists of Alberta
Permit To Practice No.: P 7109

References

1. Standard Guide for Soil Gas Monitoring in the Vadose Zone, ASTM D5314-92(2006).

2. B. Slomczynska and T. Slomczynski, "Physico-Chemical and Toxicological Characteristics of Leachates from MSW Landfills," Institute of Environmental Engineering Systems, Warsaw University of Technology, June 2004.

3. P. Kjeldsen, M.A. Barlaz, et al., "Present and Long Term Composition of MSW Landfill Leachate" A Review," Environmental Science and Technology, Volume 32(4) pages 297 - 336, 2002.

4. M.O. Rivett, Gary P. Wealthall, R.A. Dearden, T.A. McAlary, "Review of Unsaturated-Zone Transport and Attenuation of Volatile Organic Compound Plumes Leached from Shallow Source Zones," Journal of Contaminant Hydrology, Edition 123, pages 130 – 156, 2011.

5. West Park Community and Area Redevelopment Plan, Bylaw No. 3488-2013, The City of Red Deer.

6. Summary Report Former Site Landfill Red Deer Motors Site, Part of SE-08-38-27-W4M, Red Deer, Alberta by Stantec Inc. and Parkland Geotechnical Consulting Ltd., March 2007.

7. Phase I Environmental Site Assessment, Historic Waste Disposal Site, Red Deer Motors Site, The City of Red Deer, by Tiamat Environmental Consultants Ltd., September 24, 2013.

TABLES

Table 1
Elevations for Soil Vapour and Groundwater Monitoring Wells

Test Location	Well Depth (m)	Elevations				Screen Length (m)
		Ground (m)	Top of Pipe (m)	Screen Interval		
				Bottom	Top	
MW-01	6.1	874.014	875.099	867.914	872.514	4.6
MW-02	6.6	877.302	878.096	870.702	- -	- -
MW-03	5.1	877.297	877.307	872.197	- -	- -
VW-01	3.5	874.194	874.943	870.694	870.994	0.3
VW-02	4.6	877.321	878.166	872.721	873.021	0.3
VW-03	4.0	877.316	878.017	873.316	873.616	0.3
TH-03	No Well	875.332	- -	- -	- -	- -
TH-05	No Well	875.567	- -	- -	- -	- -
TH-06	No Well	876.597	- -	- -	- -	- -
TH-07	No Well	876.925	- -	- -	- -	- -
TH-08	No Well	876.812	- -	- -	- -	- -
TH-09	No Well	875.907	- -	- -	- -	- -

Notes:

1) Geodetic elevations are referenced to multiple ASCM Nos. 269191, 376673 and 384792.
2) MW - Monitoring Well.
3) VW - Soil Vapour Well.
4) TH - Testhole.
5) Well depth, screen interval derived from borehole logs by others, where avalable.
6) - - No value established.

Table 2
Site Monitoring Results

Test Location	Elevations		Groundwater Elevation (m)		Headspace Vapour			
					03/08/13			
	Ground (m)	Top of Pipe (m)	03/08/13		Combustible	Volatile	Combustible	Volatile
MW-01	874.014	875.099	869.841		230	43		
MW-02	877.302	878.096	874.276		ND	ND		
MW-03	877.297	877.307	NM		NM	NM		
VW-01	874.194	874.943	- -	- -	1,600	64		
VW-02	877.321	878.166	- -	- -	20	2		
VW-03	877.316	878.017	- -	- -	25	ND		
TH-03	875.332	NA	- -	- -	- -	- -	- -	- -
TH-05	875.567	NA	- -	- -	- -	- -	- -	- -
TH-06	876.597	NA	- -	- -	- -	- -	- -	- -
TH-07	876.925	NA	- -	- -	- -	- -	- -	- -
TH-08	876.812	NA	- -	- -	- -	- -	- -	- -
TH-09	875.907	NA	- -	- -	- -	- -	- -	- -

Notes:

1) Geodetic elevations are referenced to multiple ASCM Nos 269191, 376673 and 384792.
2) Measurement of combustible and volatile vapours by RKI Eagle 2. Units ppmv.
   Combustible vapour sensor calibrated to hexane and photoionization detector calibrated to isobutylene.
3) NA - Not Applicable.
4) ND - Not Detected, less than the limit of instrument detection.
5) NM - Not Measured.
6) - - No applicable value.

Table 3A
Analytical Results - Soil - Drill Cuttings (Soil Bag)

Parameter	Detection Limit	Soil Bag 1 of 1	Class II Landfill Acceptance Criteria
pH	0.10	7.71	2-12.5
Flash Point (°C)	30.0	>75	>61
Paint Filter Test	-	PASS	PASS
TCLP Hydrocarbons			
Benzene	0.0050	ND	0.5
Toluene	0.0050	ND	0.5
Ethylbenzene	0.0050	ND	0.5
Xylenes	0.0050	ND	0.5
TCLP Metals			
Antimony (Sb)	5.0	ND	500
Arsenic (As)	0.20	ND	5
Barium (Ba)	5.0	ND	100
Beryllium (Be)	0.50	ND	5
Boron (B)	5.0	ND	500
Cadmium (Cd)	0.050	ND	1
Chromium (Cr)	0.50	ND	5
Cobalt (Co)	5.0	ND	100
Copper (Cu)	5.0	ND	100
Iron (Fe)	5.0	ND	1,000
Lead (Pb)	0.50	ND	5
Mercury (Hg)	0.010	ND	0.2
Nickel (Ni)	0.50	ND	5
Selenium (Se)	0.20	ND	1
Silver (Ag)	0.50	ND	5
Thallium (Tl)	0.50	ND	5
Uranium (U)	1.0	ND	2
Vanadium (V)	5.0	ND	100
Zinc (Zn)	5.0	ND	500
Zirconium (Zr)	5.0	ND	500

Notes:

1) Applicance waste screening process for The City of Red Deer Class II Waste Managment Facility.
2) Class II Landfill Acceptable Criteria - per Table 2, Part 4 Schedule to the Alberta User Guide for Waste Managers 3/95.
3) All units are mg/L unless otherwise stated.
4) ND - Not Detected
5) Soil Bags were sampled June 26, 2013.
6) For further laboratory information, refer to the specific laboratory report in Appendix A.

Table 3B
Analytical Results - Soil - General Indices and Heavy Metals

Parameters	Units	Detection Limit	TH-01 @ 5.2 m 06/26/2013	Tier 1 Guideline
Chloride (Cl)	mg/kg	15	188	- -
Nitrate-N	mg/kg	0.74	ND	- -
Nitrite-N	mg/kg	0.74	ND	- -
Metals				
Antimony (Sb)	mg/kg	0.20	0.44	20
Arsenic (As)	mg/kg	0.20	7.18	17
Barium (Ba)	mg/kg	5.0	242	500
Beryllium (Be)	mg/kg	1.0	ND	5
Cadmium (Cd)	mg/kg	0.50	ND	10
Chromium (Cr)	mg/kg	0.50	35.7	64
Cobalt (Co)	mg/kg	1.0	7.8	20
Copper (Cu)	mg/kg	2.0	18.3	63
Lead (Pb)	mg/kg	5.0	8.0	140
Mercury (Hg)	mg/kg	0.05	ND	6.6
Molybdenum (Mo)	mg/kg	1.0	1.2	4
Nickel (Ni)	mg/kg	2.0	28.6	50
Selenium (Se)	mg/kg	0.50	ND	1.0
Silver (Ag)	mg/kg	1.0	ND	20
Thallium (Tl)	mg/kg	0.5	ND	1.0
Tin (Sn)	mg/kg	2.0	ND	5
Uranium (U)	mg/kg	2.0	ND	23
Vanadium (V)	mg/kg	1.0	38.4	130
Zinc (Zn)	mg/kg	10	63	200
Hexavalent Chromium	mg/kg	0.10	ND	0.4
Boron (B), Hot Water Ext.	mg/kg	0.10	1.26	2

Notes:

1) Tier 1 Guideline - Alberta Tier 1 Soil and Groundwater Remediation Guidelines, December 2010 and amendments. Coarse-grained criteria for residential/parkland land use.
2) ND - Not Detected, less than the limit of method detection.
3) - - No value established in the referenced criteria.
4) Bold & Shaded - Exceeds the referenced Alberta Tier 1 Guidelines.
5) For further laboratory information, refer to the specific laboratory report in Appendix A.

Table 3C
Analytical Results - Soil - VOCs

Parameters	Units	Detection Limit	TH-01 @ 5.2 m 06/26/2013	Tier 1 Guideline
Hydrocarbons				
F1 (C_6-C_{10})	mg/kg	10	ND	24
F2 (C_{10}-C_{16})	mg/kg	25	ND	130
F3 (C_{16}-C_{34})	mg/kg	50	117	300
F4 (C_{34}-C_{50})	mg/kg	50	ND	2,800
Total Hydrocarbons (C_6-C_{50})	mg/kg	50	117	- -
Volatile Organic Compounds				
Benzene	mg/kg	0.0050	ND	0.073
Bromobenzene	mg/kg	0.010	ND	- -
Bromochloromethane	mg/kg	0.010	ND	- -
Bromodichloromethane	mg/kg	0.010	ND	- -
Bromoform	mg/kg	0.010	ND	- -
Bromomethane	mg/kg	0.10	ND	- -
n-Butylbenzene	mg/kg	0.010	ND	- -
sec-Butylbenzene	mg/kg	0.010	ND	- -
tert-Butylbenzene	mg/kg	0.010	ND	- -
Carbon tetrachloride	mg/kg	0.010	ND	0.00056
Chlorobenzene	mg/kg	0.010	ND	0.018
Dibromochloromethane	mg/kg	0.010	ND	0.27
Chloroethane	mg/kg	0.10	ND	- -
Chloroform	mg/kg	0.010	ND	0.0010
Chloromethane	mg/kg	0.10	ND	- -
2-Chlorotoluene	mg/kg	0.010	ND	- -
4-Chlorotoluene	mg/kg	0.010	ND	- -
1,2-Dibromo-3-chloropropane	mg/kg	0.010	ND	- -
1,2-Dibromoethane	mg/kg	0.010	ND	- -
Dibromomethane	mg/kg	0.010	ND	- -
1,2-Dichlorobenzene	mg/kg	0.010	ND	0.18
1,3-Dichlorobenzene	mg/kg	0.010	ND	- -
1,4-Dichlorobenzene	mg/kg	0.010	ND	0.098
Dichlorodifluoromethane	mg/kg	0.010	ND	- -
1,1-Dichloroethane	mg/kg	0.010	ND	- -
1,2-Dichloroethane	mg/kg	0.010	ND	0.0027
1,1-Dichloroethene	mg/kg	0.010	ND	0.021
cis-1,2-Dichloroethene	mg/kg	0.010	ND	- -
trans-1,2-Dichloroethene	mg/kg	0.010	ND	- -
Methylene chloride	mg/kg	0.010	ND	0.095
1,2-Dichloropropane	mg/kg	0.010	ND	- -
1,3-Dichloropropane	mg/kg	0.010	ND	- -
2,2-Dichloropropane	mg/kg	0.010	ND	- -
1,1-Dichloropropene	mg/kg	0.010	ND	- -
cis-1,3-Dichloropropene	mg/kg	0.010	ND	- -
trans-1,3-Dichloropropene	mg/kg	0.010	ND	- -
Ethylbenzene	mg/kg	0.015	ND	0.21
Hexachlorobutadiene	mg/kg	0.010	ND	0.0067
Isopropylbenzene	mg/kg	0.010	ND	- -
p-Isopropyltoluene	mg/kg	0.010	ND	- -
n-Propylbenzene	mg/kg	0.010	ND	- -
Styrene	mg/kg	0.050	ND	0.8
1,1,1,2-Tetrachloroethane	mg/kg	0.010	ND	- -
1,1,2,2-Tetrachloroethane	mg/kg	0.050	ND	- -
Tetrachloroethene	mg/kg	0.010	ND	0.16
Toluene	mg/kg	0.050	ND	0.49
1,2,3-Trichlorobenzene	mg/kg	0.010	ND	0.26
1,2,4-Trichlorobenzene	mg/kg	0.010	ND	0.23
1,1,1-Trichloroethane	mg/kg	0.010	ND	- -
1,1,2-Trichloroethane	mg/kg	0.010	ND	- -
Trichloroethene	mg/kg	0.010	ND	0.012
Trichlorofluoromethane	mg/kg	0.010	ND	- -
1,2,3-Trichloropropane	mg/kg	0.020	ND	- -
1,2,4-Trimethylbenzene	mg/kg	0.010	0.013	- -
1,3,5-Trimethylbenzene	mg/kg	0.010	ND	- -
Vinyl chloride	mg/kg	0.20	ND	0.00034
Xylenes	mg/kg	0.1	ND	12

Notes:

1) Tier 1 Guideline - Alberta Tier 1 Soil and Groundwater Remediation Guidelines, December 2010 and amendments. Coarse-grained criteria for residential/parkland land use.
2) ND - Not Detected, less than the limit of method detection.
3) - - No value established in the reference criteria.
4) Bold & Shaded - Exceeds the referenced Alberta Tier 1 Guidelines.
5) For further laboratory information, refer to the specific laboratory report in Appendix A.

Table 4A
Groundwater Indices Measured at Time of Sampling

Monitoring Well	pH	Electrical Conductivity (µg/cm)	Temperature (°C)	Dissolved Oxygen (mg/L)	Total Dissolved Solid (mg/L)	Potential Redox (±mV)
MW-01	8.11	1,437	6.9	0.77	1,404.00	-83.6
MW-02	7.89	641	6.9	1.56	637.00	+42.3
MW-03	- -	- -	- -	- -	- -	- -

Notes:

1) Samples collected on Saturday, August 3, 2013.
2) Groundwater indices are field measured by YSI Pro Plus multi-meter.

Table 4B
Analytical Results - Groundwater - Routine Water Quality

Parameter	Unit	Detection Limit	MW-01	MW-02	Tier 1 Guideline
			08/03/2013		
General Water Quality					
Biochemical Oxygen Demand	mg/L	2.0	11	2	- -
Chemical Oxygen Demand	mg/L	5.0	350	16	- -
Conductivity	µS/cm	1.0	2,400	1,100	- -
pH	Unitless	NA	7.20	7.51	6.5-8.5
Total Organic Carbon (C)	mg/L	0.50	10	3.5	- -
Dissolved Cadmium (Cd)	µg/L	0.0050	0.037	0.025	- -
Total Cadmium (Cd)	µg/L	0.0050	**3.4**	0.025	0.060*
Alkalinity ($CaCO_3$)	mg/L	0.50	570	490	- -
Bicarbonate (HCO_3)	mg/L	0.50	700	600	- -
Carbonate (CO_3)	mg/L	0.50	ND	ND	- -
Hydroxide (OH)	mg/L	0.50	ND	ND	- -
Sulphates (SO_4)	mg/L	1.0	100	48	- -
Chlorides (Cl)	mg/L	1.0 - 5.0	360	36	- -
Total Ammonia (NH_3-N)	mg/L	0.050 - 0.50	**9**	0.1	1.37*
Total Phosphorus (P)	mg/L	0.0030 - 0.0150	4.6	0.015	- -
Total Nitrogen (N)	mg/L	0.050	12	0.26	- -
Nitrate plus Nitrite (N)	mg/L	0.0030 - .015	0.019	ND	- -
Total Kjeldahl Nitrogen (TKN)	mg/L	0.050 - 0.5	12	0.25	- -
Nitrite (NO_2)	mg/L	0.0030 - 0.015	ND	ND	- -
Nitrate (NO_3)	mg/L	0.0030	0.019	0.013	- -
Trace Organics					
Acetic Acid	mg/L	50	ND	ND	- -
Formic Acid	mg/L	50	ND	ND	- -
Propionic Acid	mg/L	50	ND	ND	- -
Adsorbable Organic Halogen	mg/L	0.004 - 0.02	0.29	0.016	- -

Notes:

1) Tier 1 Guideline - Alberta Tier 1 Soil and Groundwater Remediation Guidelines, December 2010 and amendments. Coarse-grained criteria for residential/parkland land use.
2) * Surface Water Quality Guidelines for Use in Alberta (AENV, 1999) on aquatic life pathway. Canadian Council of Ministers of the Environment (CCME) Guidelines as referenced in the Tier 1 Guidelines.
3) ND - Not Detected, less than the limit of method detection.
4) - - No value established in the reference criteria.
5) Bold & Shaded - Exceeds the referenced Alberta Tier 1 Guideline.
6) For further laboratory information, refer to the specific laboratory report in Appendix A.

Table 4C
Analytical Results - Groundwater - Metals

Parameter	Detection Limit	MW-01	MW-02	Tier 1 Guideline
		08/03/2013		
Total Metals				
Aluminum (Al)	0.0030	**34**	**0.29**	0.1*
Antimony (Sb)	0.00060	0.0017	ND	0.006
Arsenic (As)	0.00020	**0.085**	0.00072	0.005
Barium (Ba)	0.010	**1.8**	0.15	1
Beryllium (Be)	0.0010	0.0024	ND	- -
Boron (B)	0.020	0.11	0.065	1.5
Calcium (Ca)	0.30	330	150	- -
Chromium (Cr)	0.0010	**0.11**	ND	0.001*
Cobalt (Co)	0.00030	0.078	0.0022	- -
Copper (Cu)	0.00020	**0.16**	0.0023	0.003*
Iron (Fe)	0.060	**180**	**0.98**	0.3
Lead (Pb)	0.00020	**0.10**	0.00057	0.004*
Lithium (Li)	0.020	0.12	0.051	- -
Magnesium (Mg)	0.20	170	52	- -
Manganese (Mn)	0.0040	**5.6**	**1.8**	0.05
Molybdenum (Mo)	0.00020	0.0071	0.00034	0.073*
Nickel (Ni)	0.00050	**0.20**	0.0034	0.11*
Phosphorus (P)	0.10	3.4	ND	- -
Potassium (K)	0.30	22	6.6	- -
Selenium (Se)	0.00020	**0.0026**	ND	0.001
Silicon (Si)	0.10 - 0.50	100	9.9	- -
Silver (Ag)	0.00010	**0.00058**	ND	0.0001*
Sodium (Na)	0.50	140	16	- -
Strontium (Sr)	0.020	1.8	0.97	- -
Sulphur (S)	0.20	32	15	- -
Thallium (Tl)	0.00020	**0.00097**	ND	0.0008*
Tin (Sn)	0.0010	0.0029	ND	- -
Titanium (Ti)	0.0010	0.71	0.015	- -
Uranium (U)	0.00010	0.006	0.0097	0.02
Vanadium (V)	0.0010	0.17	0.0015	- -
Zinc (Zn)	0.0030	**0.41**	0.0097	0.03
Dissolved Metals				
Aluminum (Al)	0.0030	0.017	0.011	- -
Antimony (Sb)	0.00060	ND	ND	- -
Arsenic (As)	0.00020	0.0230	ND	- -
Barium (Ba)	0.010	0.68	0.13	- -
Beryllium (Be)	0.0010	ND	ND	- -
Boron (B)	0.020	0.074	0.063	- -
Calcium (Ca)	0.30	160	140	- -
Chromium (Cr)	0.0010	ND	ND	- -
Cobalt (Co)	0.00030	0.012	0.0017	- -
Copper (Cu)	0.00020	0.00078	0.002	- -
Iron (Fe)	0.060	27	0.11	- -
Lead (Pb)	0.00020	ND	ND	- -
Lithium (Li)	0.020	0.051	0.049	- -
Magnesium (Mg)	0.20	110	49	- -
Manganese (Mn)	0.0040	1.9	1.8	- -
Molybdenum (Mo)	0.00020	0.0015	0.00026	- -
Nickel (Ni)	0.00050	0.022	0.002	- -
Phosphorus (P)	0.10	ND	ND	- -
Potassium (K)	0.30	14	6.6	- -
Selenium (Se)	0.00020	ND	ND	- -
Silicon (Si)	0.10	15	9.1	- -
Silver (Ag)	0.00010	ND	ND	- -
Sodium (Na)	0.50	140	17	- -
Strontium (Sr)	0.020	1.60	0.98	- -
Sulphur (S)	0.20	32	15	- -
Thallium (Tl)	0.00020	ND	ND	- -
Tin (Sn)	0.0010	ND	ND	- -
Titanium (Ti)	0.0010	ND	ND	- -
Uranium (U)	0.00010	0.0011	0.0092	- -
Vanadium (V)	0.0010	ND	ND	- -
Zinc (Zn)	0.0030	0.0067	0.0062	- -

Notes:

1) Tier 1 Guideline - Alberta Tier 1 Soil and Groundwater Remediation Guidelines, December 2010 and amendments. Coarse-grained criteria for residential/parkland land use.
2) * Surface Water Quality Guidelines for Use in Alberta (AENV, 1999) on aquatic life pathway. Canadian Council of Ministers of the Environment (CCME) Guidelines as referenced in the Tier 1 Guidelines.
3) ND - Not Detected, less than the limit of method detection.
4) Unless specified all units are mg/L.
5) - - No value established in the reference criteria.
6) Bold & Shaded - Exceeds the referenced Alberta Tier 1 Guideline.
7) For further laboratory information, refer to the specific laboratory report in Appendix A.

Table 4D
Analytical Results - Groundwater -VOCs

Parameter	Detection Limit	MW-01	MW-02	Tier 1 Guideline
		08/03/2013		
Volatile Organic Compounds				
Benzene	0.00040	0.0015	ND	0.005
Toluene	0.00040	ND	ND	0.024
Ethylbenzene	0.00040	ND	ND	0.0024
Xylenes (Total)	0.00080	0.0018	ND	0.3
F1 (C_6-C_{10})	0.10	ND	ND	0.81
F2 (C_{10}-C_{16})	0.10	ND	ND	1.1
Total Trihalomethanes	0.0020	ND	ND	0.1
Bromodichloromethane	0.00050	ND	ND	- -
Bromoform	0.00050	ND	ND	- -
Bromomethane	0.0020	ND	ND	- -
Carbon tetrachloride	0.00050	ND	ND	0.00056
Chlorobenzene	0.00050	ND	ND	0.0013
Chlorodibromomethane	0.0010	ND	ND	- -
Chloroethane	0.0010	ND	ND	- -
Chloroform	0.00050	ND	ND	0.0018
Chloromethane	0.0020	ND	ND	- -
1,2-dibromoethane	0.00050	ND	ND	- -
1,2-dichlorobenzene	0.00050	ND	ND	0.0007
1,3-dichlorobenzene	0.00050	ND	ND	- -
1,4-dichlorobenzene	0.00050	ND	ND	0.001
1,1-dichloroethane	0.00050	ND	ND	- -
1,2-dichloroethane	0.00050	ND	ND	0.005
1,1-dichloroethene	0.00050	ND	ND	0.014
cis-1,2-dichloroethene	0.00050	0.033	ND	- -
trans-1,2-dichloroethene	0.00050	0.0034	ND	- -
Dichloromethane	0.0020	ND	ND	0.05
1,2-dichloropropane	0.00050	ND	ND	- -
cis-1,3-dichloropropene	0.00050	ND	ND	- -
trans-1,3-dichloropropene	0.00050	ND	ND	- -
Methyl methacrylate	0.00050	ND	ND	0.47
Methyl-tert-butyl ether (MTBE)	0.00050	ND	ND	0.015
Styrene	0.00050	ND	ND	0.072
1,1,1,2-tetrachloroethane	0.0020	ND	ND	- -
1,1,2,2-tetrachloroethane	0.0020	ND	ND	- -
Tetrachloroethene	0.00050	ND	ND	0.03
1,2,3-trichlorobenzene	0.0010	ND	ND	0.008
1,2,4-trichlorobenzene	0.0010	ND	ND	0.015
1,3,5-trichlorobenzene	0.00050	ND	ND	0.014
1,1,1-trichloroethane	0.00050	ND	ND	- -
1,1,2-trichloroethane	0.00050	ND	ND	- -
Trichloroethene	0.00050	ND	ND	0.005
Trichlorofluoromethane	0.00050	ND	ND	- -
1,2,4-trimethylbenzene	0.00050	0.004	ND	- -
1,3,5-trimethylbenzene	0.00050	0.0018	ND	- -
Vinyl chloride	0.00050	**0.003**	ND	0.0011

Notes:

1) Tier 1 Guideline - Alberta Tier 1 Soil and Groundwater Remediation Guidelines, December 2010 and amendments. Coarse-grained criteria for residential/parkland land use.
2) ND - Not Detected, less than the limit of method detection.
3) Unless specified all units are mg/L (ppm).
4) - - No value established in the reference criteria.
5) Bold & Shaded - Exceeds the referenced Alberta Tier 1 Guidelines.
6) For further laboratory information, refer to the specific laboratory report in Appendix A.

Table 5A
Summary of Parameters Measured During Sampling of Soil Vapour

Parameter	Well Diameter (mm)	Screen Length (cm)	Well Depth (m)	Headspace Volume (cm^3)	Purge Rate (cm^3/min)	Purge Time (min)	Pressure	
							Ambient (psi)	Vapour Well (psi)
VW-01	25	30	3.5	1,718.06	943.3	4	15.00	15.00
VW-02	25	30	4.6	2,258.02	943.3	7	15.10	15.06
VW-03	25	30	4.0	1,963.50	943.3	5	15.14	15.08

Notes:

1) Measurement of pressure by digital Cole-Parmer absolute pressure gauge.
2) Purge time is minimum elapsed time prior to the collection of a soil vapour sample.
3) Screen set at base of well.
4) Soil vapour sampling was completed on Saturday, August 3, 2013.

Table 5B
Analytical Results - Soil Vapour - General Indices

Parameter	Unit	Detection Limit	VW-01	VW-02	VW-03
Gauge Pressure					
Following sampling	psi	- -	-5.0	NA	-5.0
Reported by laboratory	psi	- -	-1.4	-3.6	-3.4
Fixed Gases					
Oxygen	% v/v	0.2 - 0.3	8.4	17.2	19.8
Nitrogen	% v/v	0.2 - 0.3	52.5	77.8	78.3
Carbon monoxide	% v/v	0.2 - 0.3	ND	ND	ND
Methane	% v/v	0.2 - 0.3	26	ND	ND
Carbon dioxide	% v/v	0.2 - 0.3	13.1	4.6	1.9

Notes:

1) Soil vapour sample collected on Saturday, August 3, 2013.
2) ND - Not Detected, less than the limit of method detection.
3) NA - Not Available.
4) - - No value established in the detection limit.
5) For further information, the reader should refer to the laboratory report in Appendix A.

Table 5C
Analytical Results - Soil Vapour - VOCs

Parameter	Unit	Detection Limit	VW-01	VW-02	VW-03
			08/03/13		
Hydrocarbon Fractions					
Aliphatic >C_5-C_6	µg/m^3	5.0 - 480	53,000	332	6.8
Aliphatic >C_6-C_8	µg/m^3	5.0 - 480	88,300	2,990	34.4
Aliphatic >C_8-C_{10}	µg/m^3	5.0 - 480	ND	577	73.1
Aliphatic >C_{10}-C_{12}	µg/m^3	5.0 - 480	664	345	202
Aliphatic >C_{12}-C_{16}	µg/m^3	5.0 - 480	ND	106	105
Aromatic >C_7-C_8 (TEX excluded)	µg/m^3	5.0 - 480	ND	ND	ND
Aromatic >C_8-C_{10}	µg/m^3	5.0 - 480	ND	44.8	30.9
Aromatic >C_{10}-C_{12}	µg/m^3	5.0 - 480	ND	78.4	58.1
Aromatic >C_{12}-C_{16}	µg/m^3	5.0 - 480	ND	ND	ND
Select Volatile Gases					
Acetylene	ppm	0.19 - 0.34	ND	ND	ND
Ethane	ppm	0.19 - 0.34	1.1	ND	ND
Ethylene	ppm	0.19 - 0.34	0.67	ND	ND
Methane	ppm	5.6 - 6.8	260,000	67	ND
n-Butane	ppm	0.358 - 0.68	2.4	ND	ND
n-Pentane	ppm	0.19 - 0.34	14	ND	ND
Propane	ppm	0.19 - 0.34	0.34	ND	ND
Propene	ppm	0.19 - 0.34	0.22	ND	ND
Propyne	ppm	0.38 - 0.68	ND	ND	ND
Volatile Organic Compounds					
Dichlorodifluoromethane (FREON 12)	ppbv	0.20 - 58	ND	348	1.60
1,2-Dichlorotetrafluoroethane	ppbv	0.17 - 16	ND	34.4	0.58
Chloromethane	ppbv	0.30 - 29	ND	ND	1.03
Vinyl chloride	ppbv	0.18 - 17	519	0.51	ND
Chloroethane	ppbv	0.30 - 29	ND	ND	ND
1,3-Butadiene	ppbv	0.50 - 48	ND	ND	ND
Trichlorofluoromethane (FREON 11)	ppbv	0.20 - 19	ND	50.6	0.42
Ethanol (ethyl alcohol)	ppbv	23 - 220	322	180	648
Trichlorotrifluoroethane	ppbv	0.15 - 14	ND	ND	ND
2-propanol	ppbv	3.0 - 290	ND	3.6	5.1
2-Propanone	ppbv	0.80 - 76	ND	36.5	18
Methyl ethyl ketone (MEK) (2-Butanone)	ppbv	3.0 - 290	ND	ND	5.8
Methyl isobutyl ketone	ppbv	3.2 - 300	ND	ND	ND
Methyl butyl ketone (MBK) (2-Hexanone)	ppbv	2.0 - 190	ND	ND	ND
Methyl t-butyl ether (MTBE)	ppbv	0.20 - 19	ND	ND	ND
Ethyl acetate	ppbv	2.2 - 210	ND	ND	ND
1,1-Dichloroethylene	ppbv	0.25 - 24	ND	1.41	ND
cis-1,2-Dichloroethylene	ppbv	0.19 - 18	123	13.2	0.42
trans-1,2-Dichloroethylene	ppbv	0.20 - 19	30	ND	ND
Methylene chloride(Dichloromethane)	ppbv	0.80 - 120	ND	1.47	1.06
Chloroform	ppbv	0.15 - 14	ND	18.2	0.52
Carbon tetrachloride	ppbv	0.30 - 29	ND	ND	ND
1,1-Dichloroethane	ppbv	0.20 - 19	ND	ND	ND
1,2-Dichloroethane	ppbv	0.20 - 19	ND	ND	ND
Ethylene dibromide	ppbv	0.17 - 16	ND	ND	ND
1,1,1-Trichloroethane	ppbv	0.30 - 29	ND	3.45	ND
1,1,2-Trichloroethane	ppbv	0.15 - 14	ND	ND	ND
1,1,2,2-Tetrachloroethane	ppbv	0.20 - 19	ND	ND	ND
cis-1,3-Dichloropropene	ppbv	0.18 - 17	ND	ND	ND
trans-1,3-Dichloropropene	ppbv	0.17 - 16	ND	ND	ND
1,2-Dichloropropane	ppbv	0.40 - 38	ND	ND	ND
Bromomethane	ppbv	0.18 - 17	ND	ND	ND
Bromoform	ppbv	0.20 - 19	ND	ND	ND
Bromodichloromethane	ppbv	0.20 - 19	ND	ND	ND
Dibromochloromethane	ppbv	0.20 - 19	ND	ND	ND
Trichloroethylene (TCE)	ppbv	0.30 - 29	ND	81.9	1.32
Tetrachloroethylene (PCE)	ppbv	0.20 - 19	ND	221	ND
Benzene	ppbv	0.18 - 17	ND	5.17	0.79
Toluene	ppbv	0.20 - 81	ND	4.80	3.95
Ethylbenzene	ppbv	0.20 - 27	ND	0.75	0.92
p+m-xylene	ppbv	0.37 - 99	ND	1.89	3.65
o-xylene	ppbv	0.20 - 19	ND	1.22	1.67
Styrene	ppbv	0.20 - 19	42	ND	0.37
4-ethyltoluene	ppbv	2.2 - 210	ND	ND	ND
1,3,5-Trimethylbenzene	ppbv	1.9 - 48	ND	4.05	ND
1,2,4-Trimethylbenzene	ppbv	0.50 - 48	ND	2.31	2.74
Chlorobenzene	ppbv	0.20 - 19	ND	ND	ND
Benzyl chloride	ppbv	1.0 - 95	ND	ND	ND
1,3-Dichlorobenzene	ppbv	0.40 - 38	ND	ND	ND
1,4-Dichlorobenzene	ppbv	0.40 - 38	ND	ND	ND
1,2-Dichlorobenzene	ppbv	0.40 - 38	ND	ND	ND
1,2,4-Trichlorobenzene	ppbv	2.0 - 190	ND	ND	ND
Hexachlorobutadiene	ppbv	3.0 - 290	ND	ND	ND
Hexane	ppbv	1.3 - 29	17,800	142	ND
Heptane	ppbv	0.30 - 29	1,970	181	0.58
Cyclohexane	ppbv	0.20 - 19	4,900	219	0.35
Tetrahydrofuran	ppbv	0.40 - 38	ND	ND	5.14
1,4-Dioxane	ppbv	2.0 - 190	ND	ND	ND
Xylene (Total)	ppbv	0.60 - 99	ND	3.11	5.31
Vinyl bromide	ppbv	0.20 - 19	ND	ND	ND
Propene	ppbv	3.9 - 29	371	ND	ND
2,2,4-Trimethylpentane	ppbv	0.20 - 19	ND	ND	0.64
Carbon disulfide	ppbv	0.50 - 48	ND	40.5	3.21
Vinyl acetate	ppbv	0.20 - 19	ND	ND	ND

Notes:
1) Results are from sampling completed on Saturday, August 03, 2013.
2) ND - Not Detected, less than the limit of method detection.
3) For further information, the reader should refer to the laboratory report in Appendix A.

Table 5D
Analytics Results - Soil Vapour - Siloxanes

Parameter	Detection Limit		VW-01		VW-02		VW-03	
			08/03/13					
	mg/m³	ppm	mg/m³	ppm	mg/m³	ppm	mg/m³	ppm
Trimethylsilyl Fluoride	- -	- -	ND	ND	ND	ND	ND	ND
Tetramethylsilane	0.00010 - 0.0022	0.0001 - 0.0006	ND	ND	ND	ND	ND	ND
Methoxytrimethylsilane	0.0032 - 0.0563	0.0007 - 0.0132	ND	ND	ND	ND	ND	ND
Ethoxytrimethylsilane	0.0031 - 0.0543	0.0006 - 0.0112	ND	ND	ND	ND	ND	ND
Trimethylsilanol	- -	- -	0.0338	0.0092	ND	ND	0.0098	0.0027
Isopropoxytrimethylsilane	0.0013 - 0.0229	0.00020 - 0.0042	ND	ND	ND	ND	ND	ND
Trimethoxymethyl Silane #	- -	- -	ND	ND	ND	ND	ND	ND
Hexamethyl Disiloxane - L2	0.00010 - 0.0021	0.0001 - 0.0003	ND	ND	ND	ND	ND	ND
Propoxytrimethylsilane	0.0035 - 0.0621	0.0006 - 0.0115	ND	ND	ND	ND	ND	ND
1-Methylbutoxytrimethylsilane *	- -	- -	ND	ND	ND	ND	ND	ND
Butoxytrimethylsilane *	- -	- -	ND	ND	ND	ND	ND	ND
Trimethoxyvinyl Silane #	- -	- -	ND	ND	ND	ND	ND	ND
Hexamethyl Cyclotrisiloxane - D3	- -	- -	0.1927	0.0212	0.0844	0.0093	0.0146	0.0016
Octamethyl Trisiloxane - L3	0.0002 - 0.0041	0.0001 - 0.0004	ND	ND	ND	ND	ND	ND
Triethoxyvinyl Silane #	- -	- -	ND	ND	ND	ND	ND	ND
Triethoxyethyl Silane #	- -	- -	ND	ND	ND	ND	ND	ND
Octamethyl Cyclotetrasiloxane - D4	- -	- -	0.0739	0.0061	0.0299	0.0025	0.0234	0.0019
Decamethyl Tetrasiloxane - L4	0.0003 - 0.0053	0.0001 - 0.0004	ND	ND	ND	ND	ND	ND
Tetraethylsilicate #	- -	- -	ND	ND	ND	ND	ND	ND
Decamethyl Cyclopentasiloxane - D5	- -	- -	0.0349	0.0023	0.0321	0.0021	0.0420	0.0028
Dodecamethyl Pentasiloxane - L5	0.0030 - 0.0528	0.0002 - 0.0034	ND	ND	ND	ND	ND	ND
Dodecamethyl Cyclohexasiloxane - D6	0.0531	0.0029	ND	ND	0.1454	0.0080	0.1513	0.0083
Sum	- -	- -	0.6503	0.0870	0.4152	0.0432	0.2559	0.0198

Notes:

1) Soil vapour samples collected on Saturday, August 3, 2013.
2) ND - Not Detected, less than the limit of method detection.
3) - - No value established in the detection limit.
4) VW-01 V=10.0mL, VW-02 V=25mL, VW-03 V=200 mL, where V is volume of air/gas sampled.
5) * - Semiquanititative (response factor set at 5).
6) # - Unstable, poor detectability, commercial standards tested.
7) For further information, the reader should refer to the laboratory report in Appendix A.

FIGURES

300 m SETBACK

WEST PARK RESIDENTIAL

HOTEL AND
DINING FACILITIES

COMMERCIAL

32 STREET

RUNNING TRACK

LOT 6 MR
BLOCK 2
PLAN 002 0018

WASKASOO CREEK

TAYLOR DRIVE

51 AVE

49 AVE

RED DEER
COLLEGE
PARKING

COMMERCIAL

SOUTH HILL
RESIDENTIAL

30 STREET

NORTHLAND
APARTMENTS

RED DEER COLLEGE
RESIDENCES

COMMERCIAL

GAETZ AVENUE

RED DEER
COLLEGE

N

0 50 100 200m

Scale 1:4000

LEGEND
- SITE BOUNDARY
- HISTORIC WASTE DISPOSAL
- LOT BOUNDARY
- 300 m SETBACK

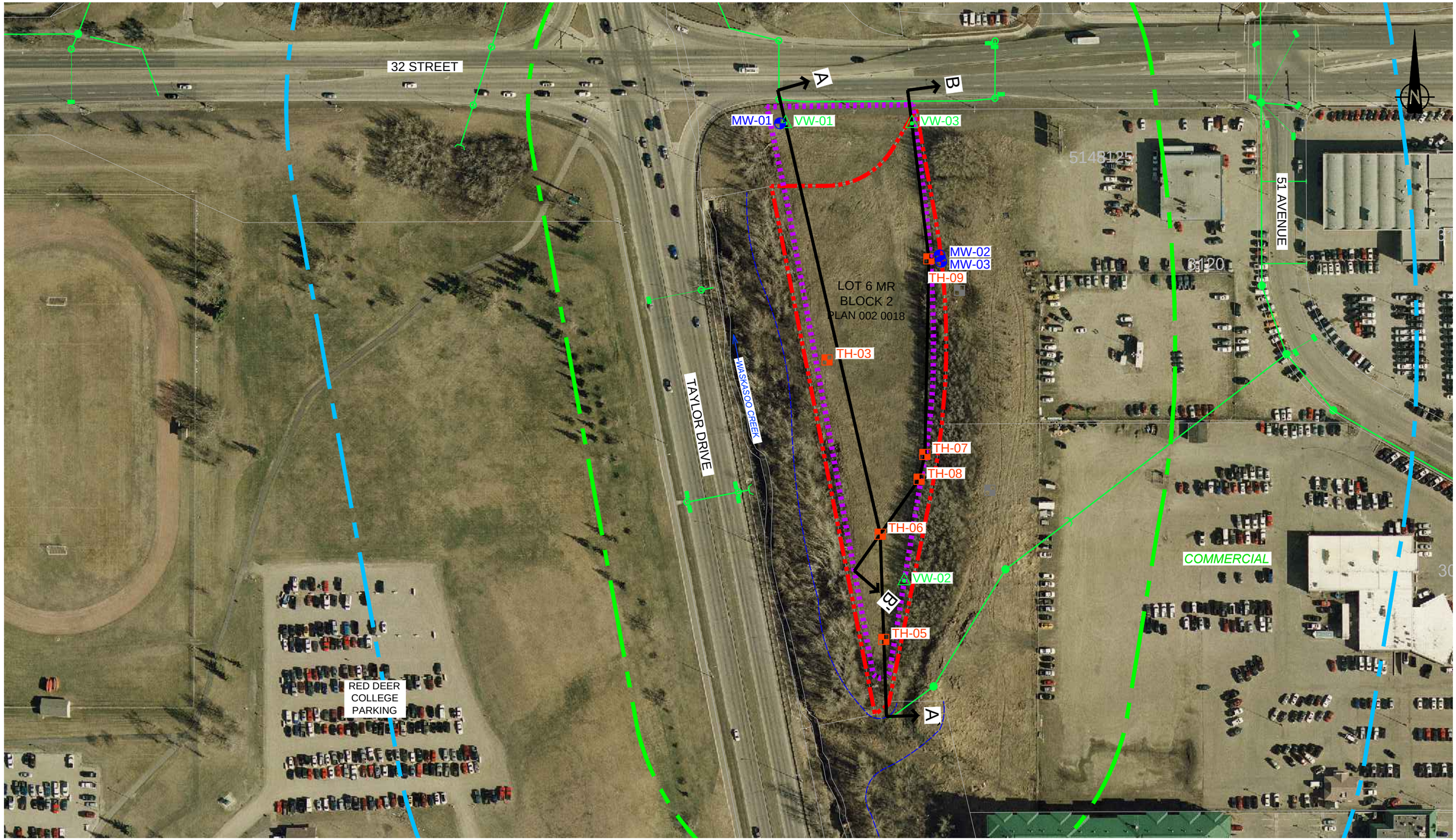
CLIENT: THE CITY OF RED DEER

PROJECT: PHASE II ESA HISTORIC WASTE DISPOSAL SITES
RED DEER MOTORS PTN SE 08-38-27 W4M

TITLE: SITE PLAN SHOWING SURROUNDING LAND USE

Tiamat Environmental Consultants Ltd.

SCALE:	DATE:	PROJECT NO.:	FIGURE NO.:
1 : 4000	April 10/14	12-435	FIGURE 1
DRAWN BY: LCH	CHECKED BY: LTM	CAD FILE NO.: Phase II ESA v1.05.dwg	



SOURCE
2010 ORTHOGRAPHIC IMAGE © COPYRIGHT WITH PERMISSION FROM THE CITY OF RED DEER.

0 20 40 80m
Scale 1:1500

PHASE II TEST LOCATIONS
MW-## GROUNDWATER MONITORING WELL INSTALLED BY TIAMAT (1)
TH-## TESTHOLE (14)
VW-## SOIL VAPOUR MONITORING WELL (2)
MW-## GROUNDWATER MONITORING WELL INSTALLED BY ALBERTA ENVIRONMENT (2)
REFER TO TABLE 1 FOR TESTHOLE INFORMATION

LEGEND
SITE BOUNDARY
HISTORIC WASTE DISPOSAL
LOT BOUNDARY
100 YEAR FLOOD LINE
CROSS SECTION LOCATION
ELECTRICAL
SANITARY
STORM
WATER

NOTE:
LOCATION OF BURIED UTILITIES ARE APPROXIMATE, ACTUAL LOCATIONS OF THE SHALLOW UTILITIES AND ANY OTHER UTILITIES SHOULD BE VERIFIED PRIOR TO ANY GROUND DISTURBANCE ACTIVITY.

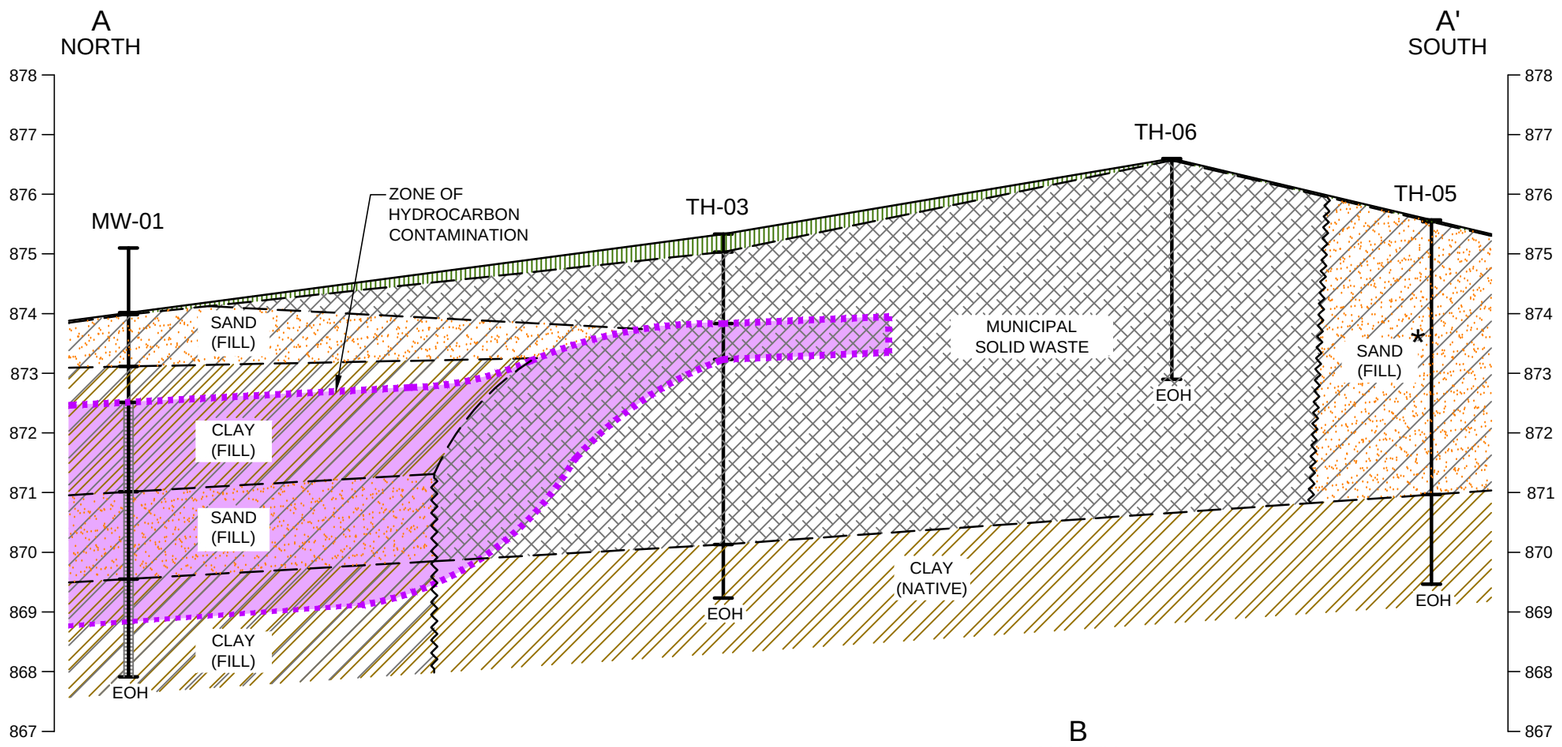
CLIENT: THE CITY OF RED DEER

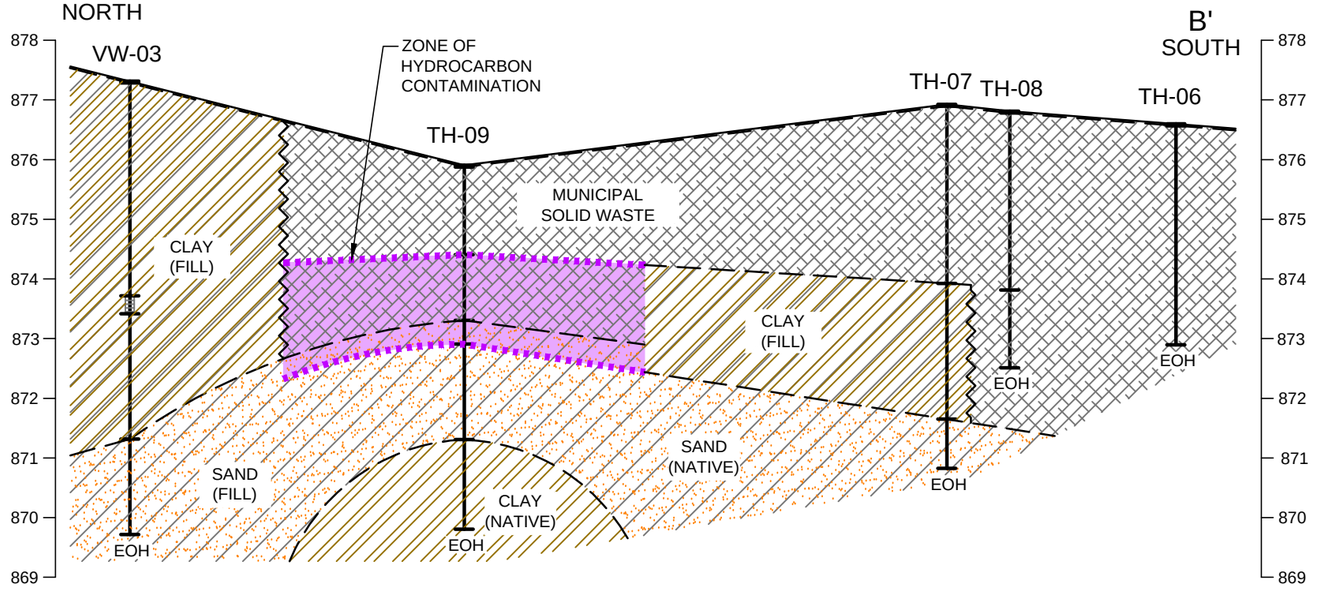
PROJECT: PHASE II ESA HISTORIC WASTE DISPOSAL SITES
RED DEER MOTORS PTN SE 08-38-27 W4M

TITLE: PHASE II ESA TEST LOCATIONS AND INTERPRETED EXTENT OF WASTE

Tiamat Environmental Consultants Ltd.

SCALE:	DATE:	PROJECT NO.:	FIGURE NO.:
1 : 1500	April 10/14	12-435	FIGURE 2
DRAWN BY: LCH	CHECKED BY: LTM	CAD FILE NO.: Phase II ESA v1.05.dwg	





0 2 5 10m
Vertical Scale 1:200

0 10 25 50m
Horizontal Scale 1:1000

NOTE:

THE GEOLOGIC AND STRATIGRAPHIC SECTIONS SHOWN ON THIS DRAWING ARE INTERPRETED FROM BOREHOLE LOGS. STRATIGRAPHY IS KNOWN WITH CERTAINTY ONLY AT THE BOREHOLE LOCATIONS. ACTUAL STRATIGRAPHY AND GEOLOGIC CONDITIONS BETWEEN BOREHOLES MAY VARY FROM THAT INDICATED ON THIS DRAWING.

CLIENT: THE CITY OF RED DEER

PROJECT: PHASE II ESA HISTORIC WASTE DISPOSAL SITES
RED DEER MOTORS PTN SE 08-38-27 W4M

TITLE: CROSS SECTION A - A' AND B - B'

Tiamat Environmental Consultants Ltd.

SCALE:	DATE:	PROJECT NO.:	FIGURE NO.:
AS SHOWN	April 10/14	12-435	FIGURE 3
DRAWN BY:	CHECKED BY:	CAD FILE NO.:	
LCH	LTM	Phase II ESA Sections v1.02	

APPENDIX A

FIELD PROTOCOLS AND ANALYTICAL DATA, ASCM INFORMATION AND LABORATORY REPORTS

Field Protocols for Soil, Groundwater and Soil Vapour

Monitoring Headspace Vapours and Liquid Levels

Headspace Vapours

Headspace vapours were measured with an RKI Eagle II portable dual sensor gas meter. The combustible vapour sensor is calibrated to hexane; the volatile vapour sensor is calibrated to isobutylene. The sample pump operates at a flow rate of about 944 ml/minute and the instrument response time is rated at 90% reading within 30 seconds, more or less.

Below is a list of the general headspace vapour monitoring protocol employed by Tiamat staff.

1. Allow the combustible and volatile sensors in the RKI Eagle II to stabilize after turning the instrument on. Typically, the instrument will stabilize within 3 to 5 minutes. Check the display voltage for the instrument is within the specified normal operating range. Should the display not show zero in ambient air, verify there are no interfering sources of Volatile Organic Compound (VOC) or combustible vapours and perform an instrument "fresh air zero" in a fresh air environment.

2. Prior to measuring headspace vapours, the monitoring well screw caps were loosened just before monitoring was conducted.

3. The probe tip of the RKI Eagle II was inserted into the top section of the monitoring well using a gloved hand. The gloved hand is held against the top of the monitoring well to limit influences of air currents at the ground surface mixing with the headspace during the period of measurement. Measurement is for a minimum of 30 seconds and maximum of approximately 2 minutes.

4. The highest reading from each sensor of the RKI Eagle was recorded in ppm, unless otherwise noted.

5. Should a low oxygen alarm activate during the measurement period, monitor the display and withdraw the probe tip once the reading has peaked. Observe the reading while the probe draws fresh air. Record the maximum reading. Repeat this if necessary.

Liquid Levels

Liquid levels are measured by a Heron electronic oil-water interface meter. The interface probe is lowered into the monitoring well until an audible signal is established by the probe. Liquid readings are taken during the lowering of the probe to minimize effects of surface tension and potential erroneous readings. The measurement is taken to the highest point on the monitoring well pipe.

The interface probe is washed with a detergent solution and thoroughly rinsed with clean water between each monitoring well.

Measurement of Water Quality Indices

Standard water quality parameters (pH, electrical conductivity, temperature, dissolved oxygen, total dissolved solids and redox potential) were field measured by a YSI Pro Plus multi-meter. The multi-meter is calibrated prior to each sampling event. Calibration is performed and documented in-house at Tiamat and re-checked by an independent third-party service provider between every third or fourth in-house instrument calibration event. Calibration and service records are maintained on file.

Groundwater Sampling

Groundwater sampling is conducted using either a disposable polyethylene bailer or portable stainless steel submersible pump. The specific sample pump utilizes a low flow sampling technique to minimize losses of VOCs by degassing during collection of water sample. In circumstances where insufficient water is present in a groundwater monitoring well, a dedicated polyethylene bailer is used.

Sampling by Disposable Polyethylene Bailer

Field procedures to perform groundwater sampling using a disposable polyethylene bailer are as follow:

1. Loosen the well screw caps and measure the liquid level with a Heron interface probe. Lower the interface probe to the highest side of the monitoring well pipe and take the first reading when an audible signal is established. The probe is rinsed with a detergent solution and clean water between each well.

2. Measure the nylon string to an approximate length of about 1 m or so greater than the expected sampling depth.

3. Tie the string to the bailer, make a big loop at the other end of the string and tie it to the sampler's hand.

4. Lower the bailer into the well, bail the stagnant water and dispose into a pail. Note subjectively any attributes of the purged ground water such as, odour, colour and phase-separate liquid.

5. During and following purging, the water indices (pH, electrical conductivity, temperature, dissolved O_2, total dissolved solids, and redox) are measured by a YSI multi-meter using a sample container and bailer or a flow cell and pump combination.

6. Repeat steps 4-5 until pH, electrical conductivity and temperature exhibit less than 10% variation, indicating a stabilized groundwater condition.

7. Once the indices indicate a stabilized state, water samples are bottled into laboratory supplied bottles and preservatives as per the laboratory instruction.

8. Note the approximate volume of water extracted, the visual quality of water, any unusual odour or discolouration and the water indices at the time of sample collection.

9. New bailer, nylon string and disposable nitrile gloves are used at each well to prevent cross contamination and preserve sample integrity.

Low Flow Sampling

Field procedures to perform low flow sampling are as follow:

1. Loosen the well screw caps and measure the liquid level with a Heron interface probe. Lower the interface probe to the highest side of the monitoring well pipe and take the first reading when an audible signal is established. The probe will be rinsed with a detergent solution and clean water between each well.

2. Once the liquid level is measured, the distance between the bottom of the monitoring well and the liquid level is calculated. The pump will be set near the middle of the water column in order to avoid stirring of sediments at the bottom of the well.

3. The required length of the Teflon tubing is determined by adding the length of the middle water column and an additional length to allow for water discharge into a pail. If the monitoring well is an aboveground casing, the length of the aboveground casing will be added as well.

4. New Teflon tubing is used at each well to avoid cross contamination.

5. Set up 12 V Monsoon stainless steel submersible pump and flow controller with Teflon tubing. Slowly lower the pump to the middle of the water column.

6. Adjust the voltage on the flow controller to acquire the required flow rate. Measure the liquid level using the interface probe from time to time. Minimal drawdown is attained once the liquid level drops and stays within the 10% range of the first measurement.

7. Once the required flow rate is achieved, attach the Teflon tubing to the inlet of the flow cell with the YSI multi-meter probe and measure the indices with the YSI multi-meter. Connect a discharge Teflon tube to the outlet of the flow cell to allow for water to discharge from the flow cell into a pail.

8. Collect groundwater samples after pH, electrical conductivity and temperature stabilize within 10% variation. Apply preservatives as per the laboratory instruction.

9. After collecting samples, transfer the pump into a clean pail filled with clean water and let it run for a moment to remove entrapped sediments. Then run the pump in a second pail to ensure thorough flush following the first rinse.

10. To avoid confusion, label pails in the sequence where the pump is rinsed. Replace with clean water in the pail as required.

Groundwater Sample Handling

The laboratory requires six (6) 40 ml clear glass vials and two (2) 250 ml amber bottles for analyses of Volatile Organic Compounds (VOCs), Benzene, Toluene, Ethylbenzene, Xylenes (BTEX), petroleum hydrocarbon fractions F1 and F2. Check the white preservative tablets are present in each 40 ml vial and 250 ml amber bottle. As well, once filled and capped, confirm each vial and bottle exhibits no notable headspace. If necessary, discard and resample with new vials and bottles.

A 45 micron filter is used to field filter groundwater for analyses of dissolved metals. The filter outlet is placed on top of a sample bottle while water is decanted through a dedicated Teflon tubing attached to the inlet of the filter. Laboratory provided nitric acid is used to preserve the sample. New filter and Teflon tubing are used for each well location.

During field sampling disposable nitrile gloves are worn during sampling and changed between wells. In the event where suspicious cross-contamination occurs, nitrile gloves and sampling bottles are discarded and replaced. Each set of samples is properly labelled and bagged into a dedicated poly bag to prevent potential cross contamination between sample bottles from different well locations. Samples are stored in a cooler with ice to maintain temperature at about 5^{o} C. The coolers are dropped off at a secure laboratory depot with a completed chain of custody at the end of each sampling day for delivery to the laboratory in Calgary, Alberta.

Soil Sampling During Drilling

Soil samples were collected during the advancement of testholes using solid stem auger, hollow stem auger or ODEX tooling. A Geoprobe or small track or truck-mounted drill rig was determined pending the presence of soft ground and the ability to access test locations in a confined or steep slope (more than 10%).

Solid stem auger was used at most of the sites to enable collection of representative soil samples. However, in cases where the test location lies near the river bank or on top of gravels, hollow stem auger or ODEX was employed to drill through the hard sediments and prevent sloughing and enable the installation of a groundwater or soil vapour monitoring well.

When waste material is noted in soil, the drilling continues to the depth where the waste ends and/or the native soil is encountered to ensure complete profiling of the waste material. Bulk soil samples underlying the waste were collected for laboratory analyses; soil samples from each soil bag were also submitted for laboratory analyses. Pending laboratory results, drill cuttings in the soil bags may be disposed at The City of Red Deer Waste Management Facility.

Sampling Soil Vapour Using Summa Canister®

1. Unlock the steel well casing and remove the brass cap from the vapour probe valve. Connect the lab provided Teflon tubing with Swagelok® fitting to the probe valve. Hand-tighten the fitting plus ¼ additional turn using a 9/16 inch wrench. To avoid damage and

short circuit of the Swagelok®, care should be taken to avoid over tightening the Swagelok® fitting.

2. Connect the probe tip of the RKI Eagle II with the Teflon tubing attached to the vapour probe. Open the vapour valve to allow the vapour to flow into the monitoring instrument.

3. Start the stop watch to count the purge time. The purge time is calculated by dividing the volume of the 1 inch PVC pipe with the flow rate of the RKI Eagle II.

4. For sites with heavy municipal solid waste (MSW) i.e. Lindsay Thurber Comprehensive High School, McKenzie Trail, Montfort, Red Deer College and Red Deer Motors, a minimum of three (3) equivalent volumes of soil vapour are purged prior to collecting a well vapour sample.

5. Record combustible and volatile vapours between the initial 30 seconds to two (2) minutes during purging.

6. Using the digital Cole-Palmer absolute pressure gauge, record the ambient and probe barometric pressures. The probe pressure is measured by connecting the gauge tip with the Teflon tubing attached to the vapour probe. The vapour probe and the pressure gauge should be on during the measurement.

7. Remove the brass cap from the 1.4 L Summa Canister® valve with a 9/16 inch wrench.

8. Attach the flow controller to the canister and remove the brass cap from the gauge adapter. Hand tighten the fittings and tighten another ¼ turn using a 9/16 wrench.

9. Open the valve, record the canister vacuum (this should read between -29 to -25 in Hg and close the valve.

10. Connect the adapter with the Teflon tubing to the vapour probe. Hand-tighten the fitting and tighten another ¼ turn using a 9/16 inch wrench.

11. Open the vapour probe and open the canister valve. Check the gauge periodically to ensure sample flow rate is acceptable.

12. When the vacuum reads about -5 inches Hg, close the vapour probe and the valve, disassemble the flow controller and the Teflon tubing, then place the protective brass cap back on the canister valve. Hand tighten the cap and perform another ¼ turn using a 9/16 inch wrench.

13. It is always a good practice to maintain some vacuum in the canister following sampling. The residual vacuum serves as a check for the integrity of the canister during transport to the laboratory.

14. Record the canister and the flow controller serial numbers on the field sheet and the chain of custody.

15. A dedicated set of Teflon tubing, Swagelok® fitting and gauge with flow controller assembly must be used at each sample well location to prevent cross contamination.

Sampling Soil Vapour Using Tedlar Bag®

1. Place the 1 L Tedlar Bag® inside the lung box. Connect the Tedlar Bag® nozzle with the tubing attached to the brass nipple inside the lung box.

2. Perform a full turn counter clockwise to open the valve and go another ¼ turn clockwise. This is to ensure that the valve is properly opened for sampling.

3. Connect the Teflon tubing attached to the vapour probe with the exterior brass nipple on the lung box.

4. Connect the other exterior brass nipple of the lung box to the SKC pump. Ensure the lung box is closed to prevent air leak during sampling.

5. Open the vapour probe valve and activate the SKC pump. The pump will evacuate the lung box causing the Tedlar Bag® to expand drawing a sample of soil vapour.

6. The SKC pump was set at a flow rate of 0.5 L/min and the volume of the lung box is 4 L. The estimated sampling time is approximately 8 minutes. Check the Tedlar Bag® at about 8 minutes or periodically to verify the progress of sample collection.

7. When the Tedlar Bag® is approximately 80% full, close the bag valve by turning it clockwise until it is tight. Then turn off the SKC pump and close the vapour probe. To ensure the bag is sufficiently filled, repeat steps 5-7, if necessary.

8. Avoid over filling the Tedlar Bag®. This will prevent damage to the bag if exposure to change of temperature, altitude and barometric pressure occurs during transport by ground and/or air.

Validation of Analytical Data

Alberta Environment and Sustainable Resource Development (ESRD), formerly Alberta Environment, implemented a Laboratory Data Quality Assurance Policy in October 2001. This policy requires laboratories providing environmental analytical data to meet the accreditation standards set by ESRD. ALS Canada Ltd. and Maxxam Analytics are each accredited by Standards Council of Canada (SCC), which is administered by the Canadian Association for Laboratory Accreditation Inc. (CALA). This accreditation demonstrates ALS Canada Ltd. Laboratories and Maxxam Analytics have consistent laboratory procedures and quality controls meeting national and international standards for staff training, equipment maintenance and

documentation of parameters. The laboratory protocols must be maintained to demonstrate the in lab quality assurance/quality control (QA/QC) procedures are consistently maintained and are paramount to the integrity and reliability of the reported results.

A data quality review was performed for all analytical results reported. The data quality review comprised of the following actions by Tiamat.

- Ensure the Chain of Custody form are properly completed and signed;
- Ensure the requested analyses were performed and reported for the correct samples;
- Calculate and review relative percent differences (RPD), where available, to assess the laboratory precision and analytical variability for each batch of samples;
- Perform independent review of the internal quality control (QC) and quality assurance (QA) practices for the laboratory;
- Confirm the applicable holding times and extraction times for each sample have been met by the laboratory;
- Identify and resolve additional data quality issues with the laboratory.

The Chain of Custody forms submitted for each work order for this project appeared to be properly completed. The Chain of Custody forms show the sample temperature (where applicable) upon receipt at the laboratory and the appropriate sample custody signatures.

Laboratory QC protocols include surrogate recoveries, laboratory duplicates, method blanks, matrix spikes and reference materials, where applicable. QC results published with the sample report comply with the prescribed laboratory QC limits. Thus, analytical results are deemed to be within acceptable variability and a corresponding acceptable level of precision and accuracy.

Tiamat reviews all QA/QC outcomes published with the respective laboratory reports. Discrepancies are reported to the laboratory for follow-up. The laboratory's analytical processes for the specific testing program for this project appear to be acceptable.

The holding times experienced by all samples submitted met the recommended holding time limit for the specified parameter where applicable. Overall, the review and data validation process indicates the analytical results are valid and reliable.

For the Red Deer Motors Site, a total of 2 groundwater samples, 3 Summa Canisters® and 6 Tedlar Bags® were collected for this Phase II ESA. Note, duplicate Tedlar Bag® samples were collected for QA/QC purposes.

Sample containers were provided by the laboratory. Collected samples are appropriately packed in sample coolers and shipped from Red Deer to Calgary by a third-party courier contracted by

the respective laboratory. It is presumed the courier handles the sample coolers with appropriate care. There were no reported issues with the samples upon receipt at the laboratory.

Tiamat applies a uniform field protocol consistent with industry practice to ensure the integrity of each sample collected for laboratory analysis. Coupled with the in-house laboratory control measures implemented by each laboratory, the overall QA/QC objectives are deemed to be satisfied.

Field Duplicate Evaluation

An evaluation of duplicate variation is undertaken to assess the precision of field sampling and laboratory analyses. For comparison, the relative percent difference (RPD) is calculated.

RPD is defined as the absolute difference between two results divided by the average of the two results multiplied by one hundred. Where one result is below detection limit, and its duplicate result is above detection limit, the non-detect concentration is assigned the detection limit for the purposes of calculating RPD.

Groundwater duplicates should be taken during groundwater sampling events at an average of every ten (10) samples or about 10% of the sample set.

For groundwater samples, the objective for RPD values is to be not more than 20%.

Field Blank Assessment

A field blank is a sample of laboratory-supplied reverse osmosis water poured into a laboratory supplied sample container in the field and shipped to the laboratory with the field samples using a unique sample identifier. The purpose of a field blank is to assess potential cross contamination from field conditions during sampling. For this initial assessment, no previous site specific analyte data was available, thus field blanks were not deemed to be necessary.

Trip Blank Assessment

A trip blank is a clean sample container of reverse osmosis water that is taken to the sampling site and transported back to the laboratory for analysis without having been exposed to sampling procedures. The trip blanks prepared by the laboratory are kept within the sample containers at all times and never opened in the field. Analyses of trip blanks indicate whether a sample was contaminated during shipment from the laboratory to the field and from the field to the laboratory. Tiamat's standard sample bottle procedure is to have each set of sample bottles placed into clean new plastic bags. This prevents direct contact between other sample bottles in the sample cooler.

Field Duplicates

Duplicate samples are samples collected sequentially at the time of sampling. Generally the same compounds should be detected in both samples. For this initial assessment, there have been no history of problematic analytical parameters and field duplicates were not warranted.

Laboratory Quality Control

The following sections outline the quality control measures which the laboratory implements. Generally, Maxxam's and ALS's QA/QC samples were tested at least once per analytical batch.

Laboratory Duplicate Assessment

Lab duplicates are two separate aliquots of water (from one location but from different vials) that are analysed in the laboratory to assess laboratory analytical precision. For comparison between duplicates a calculation of relative percent difference (RPD) was carried out by the laboratory. No laboratory duplicate had any analytes with an RPD greater than the laboratory control limits. This quantitatively affirms the QA/QC and the precision of a sample result.

Matrix Spike Assessment

A matrix spike is a sample prepared by adding a known mass of a target analyte(s) to a specified amount of sample (matrix). Spiked samples are used to determine the effect of the matrix on a method's recovery efficiency. The laboratory states their control limits based on 99% confidence interval in the quality control report section of the laboratory analytical report. Control limits for recoveries are often statistically determined by the method, but under some conditions may revert to standard method limits.

Generally, matrix spike recoveries for groundwater tests were within laboratory control limits. The results of matrix spike recovery confirm the protocols and the acceptable limits established by the laboratory for precision and accuracy was met.

SURVEYING AND MAPPING DIVISION
Alberta Survey Control Marker (ASCM) Information
MASCOT DSS-1

Horz Datum NAD83 Updated: 1994-05-24 — ASCM 269191
Latitude 52 15 12.55999 dms — Marker Installed 74-03
Longitude 113 49 45.98215 dms — Tablet Markings 790+12.50
Horz Class INTEGRATED , ORDER 2 — Date Printed 2013-08-21
Last Updated 2008-11-21 — Mapsheet Name RED DEER
Vert Datum CVD28 Updated: 1983-12-09 — Mapsheet Number 5790 + 012
Elevation 881.665 m — For current information call Geodetic Survey
Vert Class INTEGRATED , SPIRIT LEVELS — (780) 427-3143 FAX: (780) 427-1493 — Marker Condition GOOD 92-11-27

3TM COORDINATES

Scale Factor 0.999900 At Ref Mer 114

Northing 5790983.749 m
Easting 11646.310 m
Convergence 0 08 05.52 dms
Station Ellipsoid Factor 0.999865
Station Combined Factor 0.999766

GEOID DATA (GSD95) Updated: 96-01-06

Component	Magnitude	Std Dev
Meridian Defl,XI(+N)	2.0 s	2 s
Prime Vert Defl,ETA(+E)	4.7 s	2 s
Geoid_Ellip Separation	-18.19 m	1 m

COORDINATE HISTORY

	HORZ	VERT
Originating Project	75029	75029
Published	83-12-09	83-12-09
Revising Project	NAD83	
Published	94-05-24	
Revising Project		
Published		
Revising Project		
Published		

NON COORDINATE REVISIONS

1983-12-08 FIRST MARKER LOCATION DESCRIPTION ENTERED
2003-03-12 "MAPSHEET NAME" AND/OR "MAPSHEET NO" CHANGED

HISTORICAL/OTHER MARKER NAMES

OLD ASC # 57903 12 50

HISTORY 57903 12 50

ADJACENT MARKERS (calculated) Updated: 2008-11-21

ASCM To	Tablet Markings	Horizontal Distance (m)	Std Dev (cm)	PPM/ Order	Grid/ Grnd Factor	Grid Bearing (dms)	Std Dev (s)	T-t Corr (s)
56838	074197	255.723	1	51/2	0.999765	355 18 47.47	3.0	0.01
453613	790+12.62	351.297	1	31/1	0.999766	155 00 52.50	2.6	-0.01
91850	790+12.57	511.362	1	31/2	0.999767	30 02 48.91	2.5	0.01
58404	790+12.11.7	540.720	1	30/2	0.999766	326 09 21.88	2.5	0.01
229419	790+12.56	572.020	1	33/2	0.999767	344 33 16.08	2.8	0.02
237446	790+12.09.1	600.034	1	27/1	0.999766	289 50 41.32	2.3	0.01

MARKER TYPE Updated: 1992-12-07

ASC BRASS TABLET ON A 7CM HEAVY WALL STEEL PIPE.
LANDSCAPED.

MARKER LOCATION Updated: 1983-12-08

ON E/S OF 57 AVE AT WATSON ST; IN BLVD IN PARK; 4.1M E OF E F.O.C.
57 AVE; 1.9M S OF E PRODUCTION OF S B.O.W. OF WATSON ST.

MARKER CONDITION COMMENTS — Inspected Updated

MARKER REPORTED IN GOOD CONDITION — 1992-11-27 1992-12-07

COORDINATE HISTORY COMMENTS

HORZ 94-05-24 ALBERTA NAD83 READJUSTMENT

VERT

SURVEYING AND MAPPING DIVISION
Alberta Survey Control Marker (ASCM) Information
MASCOT DSS-1

Horz Datum NAD83 Updated: 1995-04-03 ASCM 376673
Latitude 52 14 19.56624 dms Marker Installed 92-11
Longitude 113 49 10.32912 dms Tablet Markings 376673
Horz Class INTEGRATED , ORDER 2 Date Printed 2013-08-21
Last Updated 2006-08-31 Mapsheet Name RED DEER
Vert Datum CVD28 Updated: 1995-04-03 Mapsheet Number 5787 + 016
Elevation 879.730 m For current information call Geodetic Survey
Vert Class INTEGRATED , SPIRIT LEVELS (780) 427-3143 FAX: (780) 427-1493 Marker Condition GOOD 92-11-27

3TM COORDINATES

Scale Factor 0.999900 At Ref Mer 114

Northing 5789347.575 m
Easting 12326.633 m
Convergence 0 08 33.61 dms
Station Ellipsoid Factor 0.999865
Station Combined Factor 0.999767

GEOID DATA (GSD95) Updated: 96-01-06

Component	Magnitude	Std Dev
Meridian Defl,XI(+N)	2.1 s	2 s
Prime Vert Defl,ETA(+E)	4.4 s	2 s
Geoid_Ellip Separation	-18.19 m	1 m

COORDINATE HISTORY HORZ VERT

Originating Project 92056 92056
Published 95-04-03 95-04-03

Revising Project
Published
Revising Project
Published
Revising Project
Published

NON COORDINATE REVISIONS

1994-09-19 FIRST MARKER LOCATION DESCRIPTION ENTERED
2003-03-12 "MAPSHEET NAME" AND/OR "MAPSHEET NO" CHANGED
1994-09-19 INSTALLATION DATE AND TABLET MARKINGS ENTERED

HISTORICAL/OTHER MARKER NAMES

ADJACENT MARKERS (calculated) Updated: 2006-08-31

ASCM To	Tablet Markings	Horizontal Distance (m)	Std Dev (cm)	PPM/ Order	Grid/ Grnd Factor	Grid Bearing (dms)	Std Dev (s)	T-t Corr (s)
112219	787+16.27	418.697	1	29/1	0.999768	86 31 40.68	2.3	0.00
205575	787+16.22	492.211	1	28/2	0.999767	48 12 19.65	2.3	0.01
358986	358986	665.236	1	24/1	0.999767	8 56 33.21	2.0	0.02
72926	075182	691.469	1	20/1	0.999766	210 02 43.81	1.8	-0.02
27391	787+16.24	785.463	1	20/1	0.999766	26 09 43.22	1.7	0.02
271460	790+16.175	1123.727	1	16/1	0.999767	17 52 34.87	1.4	0.03

MARKER TYPE Updated: 1994-09-19

ASC CAP ON 5 CM SQ HEAVY WALL STEEL PIPE 4.2 M LONG WITH HELIX BASE
3CM BGL; NO GP

MARKER LOCATION Updated: 1994-09-19

NEAR SE COR OF TAYLOR DRIVE AND 22 ST; IN GRASS BLVD; 4.9M S OF S F.O.C. 22 ST;
16.6M E OF E F.O.C. TAYLOR DRIVE.

MARKER CONDITION COMMENTS Inspected Updated

COORDINATE HISTORY COMMENTS

HORZ

VERT

SURVEYING AND MAPPING DIVISION
Alberta Survey Control Marker (ASCM) Information
MASCOT DSS-1

Horz Datum NAD83 Updated: 1994-05-24 — ASCM 384792
Latitude 52 16 32.45563 dms — Marker Installed 85-12
Longitude 113 48 50.96112 dms — Tablet Markings 793+16.124
Horz Class INTEGRATED , ORDER 2 — Date Printed 2013-08-21
Last Updated 2003-03-12 — Mapsheet Name RED DEER
Vert Datum CVD28 Updated: 1986-10-08 — Mapsheet Number 5793 + 016
Elevation 857.582 m — For current information call Geodetic Survey
Vert Class INTEGRATED , SPIRIT LEVELS — (780) 427-3143 FAX: (780) 427-1493 — Marker Condition GOOD 86-01-29

3TM COORDINATES

Scale Factor 0.999900 At Ref Mer 114

Northing 5793455.559 m
Easting 12683.580 m
Convergence 0 08 49.19 dms
Station Ellipsoid Factor 0.999869
Station Combined Factor 0.999771

GEOID DATA (GSD95) Updated: 96-01-06

Component	Magnitude	Std Dev
Meridian Defl,XI(+N)	2.1 s	2 s
Prime Vert Defl,ETA(+E)	4.6 s	2 s
Geoid_Ellip Separation	-18.24 m	1 m

COORDINATE HISTORY

	HORZ	VERT
Originating Project	85050	85050
Published	86-10-08	86-10-08
Revising Project	NAD83	
Published	94-05-24	
Revising Project		
Published		
Revising Project		
Published		

NON COORDINATE REVISIONS

1986-10-08 FIRST MARKER LOCATION DESCRIPTION ENTERED
2003-03-12 "MAPSHEET NAME" AND/OR "MAPSHEET NO" CHANGED

HISTORICAL/OTHER MARKER NAMES

OLD ASC # 57933 16 124

HISTORY 57933 16 124

ADJACENT MARKERS (calculated) Updated: 1994-06-07

ASCM To	Tablet Markings	Horizontal Distance (m)	Std Dev (cm)	PPM/ Order	Grid/ Grnd Factor	Grid Bearing (dms)	Std Dev (s)	T-t Corr (s)
489674	793+16.122	186.788	1	48/2	0.999773	0 22 23.11	3.8	0.01
425314	793+16.123	193.627	1	41/2	0.999769	68 22 57.56	3.3	0.00
329060	793+16.125	208.391	1	48/2	0.999770	180 05 38.59	4.0	-0.01
231654	793+16.5.6	220.501	1	63/2	0.999772	295 39 08.08	5.3	0.00
122424	793+16.5.3	291.491	1	38/2	0.999769	227 40 15.66	3.2	-0.01
456483	793+16.121	307.374	1	36/2	0.999772	32 06 11.21	2.9	0.01

MARKER TYPE Updated: 1986-10-08

ASC BRASS TABLET IN CONC

MARKER LOCATION Updated: 1986-10-08

NEAR SW COR 50 (GAETZ) AVE RIVER BRIDGE; IN SIDEWALK ON ABUTMENT; 1.000M E OF METAL HANDRAIL; 1.400M W OF CONC BARRIER; 6.300M N OF S LIMIT OF METAL HANDRAIL

MARKER CONDITION COMMENTS Inspected Updated

COORDINATE HISTORY COMMENTS

HORZ 94-05-24 ALBERTA NAD83 READJUSTMENT

VERT

SOIL REPORTS

TIAMAT ENVIRONMENTAL
ATTN: LEON MAH
UNIT 107, 2719 - 7TH AVENUE NE
CALGARY AB T2A 2L9

Date Received: 28-JUN-13
Report Date: 16-JUL-13 14:53 (MT)
Version: FINAL

Client Phone: 403-640-9009

Certificate of Analysis

Lab Work Order #: L1324834

Project P.O. #: NOT SUBMITTED
Job Reference: 12-435
C of C Numbers: 10-317479
Legal Site Desc:

Monica Gibson
Account Manager

ALS LABORATORY GROUP CHEMICAL ANALYSIS REPORT

Lab ID	Sample ID	Test Description	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By
L1324834-3	RDM TH-01@9'-10'								
Sample Date:	JAL/ LTM on 26-JUN-13								
Matrix:	SOIL								
		Class II Landfill Pkg w/ Paint Filter							
		Mercury (Hg)-Leachate	<0.010		0.01	mg/L		08-JUL-13	SHT
		Paint Filter Test	PASS					06-JUL-13	NPA
		Flash Point	>75		30	Deg. C		06-JUL-13	NPA
		pH	7.71		0.1	pH		08-JUL-13	KJAY
		TCLP Leachable Metals							
		Silver (Ag)-Leachable	<0.50		0.5	mg/L		06-JUL-13	LGR
		Arsenic (As)-Leachable	<0.20		0.2	mg/L		06-JUL-13	LGR
		Boron (B)-Leachable	<5.0		5	mg/L		06-JUL-13	LGR
		Barium (Ba)-Leachable	<5.0		5	mg/L		06-JUL-13	LGR
		Beryllium (Be)-Leachable	<0.50		0.5	mg/L		06-JUL-13	LGR
		Cadmium (Cd)-Leachable	<0.050		0.05	mg/L		06-JUL-13	LGR
		Cobalt (Co)-Leachable	<5.0		5	mg/L		06-JUL-13	LGR
		Chromium (Cr)-Leachable	<0.50		0.5	mg/L		06-JUL-13	LGR
		Copper (Cu)-Leachable	<5.0		5	mg/L		06-JUL-13	LGR
		Iron (Fe)-Leachable	<5.0		5	mg/L		06-JUL-13	LGR
		Nickel (Ni)-Leachable	<0.50		0.5	mg/L		06-JUL-13	LGR
		Lead (Pb)-Leachable	<0.50		0.5	mg/L		06-JUL-13	LGR
		Antimony (Sb)-Leachable	<5.0		5	mg/L		06-JUL-13	LGR
		Selenium (Se)-Leachable	<0.20		0.2	mg/L		06-JUL-13	LGR
		Thallium (Tl)-Leachable	<0.50		0.5	mg/L		06-JUL-13	LGR
		Uranium (U)-Leachable	<1.0		1	mg/L		06-JUL-13	LGR
		Vanadium (V)-Leachable	<5.0		5	mg/L		06-JUL-13	LGR
		Zinc (Zn)-Leachable	<5.0		5	mg/L		06-JUL-13	LGR
		Zirconium (Zr)-Leachable	<5.0		5	mg/L		06-JUL-13	LGR
		TCLP Leachable BTEX							
		Benzene	<0.0050		0.005	mg/L	06-JUL-13	06-JUL-13	VVS
		Toluene	<0.0050		0.005	mg/L	06-JUL-13	06-JUL-13	VVS
		Ethylbenzene	<0.0050		0.005	mg/L	06-JUL-13	06-JUL-13	VVS
		Xylenes	<0.0050		0.005	mg/L	06-JUL-13	06-JUL-13	VVS
L1324834-4	RDM TH-01@17'								
Sample Date:	JAL/ LTM on 26-JUN-13								
Matrix:	SOIL								
		Metals in Soil by ICPMS (Alberta Tier 1)							
		Metals in Soil by CRC ICPMS							
		Antimony (Sb)	0.44		0.2	mg/kg	07-JUL-13	07-JUL-13	BOC
		Arsenic (As)	7.18		0.2	mg/kg	07-JUL-13	07-JUL-13	BOC
		Barium (Ba)	242		5	mg/kg	07-JUL-13	07-JUL-13	BOC
		Beryllium (Be)	<1.0		1	mg/kg	07-JUL-13	07-JUL-13	BOC
		Cadmium (Cd)	<0.50		0.5	mg/kg	07-JUL-13	07-JUL-13	BOC
		Chromium (Cr)	35.7		0.5	mg/kg	07-JUL-13	07-JUL-13	BOC
		Cobalt (Co)	7.8		1	mg/kg	07-JUL-13	07-JUL-13	BOC
		Copper (Cu)	18.3		2	mg/kg	07-JUL-13	07-JUL-13	BOC
		Lead (Pb)	8.0		5	mg/kg	07-JUL-13	07-JUL-13	BOC
		Molybdenum (Mo)	1.2		1	mg/kg	07-JUL-13	07-JUL-13	BOC
		Nickel (Ni)	28.6		2	mg/kg	07-JUL-13	07-JUL-13	BOC
		Selenium (Se)	<0.50		0.5	mg/kg	07-JUL-13	07-JUL-13	BOC
		Silver (Ag)	<1.0		1	mg/kg	07-JUL-13	07-JUL-13	BOC
		Thallium (Tl)	<0.50		0.5	mg/kg	07-JUL-13	07-JUL-13	BOC
		Tin (Sn)	<2.0		2	mg/kg	07-JUL-13	07-JUL-13	BOC

ALS LABORATORY GROUP CHEMICAL ANALYSIS REPORT

Lab ID	Sample ID	Test Description	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By
L1324834-4	RDM TH-01@17'								
Sample Date:	JAL/ LTM on 26-JUN-13								
Matrix:	SOIL								
		Metals In Soil by ICPMS (Alberta Tier 1)							
		Metals In Soil by CRC ICPMS							
		Uranium (U)	<2.0		2	mg/kg	07-JUL-13	07-JUL-13	BOC
		Vanadium (V)	38.4		1	mg/kg	07-JUL-13	07-JUL-13	BOC
		Zinc (Zn)	63		10	mg/kg	07-JUL-13	07-JUL-13	BOC
		Mercury In Soil by CVAAS							
		Mercury (Hg)	<0.050		0.05	mg/kg	07-JUL-13	08-JUL-13	QA
		Boron (B), Hot Water Ext.	1.26		0.1	mg/kg		16-JUL-13	AMCB
		% Saturation	74.0		1	%		08-JUL-13	KJAY
		Nitrite-N	<1.0		1	mg/L		09-JUL-13	RMMS
		Nitrate (as N)	<1.0		1	mg/L		09-JUL-13	RMMS
		Hexavalent Chromium	<0.10		0.1	mg/kg	10-JUL-13	10-JUL-13	JTV
		Chloride (Cl)	255	DLA	20	mg/L		03-JUL-13	SCL
		% Moisture	14.5		0.1	%	29-JUN-13	02-JUL-13	GRP
		Salinity in mg/kg							
		Chloride (Cl)	188		15	mg/kg		09-JUL-13	
		Nitrate-N	<0.74		0.74	mg/kg		09-JUL-13	
		Nitrite-N	<0.74		0.74	mg/kg		09-JUL-13	
		EPA 8260 Volatile Organics							
		Dichlorodifluoromethane	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		Chloromethane	<0.10		0.1	mg/kg	02-JUL-13	03-JUL-13	CFB
		Vinyl chloride	<0.20		0.2	mg/kg	02-JUL-13	03-JUL-13	CFB
		Bromomethane	<0.10		0.1	mg/kg	02-JUL-13	03-JUL-13	CFB
		Chloroethane	<0.10		0.1	mg/kg	02-JUL-13	03-JUL-13	CFB
		Trichlorofluoromethane	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		1,1-Dichloroethene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		Methylene chloride	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		trans-1,2-Dichloroethene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		1,1-Dichloroethane	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		2,2-Dichloropropane	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		cis-1,2-Dichloroethene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		Chloroform	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		Bromochloromethane	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		1,2-Dichloroethane	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		1,1,1-Trichloroethane	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		1,1-Dichloropropene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		Carbon tetrachloride	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		Benzene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		Trichloroethene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		1,2-Dichloropropane	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		Bromodichloromethane	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		Dibromomethane	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		cis-1,3-Dichloropropene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		trans-1,3-Dichloropropene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		Toluene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		1,1,2-Trichloroethane	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		1,3-Dichloropropane	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		Tetrachloroethene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		Dibromochloromethane	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB

ALS LABORATORY GROUP CHEMICAL ANALYSIS REPORT

Lab ID	Sample ID	Test Description	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By
L1324834-4	RDM TH-01@17'								
Sample Date: JAL/ LTM on 26-JUN-13									
Matrix:	SOIL								
		EPA 8260 Volatile Organics							
		1,2-Dibromoethane	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		Chlorobenzene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		Ethylbenzene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		1,1,1,2-Tetrachloroethane	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		m+p-Xylenes	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		o-Xylene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		Styrene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		Bromoform	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		Isopropylbenzene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		1,1,2,2-Tetrachloroethane	<0.050		0.05	mg/kg	02-JUL-13	03-JUL-13	CFB
		1,2,3-Trichloropropane	<0.020		0.02	mg/kg	02-JUL-13	03-JUL-13	CFB
		n-Propylbenzene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		Bromobenzene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		1,3,5-Trimethylbenzene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		2-Chlorotoluene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		4-Chlorotoluene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		tert-Butylbenzene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		1,2,4-Trimethylbenzene	0.013		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		sec-Butylbenzene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		p-Isopropyltoluene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		1,3-Dichlorobenzene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		1,4-Dichlorobenzene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		n-Butylbenzene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		1,2-Dichlorobenzene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		1,2-Dibromo-3-chloropropane	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		1,2,4-Trichlorobenzene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		Hexachlorobutadiene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
		1,2,3-Trichlorobenzene	<0.010		0.01	mg/kg	02-JUL-13	03-JUL-13	CFB
Surrogate:		1,4-Difluorobenzene	106.4		N/A	%	02-JUL-13	03-JUL-13	CFB
Surrogate:		4-Bromofluorobenzene	104.0		N/A	%	02-JUL-13	03-JUL-13	CFB
Surrogate:		3,4-Dichlorotoluene	94.8		N/A	%	02-JUL-13	03-JUL-13	CFB
		CCME BTEX + Styrene, F1 TO F4							
		CCME Total Hydrocarbons							
		F1 (C6-C10)	<10		10	mg/kg		03-JUL-13	
		F1-BTEX	<10		10	mg/kg		03-JUL-13	
		F2 (C10-C16)	<25		25	mg/kg		03-JUL-13	
		F3 (C16-C34)	117		50	mg/kg		03-JUL-13	
		F4 (C34-C50)	<50		50	mg/kg		03-JUL-13	
		Total Hydrocarbons (C6-C50)	117		50	mg/kg		03-JUL-13	
		Chromatogram to baseline at nC50	YES					03-JUL-13	
		CCME F2-4 Hydrocarbons							
		Prep/Analysis Dates					29-JUN-13	02-JUL-13	JDV
Surrogate:		2-Bromobenzotrifluoride	102.1		N/A	%	29-JUN-13	02-JUL-13	JDV
		BTEX, Styrene and F1 (C6-C10)							
		Benzene	<0.0050		0.005	mg/kg	29-JUN-13	02-JUL-13	CFB
		Toluene	<0.050		0.05	mg/kg	29-JUN-13	02-JUL-13	CFB
		Ethylbenzene	<0.015		0.015	mg/kg	29-JUN-13	02-JUL-13	CFB
		o-Xylene	<0.050		0.05	mg/kg	29-JUN-13	02-JUL-13	CFB
		m+p-Xylene	<0.050		0.05	mg/kg	29-JUN-13	02-JUL-13	CFB

ALS LABORATORY GROUP CHEMICAL ANALYSIS REPORT

Lab ID	Sample ID	Test Description	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By
L1324834-4	RDM TH-01@17'								
Sample Date:	JAL/ LTM on 26-JUN-13								
Matrix:	SOIL								
		CCME BTEX + Styrene, F1 TO F4							
		BTEX, Styrene and F1 (C6-C10)							
		Xylenes	<0.10		0.1	mg/kg	29-JUN-13	02-JUL-13	CFB
		Styrene	<0.050		0.05	mg/kg	29-JUN-13	02-JUL-13	CFB
	Surrogate:	Chlorobenzene	87.9		N/A	%	29-JUN-13	02-JUL-13	CFB

Methodology Reference

ALS Test Code	Test Description	Methodology Reference (In-House Standard Operating Procedures which Generally Follow:)
NO2-SAR-CL	Nitrite-N	APHA 4110 B - ION CHROMATOGRAPHY
HG-TCLP-CL	Mercury (Hg) - TCLP	APHA 3112 B-AAS Cold Vapor
F2-4-TMB-CL	CCME F2-4 Hydrocarbons	CCME CWS-PHC Dec-2000 - Pub# 1310
HG-200.2-CVAA-ED	Mercury in Soil by CVAAS	EPA 200.2/245.1
NO3-SAR-CL	Nitrate-N	APHA 4110 B - IC
SAL-MG/KG-CALC-CL	Salinity in mg/kg	Manual Calculation
SAT-PCNT-CL	% Saturation	CSSS 18.2-Calculation
BTX-TCLP-CL	TCLP Leachable BTEX	EPA 5030/8015& 8260-P&T GC-MS/FID
CL-SAR-CL	Chloride (Cl) (Saturated Paste)	CSSS CH15/EPA300.1
C-TOT-ORG-LECO-SK	Organic Carbon by combustion method	SSSA (1996) p. 973
FLASH-PMCC-AUTO-CL	Pensky-Martens Closed Cup Flashpoint	ASTM D-93-10a Flash point tester
MET-200.2-CCMS-ED	Metals in Soil by CRC ICPMS	EPA 200.2/6020A
PREP-200.2-ED	Acid Digestion Prep for Metals in Soil	EPA 200.2
PREP-MOISTURE-CL	% Moisture	Oven dry 105C-Gravimetric
VOC-8260-CL	EPA 8260 Volatile Organics	SW 846 8260-GC-MS
PAINT FILTER-CL	Paint Filter Test	EPA SW846-9095
PH-1:2-CL	pH (1:2 Soil:Water Extraction)	CSSS 16.3 - pH of 1:2 water extract
BTXS,F1-CL	BTEX, Styrene and F1 (C6-C10)	CCME CWS-PHC Dec-2000 - Pub# 1310
MET-TCLP-ICP-CL	TCLP Leachable Metals	EPA SW846 METHODS 1311 AND 6010B
B-HOTW-CL	Available Boron, Hot Water	APHA 3120/CSSS 9.2.2-ICP-OES
CR-CR6-3060-ED	Chromium, Hexavalent (Cr +6)	APHA 3500-CR C, EPA 3060A ALKALINE
F1-4-CALC-CL	CCME Total Hydrocarbons	CCME CWS-PHC Dec-2000 - Pub# 1310

Sample Parameter Qualifier key listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution

GROUNDWATER REPORTS

Success Through Science®

Your C.O.C. #: A078666

Attention: JESSICA LEE

TIAMAT ENVIRONMENTAL CONSULTANTS
Unit #107,
2719-7 Avenue NE
CALGARY, AB
CANADA T2A 2L9

Report Date: 2013/08/13

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B367706
Received: 2013/08/06, 07:40

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Acetic Acid, Formic Acid, Propionic Acid	2	N/A	2013/08/08	CAL SOP-00063	Dionex #031181, R05
Alkalinity @25C (pp, total), CO3,HCO3,OH	2	N/A	2013/08/06	AB SOP-00005	SM 2320-B
Organic Halogen (Adsorbable) (1)	1	N/A	2013/08/09	EINDSOP-00056	Coulometric - Titr.
Organic Halogen (Adsorbable) (1)	1	N/A	2013/08/11	EINDSOP-00056	Coulometric - Titr.
Biochemical Oxygen Demand	2	2013/08/06	2013/08/11	AB SOP-00017	SM 5210 B
BTEX/F1 in Water by HS GC/MS	2	N/A	2013/08/08	AB SOP-00039	CCME, EPA 8260C
Cadmium - low level CCME - Dissolved	2	N/A	2013/08/12	AB SOP-00043	EPA 200.8
Cadmium - low level CCME (Total)	2	2013/08/06	2013/08/12	AB SOP-00043	EPA 200.8
Chloride by Automated Colourimetry	2	N/A	2013/08/09	AB SOP-00020	SSMA 4500 CL- E
Chemical Oxygen Demand	2	N/A	2013/08/11	AB SOP-00016	SM 5220-D
Conductivity @25C	2	N/A	2013/08/06	AB SOP-00005	SM 2510-B
CCME Hydrocarbons in Water (F2; C10-C16)	2	2013/08/09	2013/08/09	AB SOP-00040 AB SOP-00037	EPA3510C/CCME PHCCWS
Hardness	2	N/A	2013/08/10	AB WI-00065	SM 2340B
Elements by ICP - Dissolved	2	N/A	2013/08/09	AB SOP-00042	EPA 200.7
Elements by ICP - Total	2	2013/08/08	2013/08/08	AB SOP-00042	EPA 200.7
Elements by ICPMS - Dissolved	2	N/A	2013/08/09	AB SOP-00043	EPA 200.8
Elements by ICPMS - Total	2	2013/08/08	2013/08/09	AB SOP-00043	EPA 200.8
Ion Balance	2	N/A	2013/08/07	AB WI-00065	SM 1030E
Sum of cations, anions	2	N/A	2013/08/10	AB WI-00065	SM 1030E
Nitrogen (total), Calc. TKN, NO3, NO2	2	N/A	2013/08/07	AB WI-00065	SM 4500-N A
Ammonia-N (Total)	2	N/A	2013/08/07	AB SOP-00007	EPA 350.1
Nitrate and Nitrite	2	N/A	2013/08/07	AB SOP-00023	SM4110B
Nitrate + Nitrite-N (calculated)	2	N/A	2013/08/07	AB SOP-00023	SM 4110-B
Nitrogen, (Nitrite, Nitrate) by IC	2	N/A	2013/08/07	AB SOP-00023	SM 4110-B
pH @25°C (Alkalinity titrator)	2	N/A	2013/08/06	AB SOP-00005	SM 4500-H+B
Sulphate by Automated Colourimetry	2	N/A	2013/08/09	AB SOP-00018	EPA 375.4
Total Dissolved Solids (Calculated)	2	N/A	2013/08/10	AB WI-00065	SM 1030E
Total Trihalomethanes Calculation	2	N/A	2013/08/08	CAL SOP-00104	EPA 8260 C
Total Kjeldahl Nitrogen	2	2013/08/07	2013/08/07	AB SOP-00008	EPA 351.1, 351.2
Carbon (Total Organic)	2	N/A	2013/08/09	CAL SOP-00077	MMCW 119
Total Phosphorus	2	2013/08/08	2013/08/08	AB SOP-00024	SM 4500-P
VOCs in Water by HS GC/MS (Std List)	2	N/A	2013/08/07	CAL SOP-00227	EPA 8260 C

Remarks:

All Blank values are reported. Associated data are not blank corrected.

Your C.O.C. #: A078666

Attention: JESSICA LEE

TIAMAT ENVIRONMENTAL CONSULTANTS
Unit #107,
2719-7 Avenue NE
CALGARY, AB
CANADA T2A 2L9

Report Date: 2013/08/13

CERTIFICATE OF ANALYSIS

'MDL' = Method Detection Limit, '<' = Less than MDL, '---' Not Analyzed
Solids results are based on dry weight except Biota Analyses & Special Waste Oil & Grease
Organic analyses are not corrected for extraction recovery standards except for Isotope Dilution methods, (i.e. CARB 429 PAH, all PCDD/F and DBD/DBF analyses)
All CCME results met required criteria unless otherwise stated in the report. All data on final reports are validated by technical personnel. Signature on file at the laboratory. Deviations from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method:
F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction
All Groundwater samples except BTEX/VOC's or Purgeable Hydrocarbons are decanted and/or filtered prior to analysis unless otherwise mandated by regulatory agency
All analysis data reported was generated when the analytical methods were in statistical control and criteria for spike recoveries, reference material recoveries, method blanks data and duplicate precision were met unless otherwise stated

Reporting results to two significant figures at the RDL is to permit statistical evaluation and is not intended to be an indication of analytical precision.

Methods used by Maxxam are based upon those found in 'Standard Methods for the Examination of Water and Wastewater', 22nd Edition, published by the American Public Health Association, or on US EPA, protocols found in the ' Test Methods for Evaluating Solid Waste, Physical/Chemical Method, SW846, 3rd Edition. Other procedures are based on the methodologies accepted by the appropriate regulatory agency. Methodology briefs are available by written request.

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies, quality assurance and quality control procedures except where otherwise agreed to by the client and testing company in writing. Liability for any and all use of these test results shall be limited to the actual cost of the pertinent analysis done. There is no other warranty expressed or implied. Your samples will be retained at Maxxam for a period of 60 days from receipt of data or as per contract.

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

(1) This test was performed by Maxxam Edmonton Petroleum

Your C.O.C. #: A078666

Attention: JESSICA LEE

TIAMAT ENVIRONMENTAL CONSULTANTS
Unit #107,
2719-7 Avenue NE
CALGARY, AB
CANADA T2A 2L9

Report Date: 2013/08/13

CERTIFICATE OF ANALYSIS

Encryption Key

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

Kayla Brassard, Project Manager
Email: KBrassard@maxxam.ca
Phone# (403) 735-2258

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

Total cover pages: 3

TIAMAT ENVIRONMENTAL CONSULTANTS

Maxxam Job #: B367706
Report Date: 2013/08/13

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		HC4978			HC4979		
Sampling Date		2013/08/04 17:00			2013/08/04 17:00		
COC Number		A078666			A078666		
	UNITS	**MW-01 (RDM)**	**RDL**	**QC Batch**	**MW-02 (N)-RDM**	**RDL**	**QC Batch**
Calculated Parameters							
Anion Sum	meq/L	24	N/A	7048349	12	N/A	7048349
Cation Sum	meq/L	25	N/A	7048349	12	N/A	7048349
Hardness (CaCO3)	mg/L	840	0.50	7048347	540	0.50	7048347
Ion Balance	N/A	1.1	0.010	7048348	1.0	0.010	7048348
Dissolved Nitrate (NO3)	mg/L	0.085	0.013	7048350	0.057	0.013	7048350
Nitrate plus Nitrite (N)	mg/L	0.019	0.0030	7048351	<0.015	0.015	7048351
Dissolved Nitrite (NO2)	mg/L	<0.0099	0.0099	7048350	<0.049	0.049	7048350
Total Dissolved Solids	mg/L	1300	10	7048352	590	10	7048352
Demand Parameters							
Biochemical Oxygen Demand	mg/L	11	2.0	7051569	2.0	2.0	7051569
Total Chemical Oxygen Demand	mg/L	350	5.0	7068140	16	5.0	7068140
Misc. Inorganics							
Conductivity	uS/cm	2400	1.0	7051034	1100	1.0	7051034
pH	N/A	7.20	N/A	7051035	7.51	N/A	7051035
Total Organic Carbon (C)	mg/L	10	0.50	7064388	3.5	0.50	7064388
Low Level Elements							
Dissolved Cadmium (Cd)	ug/L	0.037	0.0050	7048345	0.025	0.0050	7048345
Total Cadmium (Cd)	ug/L	3.4	0.0050	7049781	0.025	0.0050	7049781
Anions							
Alkalinity (PP as CaCO3)	mg/L	<0.50	0.50	7051032	<0.50	0.50	7051032
Alkalinity (Total as CaCO3)	mg/L	570	0.50	7051032	490	0.50	7051032
Bicarbonate (HCO3)	mg/L	700	0.50	7051032	600	0.50	7051032
Carbonate (CO3)	mg/L	<0.50	0.50	7051032	<0.50	0.50	7051032
Hydroxide (OH)	mg/L	<0.50	0.50	7051032	<0.50	0.50	7051032
Dissolved Sulphate (SO4)	mg/L	100	1.0	7065319	48	1.0	7065319
Dissolved Chloride (Cl)	mg/L	360 (1)	5.0	7065318	36	1.0	7065318
Nutrients							
Total Ammonia (N)	mg/L	9.0 (1)	0.50	7053981	0.10	0.050	7056132
Total Nitrogen (N)	mg/L	12	0.050	7050600	0.26	0.050	7050600
Total Phosphorus (P)	mg/L	4.6 (1)	0.15	7058811	0.015	0.0030	7058811
Total Total Kjeldahl Nitrogen	mg/L	12 (2)	0.50	7057741	0.25	0.050	7057741

RDL = Reportable Detection Limit
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly

TIAMAT ENVIRONMENTAL CONSULTANTS

Maxxam Job #: B367706
Report Date: 2013/08/13

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		HC4978			HC4979		
Sampling Date		2013/08/04 17:00			2013/08/04 17:00		
COC Number		A078666			A078666		
	UNITS	**MW-01 (RDM)**	**RDL**	**QC Batch**	**MW-02 (N)-RDM**	**RDL**	**QC Batch**
Dissolved Nitrite (N)	mg/L	<0.0030	0.0030	7051380	<0.015 (1)	0.015	7051380
Dissolved Nitrate (N)	mg/L	0.019	0.0030	7051380	0.013	0.0030	7051380
Organic Acids							
Acetic Acid	mg/L	<50	50	7049414	<50	50	7049414
Formic Acid	mg/L	<50	50	7049414	<50	50	7049414
Propionic Acid	mg/L	<50	50	7049414	<50	50	7049414
Misc. Organics							
Adsorbable Organic halogen	mg/L	0.29	0.02	7029167	0.016	0.004	7029167

RDL = Reportable Detection Limit
(1) Detection limits raised due to matrix interference.

TIAMAT ENVIRONMENTAL CONSULTANTS

Maxxam Job #: B367706
Report Date: 2013/08/13

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		HC4978	HC4979		
Sampling Date		2013/08/04 17:00	2013/08/04 17:00		
COC Number		A078666	A078666		
	UNITS	**MW-01 (RDM)**	**MW-02 (N)-RDM**	**RDL**	**QC Batch**
Hydrocarbons					
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	0.10	7057596
Surrogate Recovery (%)					
O-TERPHENYL (sur.)	%	92	91		7057596

RDL = Reportable Detection Limit

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		HC4978		HC4979		
Sampling Date		2013/08/04 17:00		2013/08/04 17:00		
COC Number		A078666		A078666		
	UNITS	**MW-01 (RDM)**	**RDL**	**MW-02 (N)-RDM**	**RDL**	**QC Batch**
Elements						
Dissolved Aluminum (Al)	mg/L	0.017	0.0030	0.011	0.0030	7060719
Total Aluminum (Al)	mg/L	34	0.0030	0.29	0.0030	7060434
Dissolved Antimony (Sb)	mg/L	<0.00060	0.00060	<0.00060	0.00060	7060719
Total Antimony (Sb)	mg/L	0.0017	0.00060	<0.00060	0.00060	7060434
Dissolved Arsenic (As)	mg/L	0.023	0.00020	<0.00020	0.00020	7060719
Total Arsenic (As)	mg/L	0.085	0.00020	0.00072	0.00020	7060434
Dissolved Barium (Ba)	mg/L	0.68	0.010	0.13	0.010	7060828
Total Barium (Ba)	mg/L	1.8	0.010	0.15	0.010	7060449
Dissolved Beryllium (Be)	mg/L	<0.0010	0.0010	<0.0010	0.0010	7060719
Total Beryllium (Be)	mg/L	0.0024	0.0010	<0.0010	0.0010	7060434
Dissolved Boron (B)	mg/L	0.074	0.020	0.063	0.020	7060828
Total Boron (B)	mg/L	0.11	0.020	0.065	0.020	7060449
Dissolved Calcium (Ca)	mg/L	160	0.30	140	0.30	7060828
Total Calcium (Ca)	mg/L	330	0.30	150	0.30	7060449
Dissolved Chromium (Cr)	mg/L	<0.0010	0.0010	<0.0010	0.0010	7060719
Total Chromium (Cr)	mg/L	0.11	0.0010	<0.0010	0.0010	7060434
Dissolved Cobalt (Co)	mg/L	0.012	0.00030	0.0017	0.00030	7060719
Total Cobalt (Co)	mg/L	0.078	0.00030	0.0022	0.00030	7060434
Dissolved Copper (Cu)	mg/L	0.00078	0.00020	0.0020	0.00020	7060719
Total Copper (Cu)	mg/L	0.16	0.00020	0.0023	0.00020	7060434
Dissolved Iron (Fe)	mg/L	27	0.060	0.11	0.060	7060828
Total Iron (Fe)	mg/L	180	0.060	0.98	0.060	7060449
Dissolved Lead (Pb)	mg/L	<0.00020	0.00020	<0.00020	0.00020	7060719
Total Lead (Pb)	mg/L	0.10	0.00020	0.00057	0.00020	7060434
Dissolved Lithium (Li)	mg/L	0.051	0.020	0.049	0.020	7060828
Total Lithium (Li)	mg/L	0.12	0.020	0.051	0.020	7060449
Dissolved Magnesium (Mg)	mg/L	110	0.20	49	0.20	7060828
Total Magnesium (Mg)	mg/L	170	0.20	52	0.20	7060449
Dissolved Manganese (Mn)	mg/L	1.9	0.0040	1.8	0.0040	7060828
Total Manganese (Mn)	mg/L	5.6	0.0040	1.8	0.0040	7060449
Dissolved Molybdenum (Mo)	mg/L	0.0015	0.00020	0.00026	0.00020	7060719
Total Molybdenum (Mo)	mg/L	0.0071	0.00020	0.00034	0.00020	7060434

RDL = Reportable Detection Limit

TIAMAT ENVIRONMENTAL CONSULTANTS

Maxxam Job #: B367706
Report Date: 2013/08/13

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		HC4978		HC4979		
Sampling Date		2013/08/04 17:00		2013/08/04 17:00		
COC Number		A078666		A078666		
	UNITS	**MW-01 (RDM)**	**RDL**	**MW-02 (N)-RDM**	**RDL**	**QC Batch**
Dissolved Nickel (Ni)	mg/L	0.022	0.00050	0.0020	0.00050	7060719
Total Nickel (Ni)	mg/L	0.20	0.00050	0.0034	0.00050	7060434
Dissolved Phosphorus (P)	mg/L	<0.10	0.10	<0.10	0.10	7060828
Total Phosphorus (P)	mg/L	3.4	0.10	<0.10	0.10	7060449
Dissolved Potassium (K)	mg/L	14	0.30	6.6	0.30	7060828
Total Potassium (K)	mg/L	22	0.30	6.6	0.30	7060449
Dissolved Selenium (Se)	mg/L	<0.00020	0.00020	<0.00020	0.00020	7060719
Total Selenium (Se)	mg/L	0.0026	0.00020	<0.00020	0.00020	7060434
Dissolved Silicon (Si)	mg/L	15	0.10	9.1	0.10	7060828
Total Silicon (Si)	mg/L	100 (1)	0.50	9.9	0.10	7060449
Dissolved Silver (Ag)	mg/L	<0.00010	0.00010	<0.00010	0.00010	7060719
Total Silver (Ag)	mg/L	0.00058	0.00010	<0.00010	0.00010	7060434
Dissolved Sodium (Na)	mg/L	140	0.50	17 (2)	0.50	7060828
Total Sodium (Na)	mg/L	140	0.50	16	0.50	7060449
Dissolved Strontium (Sr)	mg/L	1.6	0.020	0.98 (2)	0.020	7060828
Total Strontium (Sr)	mg/L	1.8	0.020	0.97	0.020	7060449
Dissolved Sulphur (S)	mg/L	32	0.20	15	0.20	7060828
Total Sulphur (S)	mg/L	32	0.20	15	0.20	7060449
Dissolved Thallium (Tl)	mg/L	<0.00020	0.00020	<0.00020	0.00020	7060719
Total Thallium (Tl)	mg/L	0.00097	0.00020	<0.00020	0.00020	7060434
Dissolved Tin (Sn)	mg/L	<0.0010	0.0010	<0.0010	0.0010	7060719
Total Tin (Sn)	mg/L	0.0029	0.0010	<0.0010	0.0010	7060434
Dissolved Titanium (Ti)	mg/L	<0.0010	0.0010	<0.0010	0.0010	7060719
Total Titanium (Ti)	mg/L	0.71	0.0010	0.015	0.0010	7060434
Dissolved Uranium (U)	mg/L	0.0011	0.00010	0.0092	0.00010	7060719
Total Uranium (U)	mg/L	0.0060	0.00010	0.0097	0.00010	7060434
Dissolved Vanadium (V)	mg/L	<0.0010	0.0010	<0.0010	0.0010	7060719
Total Vanadium (V)	mg/L	0.17	0.0010	0.0015	0.0010	7060434
Dissolved Zinc (Zn)	mg/L	0.0067	0.0030	0.0062	0.0030	7060719
Total Zinc (Zn)	mg/L	0.41	0.0030	0.0097	0.0030	7060434

RDL = Reportable Detection Limit
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Dissolved greater than total. Results within acceptable limits of precision.

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		HC4978	HC4979		
Sampling Date		2013/08/04 17:00	2013/08/04 17:00		
COC Number		A078666	A078666		
	UNITS	**MW-01 (RDM)**	**MW-02 (N)-RDM**	**RDL**	**QC Batch**
Volatiles					
Total Trihalomethanes	ug/L	<2.0	<2.0	2.0	7049207
Bromodichloromethane	ug/L	<0.50	<0.50	0.50	7054234
Bromoform	ug/L	<0.50	<0.50	0.50	7054234
Bromomethane	ug/L	<2.0	<2.0	2.0	7054234
Carbon tetrachloride	ug/L	<0.50	<0.50	0.50	7054234
Chlorobenzene	ug/L	<0.50	<0.50	0.50	7054234
Chlorodibromomethane	ug/L	<1.0	<1.0	1.0	7054234
Chloroethane	ug/L	<1.0	<1.0	1.0	7054234
Chloroform	ug/L	<0.50	<0.50	0.50	7054234
Chloromethane	ug/L	<2.0	<2.0	2.0	7054234
1,2-dibromoethane	ug/L	<0.50	<0.50	0.50	7054234
1,2-dichlorobenzene	ug/L	<0.50	<0.50	0.50	7054234
1,3-dichlorobenzene	ug/L	<0.50	<0.50	0.50	7054234
1,4-dichlorobenzene	ug/L	<0.50	<0.50	0.50	7054234
1,1-dichloroethane	ug/L	<0.50	<0.50	0.50	7054234
1,2-dichloroethane	ug/L	<0.50	<0.50	0.50	7054234
1,1-dichloroethene	ug/L	<0.50	<0.50	0.50	7054234
cis-1,2-dichloroethene	ug/L	33	<0.50	0.50	7054234
trans-1,2-dichloroethene	ug/L	3.4	<0.50	0.50	7054234
Dichloromethane	ug/L	<2.0	<2.0	2.0	7054234
1,2-dichloropropane	ug/L	<0.50	<0.50	0.50	7054234
cis-1,3-dichloropropene	ug/L	<0.50	<0.50	0.50	7054234
trans-1,3-dichloropropene	ug/L	<0.50	<0.50	0.50	7054234
Methyl methacrylate	ug/L	<0.50	<0.50	0.50	7054234
Methyl-tert-butylether (MTBE)	ug/L	<0.50	<0.50	0.50	7054234
Styrene	ug/L	<0.50	<0.50	0.50	7054234
1,1,1,2-tetrachloroethane	ug/L	<2.0	<2.0	2.0	7054234
1,1,2,2-tetrachloroethane	ug/L	<2.0	<2.0	2.0	7054234
Tetrachloroethene	ug/L	<0.50	<0.50	0.50	7054234
1,2,3-trichlorobenzene	ug/L	<1.0	<1.0	1.0	7054234
1,2,4-trichlorobenzene	ug/L	<1.0	<1.0	1.0	7054234
1,3,5-trichlorobenzene	ug/L	<0.50	<0.50	0.50	7054234

RDL = Reportable Detection Limit

TIAMAT ENVIRONMENTAL CONSULTANTS

Maxxam Job #: B367706
Report Date: 2013/08/13

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		HC4978	HC4979		
Sampling Date		2013/08/04 17:00	2013/08/04 17:00		
COC Number		A078666	A078666		
	UNITS	**MW-01 (RDM)**	**MW-02 (N)-RDM**	**RDL**	**QC Batch**
1,1,1-trichloroethane	ug/L	<0.50	<0.50	0.50	7054234
1,1,2-trichloroethane	ug/L	<0.50	<0.50	0.50	7054234
Trichloroethene	ug/L	<0.50	<0.50	0.50	7054234
Trichlorofluoromethane	ug/L	<0.50	<0.50	0.50	7054234
1,2,4-trimethylbenzene	ug/L	4.0	<0.50	0.50	7054234
1,3,5-trimethylbenzene	ug/L	1.8	<0.50	0.50	7054234
Vinyl chloride	ug/L	3.0	<0.50	0.50	7054234
Surrogate Recovery (%)					
1,4-Difluorobenzene (sur.)	%	103	100		7054234
4-BROMOFLUOROBENZENE (sur.)	%	93	98		7054234
D4-1,2-DICHLOROETHANE (sur.)	%	104	99		7054234

RDL = Reportable Detection Limit

TIAMAT ENVIRONMENTAL CONSULTANTS

Maxxam Job #: B367706
Report Date: 2013/08/13

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		HC4978	HC4979		
Sampling Date		2013/08/04 17:00	2013/08/04 17:00		
COC Number		A078666	A078666		
	UNITS	**MW-01 (RDM)**	**MW-02 (N)-RDM**	**RDL**	**QC Batch**
Volatiles					
Benzene	ug/L	1.5	<0.40	0.40	7058506
Toluene	ug/L	<0.40	<0.40	0.40	7058506
Ethylbenzene	ug/L	<0.40	<0.40	0.40	7058506
m & p-Xylene	ug/L	1.2	<0.80	0.80	7058506
o-Xylene	ug/L	0.58	<0.40	0.40	7058506
Xylenes (Total)	ug/L	1.8	<0.80	0.80	7058506
F1 (C6-C10) - BTEX	ug/L	<100	<100	100	7058506
(C6-C10)	ug/L	<100	<100	100	7058506
Surrogate Recovery (%)					
1,4-Difluorobenzene (sur.)	%	112	107		7058506
4-BROMOFLUOROBENZENE (sur.)	%	105	108		7058506
D4-1,2-DICHLOROETHANE (sur.)	%	105	103		7058506

RDL = Reportable Detection Limit

Package 1	3.7°C
Package 2	2.0°C

Each temperature is the average of up to three cooler temperatures taken at receipt

RESULTS OF CHEMICAL ANALYSES OF WATER Comments

Sample HC4978-02 Acetic Acid, Formic Acid, Propionic Acid: Detection limits raised due to sample matrix.

Sample HC4979-02 Acetic Acid, Formic Acid, Propionic Acid: Detection limits raised due to sample matrix.

Results relate only to the items tested.

TIAMAT ENVIRONMENTAL CONSULTANTS
Attention: JESSICA LEE
Client Project #:
P.O. #:
Site Location:

Quality Assurance Report

Maxxam Job Number: CB367706

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits
7029167	MN2	QC Standard	Adsorbable Organic halogen	2013/08/09		86	%	84 - 111
		Method Blank	Adsorbable Organic halogen	2013/08/09	<0.5		mg/L	
7049414	FM0	Matrix Spike	Acetic Acid	2013/08/08		103	%	70 - 130
			Formic Acid	2013/08/08		112	%	70 - 130
			Propionic Acid	2013/08/08		91	%	70 - 130
		Spiked Blank	Acetic Acid	2013/08/08		117	%	70 - 130
			Formic Acid	2013/08/08		109	%	70 - 130
			Propionic Acid	2013/08/08		104	%	70 - 130
		Method Blank	Acetic Acid	2013/08/08	<0.50		mg/L	
			Formic Acid	2013/08/08	<0.50		mg/L	
			Propionic Acid	2013/08/08	<0.50		mg/L	
		RPD	Acetic Acid	2013/08/08	NC		%	40
			Formic Acid	2013/08/08	NC		%	40
			Propionic Acid	2013/08/08	NC		%	40
7051032	FT2	Spiked Blank	Alkalinity (Total as CaCO3)	2013/08/06		93	%	80 - 120
		Method Blank	Alkalinity (PP as CaCO3)	2013/08/06	<0.50		mg/L	
			Alkalinity (Total as CaCO3)	2013/08/06	<0.50		mg/L	
			Bicarbonate (HCO3)	2013/08/06	<0.50		mg/L	
			Carbonate (CO3)	2013/08/06	<0.50		mg/L	
			Hydroxide (OH)	2013/08/06	<0.50		mg/L	
		RPD	Alkalinity (PP as CaCO3)	2013/08/06	NC		%	20
			Alkalinity (Total as CaCO3)	2013/08/06	1.3		%	20
			Bicarbonate (HCO3)	2013/08/06	1.3		%	20
			Carbonate (CO3)	2013/08/06	NC		%	20
			Hydroxide (OH)	2013/08/06	NC		%	20
7051034	FT2	Spiked Blank	Conductivity	2013/08/06		100	%	90 - 110
		Method Blank	Conductivity	2013/08/06	<1.0		uS/cm	
		RPD	Conductivity	2013/08/06	1.8		%	20
7051035	FT2	Spiked Blank	pH	2013/08/06		100	%	97 - 102
		RPD	pH	2013/08/06	1.3		%	5
7051380	DA4	Matrix Spike	Dissolved Nitrite (N)	2013/08/06		NC	%	80 - 120
			Dissolved Nitrate (N)	2013/08/06		NC	%	80 - 120
		Spiked Blank	Dissolved Nitrite (N)	2013/08/06		102	%	90 - 110
			Dissolved Nitrate (N)	2013/08/06		102	%	90 - 110
		Method Blank	Dissolved Nitrite (N)	2013/08/06	<0.0030		mg/L	
			Dissolved Nitrate (N)	2013/08/06	<0.0030		mg/L	
		RPD	Dissolved Nitrite (N)	2013/08/06	1.1		%	20
			Dissolved Nitrate (N)	2013/08/06	0.6		%	20
7051569	LS0	Spiked Blank	Biochemical Oxygen Demand	2013/08/11		88	%	85 - 115
		Method Blank	Biochemical Oxygen Demand	2013/08/11	<2.0		mg/L	
		RPD	Biochemical Oxygen Demand	2013/08/11	10.2		%	20
7053981	IA0	Matrix Spike	Total Ammonia (N)	2013/08/07		101 (1)	%	80 - 120
		Spiked Blank	Total Ammonia (N)	2013/08/07		99	%	80 - 120
		Method Blank	Total Ammonia (N)	2013/08/07	<0.050		mg/L	
		RPD	Total Ammonia (N)	2013/08/07	NC		%	20
7054234	MJ0	Matrix Spike	1,4-Difluorobenzene (sur.)	2013/08/07		114	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2013/08/07		110	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2013/08/07		123	%	70 - 130
			Bromodichloromethane	2013/08/07		98	%	70 - 130
			Bromoform	2013/08/07		97	%	70 - 130
			Bromomethane	2013/08/07		82	%	70 - 130
			Carbon tetrachloride	2013/08/07		102	%	70 - 130
			Chlorobenzene	2013/08/07		89	%	70 - 130
			Chlorodibromomethane	2013/08/07		93	%	70 - 130
			Chloroethane	2013/08/07		83	%	70 - 130

TIAMAT ENVIRONMENTAL CONSULTANTS
Attention: JESSICA LEE
Client Project #:
P.O. #:
Site Location:

Quality Assurance Report (Continued)

Maxxam Job Number: CB367706

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits
7054234	MJ0	Matrix Spike	Chloroform	2013/08/07		95	%	70 - 130
			Chloromethane	2013/08/07		79	%	70 - 130
			1,2-dibromoethane	2013/08/07		90	%	70 - 130
			1,2-dichlorobenzene	2013/08/07		87	%	70 - 130
			1,3-dichlorobenzene	2013/08/07		85	%	70 - 130
			1,4-dichlorobenzene	2013/08/07		85	%	70 - 130
			1,1-dichloroethane	2013/08/07		92	%	70 - 130
			1,2-dichloroethane	2013/08/07		96	%	70 - 130
			1,1-dichloroethene	2013/08/07		96	%	70 - 130
			cis-1,2-dichloroethene	2013/08/07		93	%	70 - 130
			trans-1,2-dichloroethene	2013/08/07		92	%	70 - 130
			Dichloromethane	2013/08/07		92	%	70 - 130
			1,2-dichloropropane	2013/08/07		94	%	70 - 130
			cis-1,3-dichloropropene	2013/08/07		95	%	70 - 130
			trans-1,3-dichloropropene	2013/08/07		95	%	70 - 130
			Methyl methacrylate	2013/08/07		98	%	70 - 130
			Methyl-tert-butylether (MTBE)	2013/08/07		87	%	70 - 130
			Styrene	2013/08/07		97	%	70 - 130
			1,1,1,2-tetrachloroethane	2013/08/07		94	%	70 - 130
			1,1,2,2-tetrachloroethane	2013/08/07		87	%	70 - 130
			Tetrachloroethene	2013/08/07		95	%	70 - 130
			1,2,3-trichlorobenzene	2013/08/07		96	%	70 - 130
			1,2,4-trichlorobenzene	2013/08/07		96	%	70 - 130
			1,3,5-trichlorobenzene	2013/08/07		96	%	70 - 130
			1,1,1-trichloroethane	2013/08/07		95	%	70 - 130
			1,1,2-trichloroethane	2013/08/07		97	%	70 - 130
			Trichloroethene	2013/08/07		92	%	70 - 130
			Trichlorofluoromethane	2013/08/07		87	%	70 - 130
			1,2,4-trimethylbenzene	2013/08/07		97	%	70 - 130
			1,3,5-trimethylbenzene	2013/08/07		99	%	70 - 130
			Vinyl chloride	2013/08/07		71	%	70 - 130
		Spiked Blank	1,4-Difluorobenzene (sur.)	2013/08/07		115	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2013/08/07		106	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2013/08/07		111	%	70 - 130
			Bromodichloromethane	2013/08/07		103	%	70 - 130
			Bromoform	2013/08/07		104	%	70 - 130
			Bromomethane	2013/08/07		87	%	70 - 130
			Carbon tetrachloride	2013/08/07		106	%	70 - 130
			Chlorobenzene	2013/08/07		93	%	70 - 130
			Chlorodibromomethane	2013/08/07		99	%	70 - 130
			Chloroethane	2013/08/07		86	%	70 - 130
			Chloroform	2013/08/07		99	%	70 - 130
			Chloromethane	2013/08/07		83	%	70 - 130
			1,2-dibromoethane	2013/08/07		95	%	70 - 130
			1,2-dichlorobenzene	2013/08/07		90	%	70 - 130
			1,3-dichlorobenzene	2013/08/07		87	%	70 - 130
			1,4-dichlorobenzene	2013/08/07		89	%	70 - 130
			1,1-dichloroethane	2013/08/07		96	%	70 - 130
			1,2-dichloroethane	2013/08/07		101	%	70 - 130
			1,1-dichloroethene	2013/08/07		98	%	70 - 130
			cis-1,2-dichloroethene	2013/08/07		97	%	70 - 130
			trans-1,2-dichloroethene	2013/08/07		96	%	70 - 130
			Dichloromethane	2013/08/07		97	%	70 - 130
			1,2-dichloropropane	2013/08/07		98	%	70 - 130
			cis-1,3-dichloropropene	2013/08/07		100	%	70 - 130

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7054234	MJ0	Spiked Blank	trans-1,3-dichloropropene	2013/08/07		96	%	70 - 130
			Methyl methacrylate	2013/08/07		106	%	70 - 130
			Methyl-tert-butylether (MTBE)	2013/08/07		92	%	70 - 130
			Styrene	2013/08/07		101	%	70 - 130
			1,1,1,2-tetrachloroethane	2013/08/07		98	%	70 - 130
			1,1,2,2-tetrachloroethane	2013/08/07		92	%	70 - 130
			Tetrachloroethene	2013/08/07		98	%	70 - 130
			1,2,3-trichlorobenzene	2013/08/07		99	%	70 - 130
			1,2,4-trichlorobenzene	2013/08/07		98	%	70 - 130
			1,3,5-trichlorobenzene	2013/08/07		99	%	70 - 130
			1,1,1-trichloroethane	2013/08/07		98	%	70 - 130
			1,1,2-trichloroethane	2013/08/07		102	%	70 - 130
			Trichloroethene	2013/08/07		94	%	70 - 130
			Trichlorofluoromethane	2013/08/07		90	%	70 - 130
			1,2,4-trimethylbenzene	2013/08/07		100	%	70 - 130
			1,3,5-trimethylbenzene	2013/08/07		101	%	70 - 130
			Vinyl chloride	2013/08/07		75	%	70 - 130
		Method Blank	1,4-Difluorobenzene (sur.)	2013/08/07		99	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2013/08/07		96	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2013/08/07		97	%	70 - 130
			Bromodichloromethane	2013/08/07	<0.50		ug/L	
			Bromoform	2013/08/07	<0.50		ug/L	
			Bromomethane	2013/08/07	<2.0		ug/L	
			Carbon tetrachloride	2013/08/07	<0.50		ug/L	
			Chlorobenzene	2013/08/07	<0.50		ug/L	
			Chlorodibromomethane	2013/08/07	<1.0		ug/L	
			Chloroethane	2013/08/07	<1.0		ug/L	
			Chloroform	2013/08/07	<0.50		ug/L	
			Chloromethane	2013/08/07	<2.0		ug/L	
			1,2-dibromoethane	2013/08/07	<0.50		ug/L	
			1,2-dichlorobenzene	2013/08/07	<0.50		ug/L	
			1,3-dichlorobenzene	2013/08/07	<0.50		ug/L	
			1,4-dichlorobenzene	2013/08/07	<0.50		ug/L	
			1,1-dichloroethane	2013/08/07	<0.50		ug/L	
			1,2-dichloroethane	2013/08/07	<0.50		ug/L	
			1,1-dichloroethene	2013/08/07	<0.50		ug/L	
			cis-1,2-dichloroethene	2013/08/07	<0.50		ug/L	
			trans-1,2-dichloroethene	2013/08/07	<0.50		ug/L	
			Dichloromethane	2013/08/07	<2.0		ug/L	
			1,2-dichloropropane	2013/08/07	<0.50		ug/L	
			cis-1,3-dichloropropene	2013/08/07	<0.50		ug/L	
			trans-1,3-dichloropropene	2013/08/07	<0.50		ug/L	
			Methyl methacrylate	2013/08/07	<0.50		ug/L	
			Methyl-tert-butylether (MTBE)	2013/08/07	<0.50		ug/L	
			Styrene	2013/08/07	<0.50		ug/L	
			1,1,1,2-tetrachloroethane	2013/08/07	<2.0		ug/L	
			1,1,2,2-tetrachloroethane	2013/08/07	<2.0		ug/L	
			Tetrachloroethene	2013/08/07	<0.50		ug/L	
			1,2,3-trichlorobenzene	2013/08/07	<1.0		ug/L	
			1,2,4-trichlorobenzene	2013/08/07	<1.0		ug/L	
			1,3,5-trichlorobenzene	2013/08/07	<0.50		ug/L	
			1,1,1-trichloroethane	2013/08/07	<0.50		ug/L	
			1,1,2-trichloroethane	2013/08/07	<0.50		ug/L	
			Trichloroethene	2013/08/07	<0.50		ug/L	
			Trichlorofluoromethane	2013/08/07	<0.50		ug/L	

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7054234	MJ0	Method Blank	1,2,4-trimethylbenzene	2013/08/07	<0.50		ug/L	
			1,3,5-trimethylbenzene	2013/08/07	<0.50		ug/L	
			Vinyl chloride	2013/08/07	<0.50		ug/L	
		RPD	1,2-dibromoethane	2013/08/07	NC		%	40
			1,2-dichloroethane	2013/08/07	0.4		%	40
7056132	SK9	Matrix Spike	Total Ammonia (N)	2013/08/07		93	%	80 - 120
		Spiked Blank	Total Ammonia (N)	2013/08/07		95	%	80 - 120
		Method Blank	Total Ammonia (N)	2013/08/07	<0.050		mg/L	
		RPD	Total Ammonia (N)	2013/08/07	NC		%	20
7057596	JP0	Matrix Spike						
		[HC4978-07]	O-TERPHENYL (sur.)	2013/08/09		102	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2013/08/09		113	%	50 - 130
		Spiked Blank	O-TERPHENYL (sur.)	2013/08/09		95	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2013/08/09		83	%	70 - 130
		Method Blank	O-TERPHENYL (sur.)	2013/08/09		96	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2013/08/09	<0.10		mg/L	
		RPD	F2 (C10-C16 Hydrocarbons)	2013/08/09	NC		%	40
7057741	SK9	Matrix Spike	Total Total Kjeldahl Nitrogen	2013/08/07		102	%	80 - 120
		QC Standard	Total Total Kjeldahl Nitrogen	2013/08/07		92	%	75 - 125
		Spiked Blank	Total Total Kjeldahl Nitrogen	2013/08/07		86	%	80 - 120
		Method Blank	Total Total Kjeldahl Nitrogen	2013/08/07	<0.050		mg/L	
		RPD	Total Total Kjeldahl Nitrogen	2013/08/07	2.2		%	20
7058506	WZ0	Matrix Spike	1,4-Difluorobenzene (sur.)	2013/08/08		110	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2013/08/08		101	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2013/08/08		106	%	70 - 130
			Benzene	2013/08/08		93	%	70 - 130
			Toluene	2013/08/08		102	%	70 - 130
			Ethylbenzene	2013/08/08		99	%	70 - 130
			m & p-Xylene	2013/08/08		100	%	70 - 130
			o-Xylene	2013/08/08		96	%	70 - 130
			(C6-C10)	2013/08/08		91	%	70 - 130
		Spiked Blank	1,4-Difluorobenzene (sur.)	2013/08/08		118	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2013/08/08		99	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2013/08/08		106	%	70 - 130
			Benzene	2013/08/08		76	%	70 - 130
			Toluene	2013/08/08		91	%	70 - 130
			Ethylbenzene	2013/08/08		82	%	70 - 130
			m & p-Xylene	2013/08/08		85	%	70 - 130
			o-Xylene	2013/08/08		78	%	70 - 130
			(C6-C10)	2013/08/08		95	%	70 - 130
		Method Blank	1,4-Difluorobenzene (sur.)	2013/08/08		118	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2013/08/08		101	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2013/08/08		104	%	70 - 130
			Benzene	2013/08/08	<0.40		ug/L	
			Toluene	2013/08/08	<0.40		ug/L	
			Ethylbenzene	2013/08/08	<0.40		ug/L	
			m & p-Xylene	2013/08/08	<0.80		ug/L	
			o-Xylene	2013/08/08	<0.40		ug/L	
			Xylenes (Total)	2013/08/08	<0.80		ug/L	
			F1 (C6-C10) - BTEX	2013/08/08	<100		ug/L	
			(C6-C10)	2013/08/08	<100		ug/L	
		RPD	Benzene	2013/08/08	NC		%	40
			Toluene	2013/08/08	NC		%	40
			Ethylbenzene	2013/08/08	NC		%	40
			m & p-Xylene	2013/08/08	NC		%	40

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7058506	WZ0	RPD	o-Xylene	2013/08/08	NC		%	40
			Xylenes (Total)	2013/08/08	NC		%	40
			F1 (C6-C10) - BTEX	2013/08/08	NC		%	40
			(C6-C10)	2013/08/08	NC		%	40
7058811	IA0	Matrix Spike	Total Phosphorus (P)	2013/08/08		108	%	80 - 120
		QC Standard	Total Phosphorus (P)	2013/08/08		96	%	80 - 120
		Spiked Blank	Total Phosphorus (P)	2013/08/08		102	%	83 - 111
		Method Blank	Total Phosphorus (P)	2013/08/08	<0.0030		mg/L	
		RPD	Total Phosphorus (P)	2013/08/08	0.6		%	20
7060434	TDB	Matrix Spike	Total Aluminum (Al)	2013/08/08		NC	%	80 - 120
			Total Antimony (Sb)	2013/08/08		108	%	80 - 120
			Total Arsenic (As)	2013/08/08		95	%	80 - 120
			Total Beryllium (Be)	2013/08/08		93	%	80 - 120
			Total Chromium (Cr)	2013/08/08		100	%	80 - 120
			Total Cobalt (Co)	2013/08/08		96	%	80 - 120
			Total Copper (Cu)	2013/08/08		94	%	80 - 120
			Total Lead (Pb)	2013/08/08		91	%	80 - 120
			Total Molybdenum (Mo)	2013/08/08		109	%	80 - 120
			Total Nickel (Ni)	2013/08/08		96	%	80 - 120
			Total Selenium (Se)	2013/08/08		81	%	80 - 120
			Total Silver (Ag)	2013/08/08		97	%	80 - 120
			Total Thallium (Tl)	2013/08/08		89	%	80 - 120
			Total Tin (Sn)	2013/08/08		102	%	80 - 120
			Total Titanium (Ti)	2013/08/08		106	%	80 - 120
			Total Uranium (U)	2013/08/08		97	%	80 - 120
			Total Vanadium (V)	2013/08/08		102	%	80 - 120
			Total Zinc (Zn)	2013/08/08		95	%	80 - 120
		Spiked Blank	Total Aluminum (Al)	2013/08/08		106	%	80 - 120
			Total Antimony (Sb)	2013/08/08		103	%	80 - 120
			Total Arsenic (As)	2013/08/08		97	%	80 - 120
			Total Beryllium (Be)	2013/08/08		99	%	80 - 120
			Total Chromium (Cr)	2013/08/08		104	%	80 - 120
			Total Cobalt (Co)	2013/08/08		100	%	80 - 120
			Total Copper (Cu)	2013/08/08		102	%	80 - 120
			Total Lead (Pb)	2013/08/08		96	%	80 - 120
			Total Molybdenum (Mo)	2013/08/08		101	%	80 - 120
			Total Nickel (Ni)	2013/08/08		101	%	80 - 120
			Total Selenium (Se)	2013/08/08		92	%	80 - 120
			Total Silver (Ag)	2013/08/08		100	%	80 - 120
			Total Thallium (Tl)	2013/08/08		95	%	80 - 120
			Total Tin (Sn)	2013/08/08		98	%	80 - 120
			Total Titanium (Ti)	2013/08/08		102	%	80 - 120
			Total Uranium (U)	2013/08/08		100	%	80 - 120
			Total Vanadium (V)	2013/08/08		102	%	80 - 120
			Total Zinc (Zn)	2013/08/08		101	%	80 - 120
		Method Blank	Total Aluminum (Al)	2013/08/08	<0.0030		mg/L	
			Total Antimony (Sb)	2013/08/08	<0.00060		mg/L	
			Total Arsenic (As)	2013/08/08	<0.00020		mg/L	
			Total Beryllium (Be)	2013/08/08	<0.0010		mg/L	
			Total Chromium (Cr)	2013/08/08	<0.0010		mg/L	
			Total Cobalt (Co)	2013/08/08	<0.00030		mg/L	
			Total Copper (Cu)	2013/08/08	<0.00020		mg/L	
			Total Lead (Pb)	2013/08/08	<0.00020		mg/L	
			Total Molybdenum (Mo)	2013/08/08	<0.00020		mg/L	
			Total Nickel (Ni)	2013/08/08	<0.00050		mg/L	

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7060434 TDB	Method Blank	Total Selenium (Se)	2013/08/08	<0.00020		mg/L	
		Total Silver (Ag)	2013/08/08	<0.00010		mg/L	
		Total Thallium (Tl)	2013/08/08	<0.00020		mg/L	
		Total Tin (Sn)	2013/08/08	<0.0010		mg/L	
		Total Titanium (Ti)	2013/08/08	<0.0010		mg/L	
		Total Uranium (U)	2013/08/08	<0.00010		mg/L	
		Total Vanadium (V)	2013/08/08	<0.0010		mg/L	
		Total Zinc (Zn)	2013/08/08	<0.0030		mg/L	
	RPD	Total Aluminum (Al)	2013/08/08	18.9		%	20
		Total Antimony (Sb)	2013/08/08	NC		%	20
		Total Arsenic (As)	2013/08/08	NC		%	20
		Total Beryllium (Be)	2013/08/08	NC		%	20
		Total Chromium (Cr)	2013/08/08	NC		%	20
		Total Cobalt (Co)	2013/08/08	NC		%	20
		Total Copper (Cu)	2013/08/08	9.5		%	20
		Total Lead (Pb)	2013/08/08	NC		%	20
		Total Molybdenum (Mo)	2013/08/08	0.8		%	20
		Total Nickel (Ni)	2013/08/08	NC		%	20
		Total Selenium (Se)	2013/08/08	NC		%	20
		Total Silver (Ag)	2013/08/08	NC		%	20
		Total Thallium (Tl)	2013/08/08	NC		%	20
		Total Tin (Sn)	2013/08/08	NC		%	20
		Total Titanium (Ti)	2013/08/08	16.4		%	20
		Total Uranium (U)	2013/08/08	NC		%	20
		Total Vanadium (V)	2013/08/08	NC		%	20
		Total Zinc (Zn)	2013/08/08	NC		%	20
7060449 YK1	Matrix Spike	Total Barium (Ba)	2013/08/08		97	%	80 - 120
		Total Boron (B)	2013/08/08		114	%	80 - 120
		Total Calcium (Ca)	2013/08/08		102	%	80 - 120
		Total Iron (Fe)	2013/08/08		106	%	80 - 120
		Total Lithium (Li)	2013/08/08		99	%	80 - 120
		Total Magnesium (Mg)	2013/08/08		102	%	80 - 120
		Total Manganese (Mn)	2013/08/08		101	%	80 - 120
		Total Phosphorus (P)	2013/08/08		100	%	80 - 120
		Total Potassium (K)	2013/08/08		101	%	80 - 120
		Total Silicon (Si)	2013/08/08		132 (2)	%	80 - 120
		Total Sodium (Na)	2013/08/08		NC	%	80 - 120
		Total Strontium (Sr)	2013/08/08		97	%	80 - 120
	Spiked Blank	Total Barium (Ba)	2013/08/08		92	%	80 - 120
		Total Boron (B)	2013/08/08		107	%	80 - 120
		Total Calcium (Ca)	2013/08/08		97	%	80 - 120
		Total Iron (Fe)	2013/08/08		94	%	80 - 120
		Total Lithium (Li)	2013/08/08		92	%	80 - 120
		Total Magnesium (Mg)	2013/08/08		96	%	80 - 120
		Total Manganese (Mn)	2013/08/08		96	%	80 - 120
		Total Phosphorus (P)	2013/08/08		93	%	80 - 120
		Total Potassium (K)	2013/08/08		92	%	80 - 120
		Total Silicon (Si)	2013/08/08		119	%	80 - 120
		Total Sodium (Na)	2013/08/08		97	%	80 - 120
		Total Strontium (Sr)	2013/08/08		92	%	80 - 120
	Method Blank	Total Barium (Ba)	2013/08/08	<0.010		mg/L	
		Total Boron (B)	2013/08/08	<0.020		mg/L	
		Total Calcium (Ca)	2013/08/08	<0.30		mg/L	
		Total Iron (Fe)	2013/08/08	<0.060		mg/L	
		Total Lithium (Li)	2013/08/08	<0.020		mg/L	

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7060449	YK1	Method Blank	Total Magnesium (Mg)	2013/08/08	<0.20		mg/L	
			Total Manganese (Mn)	2013/08/08	<0.0040		mg/L	
			Total Phosphorus (P)	2013/08/08	<0.10		mg/L	
			Total Potassium (K)	2013/08/08	<0.30		mg/L	
			Total Silicon (Si)	2013/08/08	<0.10		mg/L	
			Total Sodium (Na)	2013/08/08	<0.50		mg/L	
			Total Strontium (Sr)	2013/08/08	<0.020		mg/L	
			Total Sulphur (S)	2013/08/08	<0.20		mg/L	
		RPD	Total Barium (Ba)	2013/08/08	0.3		%	20
			Total Boron (B)	2013/08/08	0.7		%	20
			Total Calcium (Ca)	2013/08/08	0.8		%	20
			Total Iron (Fe)	2013/08/08	NC		%	20
			Total Lithium (Li)	2013/08/08	NC		%	20
			Total Magnesium (Mg)	2013/08/08	NC		%	20
			Total Manganese (Mn)	2013/08/08	NC		%	20
			Total Phosphorus (P)	2013/08/08	NC		%	20
			Total Potassium (K)	2013/08/08	NC		%	20
			Total Silicon (Si)	2013/08/08	0.2		%	20
			Total Sodium (Na)	2013/08/08	0.4		%	20
			Total Strontium (Sr)	2013/08/08	NC		%	20
			Total Sulphur (S)	2013/08/08	0.03		%	20
7060719	TDB	Matrix Spike	Dissolved Aluminum (Al)	2013/08/09		101	%	80 - 120
			Dissolved Antimony (Sb)	2013/08/09		88	%	80 - 120
			Dissolved Arsenic (As)	2013/08/09		101	%	80 - 120
			Dissolved Beryllium (Be)	2013/08/09		95	%	80 - 120
			Dissolved Chromium (Cr)	2013/08/09		95	%	80 - 120
			Dissolved Cobalt (Co)	2013/08/09		90	%	80 - 120
			Dissolved Copper (Cu)	2013/08/09		88	%	80 - 120
			Dissolved Lead (Pb)	2013/08/09		90	%	80 - 120
			Dissolved Molybdenum (Mo)	2013/08/09		104	%	80 - 120
			Dissolved Nickel (Ni)	2013/08/09		91	%	80 - 120
			Dissolved Selenium (Se)	2013/08/09		107	%	80 - 120
			Dissolved Silver (Ag)	2013/08/09		93	%	80 - 120
			Dissolved Thallium (Tl)	2013/08/09		92	%	80 - 120
			Dissolved Tin (Sn)	2013/08/09		93	%	80 - 120
			Dissolved Titanium (Ti)	2013/08/09		96	%	80 - 120
			Dissolved Uranium (U)	2013/08/09		100	%	80 - 120
			Dissolved Vanadium (V)	2013/08/09		98	%	80 - 120
			Dissolved Zinc (Zn)	2013/08/09		94	%	80 - 120
		Spiked Blank	Dissolved Aluminum (Al)	2013/08/09		99	%	80 - 120
			Dissolved Antimony (Sb)	2013/08/09		84	%	80 - 120
			Dissolved Arsenic (As)	2013/08/09		96	%	80 - 120
			Dissolved Beryllium (Be)	2013/08/09		96	%	80 - 120
			Dissolved Chromium (Cr)	2013/08/09		94	%	80 - 120
			Dissolved Cobalt (Co)	2013/08/09		92	%	80 - 120
			Dissolved Copper (Cu)	2013/08/09		96	%	80 - 120
			Dissolved Lead (Pb)	2013/08/09		93	%	80 - 120
			Dissolved Molybdenum (Mo)	2013/08/09		95	%	80 - 120
			Dissolved Nickel (Ni)	2013/08/09		96	%	80 - 120
			Dissolved Selenium (Se)	2013/08/09		97	%	80 - 120
			Dissolved Silver (Ag)	2013/08/09		88	%	80 - 120
			Dissolved Thallium (Tl)	2013/08/09		93	%	80 - 120
			Dissolved Tin (Sn)	2013/08/09		91	%	80 - 120
			Dissolved Titanium (Ti)	2013/08/09		94	%	80 - 120
			Dissolved Uranium (U)	2013/08/09		101	%	80 - 120

TIAMAT ENVIRONMENTAL CONSULTANTS
Attention: JESSICA LEE
Client Project #:
P.O. #:
Site Location:

Quality Assurance Report (Continued)

Maxxam Job Number: CB367706

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits
7060719	TDB	Spiked Blank	Dissolved Vanadium (V)	2013/08/09		95	%	80 - 120
			Dissolved Zinc (Zn)	2013/08/09		97	%	80 - 120
		Method Blank	Dissolved Aluminum (Al)	2013/08/09	<0.0030		mg/L	
			Dissolved Antimony (Sb)	2013/08/09	<0.00060		mg/L	
			Dissolved Arsenic (As)	2013/08/09	<0.00020		mg/L	
			Dissolved Beryllium (Be)	2013/08/09	<0.0010		mg/L	
			Dissolved Chromium (Cr)	2013/08/09	<0.0010		mg/L	
			Dissolved Cobalt (Co)	2013/08/09	<0.00030		mg/L	
			Dissolved Copper (Cu)	2013/08/09	<0.00020		mg/L	
			Dissolved Lead (Pb)	2013/08/09	<0.00020		mg/L	
			Dissolved Molybdenum (Mo)	2013/08/09	<0.00020		mg/L	
			Dissolved Nickel (Ni)	2013/08/09	<0.00050		mg/L	
			Dissolved Selenium (Se)	2013/08/09	<0.00020		mg/L	
			Dissolved Silver (Ag)	2013/08/09	<0.00010		mg/L	
			Dissolved Thallium (Tl)	2013/08/09	<0.00020		mg/L	
			Dissolved Tin (Sn)	2013/08/09	<0.0010		mg/L	
			Dissolved Titanium (Ti)	2013/08/09	<0.0010		mg/L	
			Dissolved Uranium (U)	2013/08/09	<0.00010		mg/L	
			Dissolved Vanadium (V)	2013/08/09	<0.0010		mg/L	
			Dissolved Zinc (Zn)	2013/08/09	<0.0030		mg/L	
		RPD	Dissolved Aluminum (Al)	2013/08/09	NC		%	20
			Dissolved Antimony (Sb)	2013/08/09	NC		%	20
			Dissolved Arsenic (As)	2013/08/09	NC		%	20
			Dissolved Beryllium (Be)	2013/08/09	NC		%	20
			Dissolved Chromium (Cr)	2013/08/09	NC		%	20
			Dissolved Cobalt (Co)	2013/08/09	NC		%	20
			Dissolved Copper (Cu)	2013/08/09	1.4		%	20
			Dissolved Lead (Pb)	2013/08/09	NC		%	20
			Dissolved Molybdenum (Mo)	2013/08/09	1.9		%	20
			Dissolved Nickel (Ni)	2013/08/09	NC		%	20
			Dissolved Selenium (Se)	2013/08/09	NC		%	20
			Dissolved Silver (Ag)	2013/08/09	NC		%	20
			Dissolved Thallium (Tl)	2013/08/09	NC		%	20
			Dissolved Tin (Sn)	2013/08/09	NC		%	20
			Dissolved Titanium (Ti)	2013/08/09	NC		%	20
			Dissolved Uranium (U)	2013/08/09	0.2		%	20
			Dissolved Vanadium (V)	2013/08/09	NC		%	20
			Dissolved Zinc (Zn)	2013/08/09	NC		%	20
7060828	STI	Matrix Spike	Dissolved Barium (Ba)	2013/08/09		100	%	80 - 120
			Dissolved Boron (B)	2013/08/09		103	%	80 - 120
			Dissolved Calcium (Ca)	2013/08/09		NC	%	80 - 120
			Dissolved Iron (Fe)	2013/08/09		NC	%	80 - 120
			Dissolved Lithium (Li)	2013/08/09		105	%	80 - 120
			Dissolved Magnesium (Mg)	2013/08/09		93	%	80 - 120
			Dissolved Manganese (Mn)	2013/08/09		NC	%	80 - 120
			Dissolved Phosphorus (P)	2013/08/09		99	%	80 - 120
			Dissolved Potassium (K)	2013/08/09		101	%	80 - 120
			Dissolved Silicon (Si)	2013/08/09		NC	%	80 - 120
			Dissolved Sodium (Na)	2013/08/09		NC	%	80 - 120
			Dissolved Strontium (Sr)	2013/08/09		97	%	80 - 120
		Spiked Blank	Dissolved Barium (Ba)	2013/08/09		105	%	80 - 120
			Dissolved Boron (B)	2013/08/09		107	%	80 - 120
			Dissolved Calcium (Ca)	2013/08/09		102	%	80 - 120
			Dissolved Iron (Fe)	2013/08/09		109	%	80 - 120
			Dissolved Lithium (Li)	2013/08/09		108	%	80 - 120

TIAMAT ENVIRONMENTAL CONSULTANTS
Attention: JESSICA LEE
Client Project #:
P.O. #:
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Quality Assurance Report (Continued)

Maxxam Job Number: CB367706

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits
7060828	STI	Spiked Blank	Dissolved Magnesium (Mg)	2013/08/09		99	%	80 - 120
			Dissolved Manganese (Mn)	2013/08/09		104	%	80 - 120
			Dissolved Phosphorus (P)	2013/08/09		102	%	80 - 120
			Dissolved Potassium (K)	2013/08/09		104	%	80 - 120
			Dissolved Silicon (Si)	2013/08/09		103	%	80 - 120
			Dissolved Sodium (Na)	2013/08/09		102	%	80 - 120
			Dissolved Strontium (Sr)	2013/08/09		105	%	80 - 120
		Method Blank	Dissolved Barium (Ba)	2013/08/09	<0.010		mg/L	
			Dissolved Boron (B)	2013/08/09	<0.020		mg/L	
			Dissolved Calcium (Ca)	2013/08/09	<0.30		mg/L	
			Dissolved Iron (Fe)	2013/08/09	<0.060		mg/L	
			Dissolved Lithium (Li)	2013/08/09	<0.020		mg/L	
			Dissolved Magnesium (Mg)	2013/08/09	<0.20		mg/L	
			Dissolved Manganese (Mn)	2013/08/09	<0.0040		mg/L	
			Dissolved Phosphorus (P)	2013/08/09	<0.10		mg/L	
			Dissolved Potassium (K)	2013/08/09	<0.30		mg/L	
			Dissolved Silicon (Si)	2013/08/09	<0.10		mg/L	
			Dissolved Sodium (Na)	2013/08/09	<0.50		mg/L	
			Dissolved Strontium (Sr)	2013/08/09	<0.020		mg/L	
			Dissolved Sulphur (S)	2013/08/09	<0.20		mg/L	
		RPD	Dissolved Barium (Ba)	2013/08/09	NC		%	20
			Dissolved Boron (B)	2013/08/09	1.9		%	20
			Dissolved Calcium (Ca)	2013/08/09	0.4		%	20
			Dissolved Iron (Fe)	2013/08/09	0.7		%	20
			Dissolved Lithium (Li)	2013/08/09	NC		%	20
			Dissolved Magnesium (Mg)	2013/08/09	0.7		%	20
			Dissolved Manganese (Mn)	2013/08/09	0.4		%	20
			Dissolved Phosphorus (P)	2013/08/09	NC		%	20
			Dissolved Potassium (K)	2013/08/09	0.8		%	20
			Dissolved Silicon (Si)	2013/08/09	0.3		%	20
			Dissolved Sodium (Na)	2013/08/09	0.4		%	20
			Dissolved Strontium (Sr)	2013/08/09	0.7		%	20
			Dissolved Sulphur (S)	2013/08/09	0.2		%	20
7064388	RW8	Matrix Spike	Total Organic Carbon (C)	2013/08/09		120	%	80 - 120
		Spiked Blank	Total Organic Carbon (C)	2013/08/09		113	%	80 - 120
		Method Blank	Total Organic Carbon (C)	2013/08/09	<0.50		mg/L	
		RPD	Total Organic Carbon (C)	2013/08/09	NC		%	20
7065318	ZI	Matrix Spike	Dissolved Chloride (Cl)	2013/08/09		111	%	80 - 120
		Spiked Blank	Dissolved Chloride (Cl)	2013/08/09		109	%	80 - 120
		Method Blank	Dissolved Chloride (Cl)	2013/08/09	<1.0		mg/L	
		RPD	Dissolved Chloride (Cl)	2013/08/09	NC		%	20
7065319	ZI	Matrix Spike	Dissolved Sulphate (SO4)	2013/08/09		NC	%	80 - 120
		Spiked Blank	Dissolved Sulphate (SO4)	2013/08/09		104	%	80 - 120
		Method Blank	Dissolved Sulphate (SO4)	2013/08/09	<1.0		mg/L	
		RPD	Dissolved Sulphate (SO4)	2013/08/09	1.3		%	20
7068140	TSJ	Matrix Spike	Total Chemical Oxygen Demand	2013/08/11		98	%	80 - 120
		Spiked Blank	Total Chemical Oxygen Demand	2013/08/11		99	%	80 - 120
		Method Blank	Total Chemical Oxygen Demand	2013/08/11	<5.0		mg/L	
		RPD	Total Chemical Oxygen Demand	2013/08/11	12.1		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.
Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

TIAMAT ENVIRONMENTAL CONSULTANTS
Attention: JESSICA LEE
Client Project #:
P.O. #:
Site Location:

Quality Assurance Report (Continued)

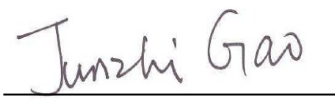
Maxxam Job Number: CB367706

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) Dissolved greater than total. Reanalysis yields similar results.
(2) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

Validation Signature Page

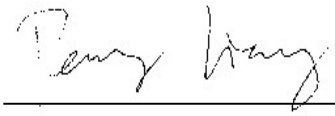
Maxxam Job #: B367706

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

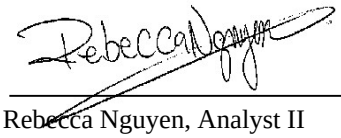


Janet Gao, Senior Analyst, Organics Department

Luba Shymushovska, Senior Analyst, Organic Department



Peng Liang, Analyst II



Rebecca Nguyen, Analyst II

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

Maxxam

Calgary: 4000 19st St. NE, T2E 6P8. Ph: (403) 291-3077, Fax: (403) 735-2240, Toll free: (800) 386-7247
Edmonton: 9331 - 48 Street, T6B 2R4. Ph: (780) 577-7100, Fax: (780) 450-4187, Toll free: (877) 465-8889
www.maxxamanalytics.com

Chain of Custody

A078666

Page: 1 of 1

	Invoice To: C/O Report Address ☐	Report To: Same as Invoice ☑	Report Distribution (E-Mail):
Company:			jessica@tranatgroup.ca
Contact:	~~JESSICA~~ JESSICA LEE		keling@tranatgroup.ca
Address:	107, 2719 7 AVE NE		
	Prov: AB PC: T2A 2L9	Prov: PC:	
Contact #s:	Ph: 403-860-9024 Cell: 403-903-6977	Ph: Cell:	

REGULATORY GUIDELINES:
☐ AT1
☐ CCME
☐ Regulated Drinking Water
☐ Other:

All samples are held for 60 calendar days after sample receipt, unless specified otherwise.

PO #:
Project # / Name:
Site Location:
Quote #:
Sampled By:

SERVICE REQUESTED: ☐ RUSH (Contact lab to reserve) Date Required: ☑ REGULAR (5 to 7 Days)

See reverse for package specifics

	Sample ID	Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00	SOIL: BTEX F1-F4	Sieve (75 micron)	Regulated Metals (CCME / AT1)	Salinity 4	Assessment ICP Metals	Basic Class II Landfill	WATER: ☐BTEX F1 ☑VOCs 8260	☐BTEX F1-F2 ☐BTEX F1-F4	☐ Routine Water ☐ Turb ☐ F	☐ TOC ☐ DOC	Regulated Metals (CCME/AT1) Total	Dissolved	Mercury	☐ Total ☐ Dissolved	Other Analysis: Chlorides, SO4,	NH4-N, P,	alkalinity, COD, BOD	Nitrates/Nitrites as N,	total N	pH/EC	ADX, volatile fatty	metals				HOLD - Do not Analyze	# of Containers Submitted
1	MW-01 (Convent Hill)		GW	AM							✓			✓	✓	✓			✓	✓	✓	✓	✓	✓	✓						
2	MW-02										✓	✓		✓	✓				✓	✓	✓	✓	✓	✓	✓						
3	MW-03										✓	✓		✓	✓				✓	✓	✓	✓	✓	✓	✓						
4	MW-01 (RDM)			PM							✓	✓		✓	✓	✓			✓	✓	✓	✓	✓	✓	✓						
5	MW-02 (N) - RDM										✓	✓		✓	✓	✓			✓	✓	✓	✓	✓	✓	✓						
6																														
7																														
8																														
9																														
10																														
11																														
12																														

(B367371)

Pls see instructions

6-Aug-13 07:40
B367706
JB0 INS-0066
FOR RDM Samples

Please indicate Filtered, Preserved or Both (F, P, F/P) → F F/P F/P

Relinquished By (Signature/Print):	Date (YY/MM/DD): 13/08/03	Time (24:00): 2040
Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):

Special Instructions: PLS NOTE THAT MORE WATER SAMPLES WILL BE SUBMITTED FOR MW-01 to MW-03 (CONVENT HILL) TOMORROW DUE TO SLOW WATER RECHARGE. PLS CONSERVE FOR ANALYSIS.

# of Jars Used & Not Submitted:

LAB USE ONLY

Received By:	Date:	Time:	Maxxam Job #:
Heather Akin	2013/08/06	0740	

Lab Comments:	Custody Seal	Temperature	Ice
	N	3,4,4 2,2,2	Y

155

SOIL VAPOUR REPORTS

Maxxam

Success Through Science®

Your Project #: 12-435
Your C.O.C. #: 18283

Attention: Leon T. Mah
Tiamat Environmental
107, 2719-7 Ave. NE
Calgary, AB
CANADA T2A 2L9

Report Date: 2013/08/25

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B3C8546
Received: 2013/08/07, 10:11

Sample Matrix: AIR
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
BTEX Fractionation in Air (TO-15mod)	2	N/A	2013/08/14	BRL SOP-00304	EPA TO-15mod
BTEX Fractionation in Air (TO-15mod)	1	N/A	2013/08/15	BRL SOP-00304	EPA TO-15mod
Canister Pressure (TO-15)	2	N/A	2013/08/14	BRL SOP-00304	EPA TO-15
Canister Pressure (TO-15)	1	N/A	2013/08/15	BRL SOP-00304	EPA TO-15
Light Hydrocarbons	3	N/A	2013/08/21	CAM SOP-00227	GC/FID
Matrix Gases	3	N/A	2013/08/22	CAM SOP-00225, CAM SOP-00209	ASTM D1946-90
Volatile Organics in Air (TO-15) (1)	2	N/A	2013/08/14	BRL SOP-00304	EPA TO-15
Volatile Organics in Air (TO-15) (1)	1	N/A	2013/08/15	BRL SOP-00304	EPA TO-15

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

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

Encryption Key

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

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

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section

Your Project #: 12-435
Your C.O.C. #: 18283

Attention: Leon T. Mah
Tiamat Environmental
107, 2719-7 Ave. NE
Calgary, AB
CANADA T2A 2L9

Report Date: 2013/08/25

CERTIFICATE OF ANALYSIS

5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Total cover pages: 2

Maxxam Job #: B3C8546
Report Date: 2013/08/25

Tiamat Environmental
Client Project #: 12-435

Sampler Initials: JAL

RESULTS OF ANALYSES OF AIR

Maxxam ID		SN8303			SN8304			SN8305		
Sampling Date		2013/08/02			2013/08/02			2013/08/02		
COC Number		18283			18283			18283		
	Units	**VW-01 (CONVENT HILL) / 1360**	**RDL**	**QC Batch**	**VW-01 (RDM) / 00291**	**RDL**	**QC Batch**	**VW-03 (RDM) / 1929**	**RDL**	**QC Batch**
Gas										
Acetylene	ppm	ND	0.21	3322553	ND	0.19	3322553	ND	0.34	3322553
Ethane	ppm	ND	0.21	3322553	1.1	0.19	3322553	ND	0.34	3322553
Ethylene	ppm	ND	0.21	3322553	0.67	0.19	3322553	ND	0.34	3322553
Methane	ppm	14	4.2	3322553				ND	6.8	3322553
n-Butane	ppm	ND	0.42	3322553	2.4	0.38	3322553	ND	0.68	3322553
n-Pentane	ppm	ND	0.21	3322553	14	0.19	3322553	ND	0.34	3322553
Propane	ppm	ND	0.21	3322553	0.34	0.19	3322553	ND	0.34	3322553
Propene	ppm	ND	0.21	3322553	0.22	0.19	3322553	ND	0.34	3322553
Propyne	ppm	ND	0.42	3322553	ND	0.38	3322553	ND	0.68	3322553
Volatile Organics										
Pressure on Receipt	psig	(-3.3)	N/A	3317031	(-1.4)	N/A	3320530	(-3.4)	N/A	3317031

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B3C8546
Report Date: 2013/08/25

Tiamat Environmental
Client Project #: 12-435

Sampler Initials: JAL

COMPRESSED GAS PARAMETERS (AIR)

Maxxam ID		SN8303	SN8304		SN8305		
Sampling Date		2013/08/02	2013/08/02		2013/08/02		
COC Number		18283	18283		18283		
	Units	**VW-01 (CONVENT HILL) / 1360**	**VW-01 (RDM) / 00291**	**RDL**	**VW-03 (RDM) / 1929**	**RDL**	**QC Batch**
Fixed Gases							
Oxygen	% v/v	8.9	8.4	0.2	19.8	0.3	3324319
Nitrogen	% v/v	81.9	52.5	0.2	78.3	0.3	3324319
Carbon Monoxide	% v/v	ND	ND	0.2	ND	0.3	3324319
Methane	% v/v	ND	26.0	0.2	ND	0.3	3324319
Carbon Dioxide	% v/v	9.1	13.1	0.2	1.9	0.3	3324319

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B3C8546
Report Date: 2013/08/25

Tiamat Environmental
Client Project #: 12-435

Sampler Initials: JAL

VOLATILE ORGANIC HYDROCARBONS BY GC/MS (AIR)

Maxxam ID		SN8303			SN8304			SN8305		
Sampling Date		2013/08/02			2013/08/02			2013/08/02		
COC Number		18283			18283			18283		
	Units	**VW-01 (CONVENT HILL) / 1360**	**RDL**	**QC Batch**	**VW-01 (RDM) / 00291**	**RDL**	**QC Batch**	**VW-03 (RDM) / 1929**	**RDL**	**QC Batch**
Volatile Organics										
Aliphatic >C5-C6	ug/m3	ND	5.5	3319686	53000	480	3320596	6.8	5.0	3319686
Aliphatic >C6-C8	ug/m3	18.7	5.5	3319686	88300	480	3320596	34.4	5.0	3319686
Aliphatic >C8-C10	ug/m3	57.4	5.5	3319686	ND	480	3320596	73.1	5.0	3319686
Aliphatic >C10-C12	ug/m3	92.1	5.5	3319686	664	480	3320596	202	5.0	3319686
Aliphatic >C12-C16	ug/m3	710	5.5	3319686	ND	480	3320596	105	5.0	3319686
Aromatic >C7-C8 (TEX Excluded)	ug/m3	ND	5.5	3319686	ND	480	3320596	ND	5.0	3319686
Aromatic >C8-C10	ug/m3	36.1	5.5	3319686	ND	480	3320596	30.9	5.0	3319686
Aromatic >C10-C12	ug/m3	44.5	5.5	3319686	ND	480	3320596	58.1	5.0	3319686
Aromatic >C12-C16	ug/m3	ND	5.5	3319686	ND	480	3320596	ND	5.0	3319686

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Maxxam Job #: B3C8546
Report Date: 2013/08/25

Tiamat Environmental
Client Project #: 12-435

Sampler Initials: JAL

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		SN8303				
Sampling Date		2013/08/02				
COC Number		18283				
	Units	**VW-01 (CONVENT HILL) / 1360**	**RDL**	**ug/m3**	**DL (ug/m3)**	**QC Batch**
Volatile Organics						
Dichlorodifluoromethane (FREON 12)	ppbv	0.92	0.22	4.53	1.09	3317067
1,2-Dichlorotetrafluoroethane	ppbv	<0.19	0.19	<1.31	1.31	3317067
Chloromethane	ppbv	0.76	0.33	1.56	0.681	3317067
Vinyl Chloride	ppbv	<0.20	0.20	<0.506	0.506	3317067
Chloroethane	ppbv	<0.33	0.33	<0.871	0.871	3317067
1,3-Butadiene	ppbv	<0.55	0.55	<1.22	1.22	3317067
Trichlorofluoromethane (FREON 11)	ppbv	0.22	0.22	1.26	1.24	3317067
Ethanol (ethyl alcohol)	ppbv	43.5	2.5	81.9	4.77	3317067
Trichlorotrifluoroethane	ppbv	<0.17	0.17	<1.26	1.26	3317067
2-propanol	ppbv	3.5	3.3	8.67	8.11	3317067
2-Propanone	ppbv	11.4	0.88	27.0	2.09	3317067
Methyl Ethyl Ketone (2-Butanone)	ppbv	3.7	3.3	10.9	9.73	3317067
Methyl Isobutyl Ketone	ppbv	<3.5	3.5	<14.4	14.4	3317067
Methyl Butyl Ketone (2-Hexanone)	ppbv	<2.2	2.2	<9.01	9.01	3317067
Methyl t-butyl ether (MTBE)	ppbv	<0.22	0.22	<0.793	0.793	3317067
Ethyl Acetate	ppbv	<2.4	2.4	<8.72	8.72	3317067
1,1-Dichloroethylene	ppbv	<0.28	0.28	<1.09	1.09	3317067
cis-1,2-Dichloroethylene	ppbv	<0.21	0.21	<0.829	0.829	3317067
trans-1,2-Dichloroethylene	ppbv	<0.22	0.22	<0.872	0.872	3317067
Methylene Chloride(Dichloromethane)	ppbv	1.33	0.88	4.61	3.06	3317067
Chloroform	ppbv	0.24	0.17	1.16	0.806	3317067
Carbon Tetrachloride	ppbv	<0.33	0.33	<2.08	2.08	3317067
1,1-Dichloroethane	ppbv	<0.22	0.22	<0.890	0.890	3317067
1,2-Dichloroethane	ppbv	<0.22	0.22	<0.890	0.890	3317067
Ethylene Dibromide	ppbv	<0.19	0.19	<1.44	1.44	3317067
1,1,1-Trichloroethane	ppbv	<0.33	0.33	<1.80	1.80	3317067
1,1,2-Trichloroethane	ppbv	<0.17	0.17	<0.900	0.900	3317067
1,1,2,2-Tetrachloroethane	ppbv	<0.22	0.22	<1.51	1.51	3317067
cis-1,3-Dichloropropene	ppbv	<0.20	0.20	<0.899	0.899	3317067
trans-1,3-Dichloropropene	ppbv	<0.19	0.19	<0.849	0.849	3317067
1,2-Dichloropropane	ppbv	<0.44	0.44	<2.03	2.03	3317067
Bromomethane	ppbv	<0.20	0.20	<0.769	0.769	3317067

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B3C8546
Report Date: 2013/08/25

Tiamat Environmental
Client Project #: 12-435

Sampler Initials: JAL

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		SN8303				
Sampling Date		2013/08/02				
COC Number		18283				
	Units	**VW-01 (CONVENT HILL) / 1360**	**RDL**	**ug/m3**	**DL (ug/m3)**	**QC Batch**
Bromoform	ppbv	<0.22	0.22	<2.27	2.27	3317067
Bromodichloromethane	ppbv	<0.22	0.22	<1.47	1.47	3317067
Dibromochloromethane	ppbv	<0.22	0.22	<1.87	1.87	3317067
Trichloroethylene	ppbv	0.88	0.33	4.72	1.77	3317067
Tetrachloroethylene	ppbv	<0.22	0.22	<1.49	1.49	3317067
Benzene	ppbv	1.21	0.20	3.88	0.633	3317067
Toluene	ppbv	5.40	0.22	20.3	0.828	3317067
Ethylbenzene	ppbv	1.19	0.22	5.17	0.955	3317067
p+m-Xylene	ppbv	4.25	0.41	18.5	1.77	3317067
o-Xylene	ppbv	1.73	0.22	7.51	0.955	3317067
Styrene	ppbv	0.45	0.22	1.91	0.937	3317067
4-ethyltoluene	ppbv	<2.4	2.4	<11.9	11.9	3317067
1,3,5-Trimethylbenzene	ppbv	<1.5	1.5	<7.32	7.32	3317067
1,2,4-Trimethylbenzene	ppbv	2.51	0.55	12.4	2.70	3317067
Chlorobenzene	ppbv	<0.22	0.22	<1.01	1.01	3317067
Benzyl chloride	ppbv	<1.1	1.1	<5.69	5.69	3317067
1,3-Dichlorobenzene	ppbv	<0.44	0.44	<2.65	2.65	3317067
1,4-Dichlorobenzene	ppbv	<0.44	0.44	<2.65	2.65	3317067
1,2-Dichlorobenzene	ppbv	<0.44	0.44	<2.65	2.65	3317067
1,2,4-Trichlorobenzene	ppbv	<2.2	2.2	<16.3	16.3	3317067
Hexachlorobutadiene	ppbv	<3.3	3.3	<35.2	35.2	3317067
Hexane	ppbv	1.34	0.33	4.73	1.16	3317067
Heptane	ppbv	0.45	0.33	1.84	1.35	3317067
Cyclohexane	ppbv	<0.22	0.22	<0.757	0.757	3317067
Tetrahydrofuran	ppbv	2.61	0.44	7.69	1.30	3317067
1,4-Dioxane	ppbv	<2.2	2.2	<7.93	7.93	3317067
Xylene (Total)	ppbv	5.98	0.66	26.0	2.87	3317067
Vinyl Bromide	ppbv	<0.22	0.22	<0.962	0.962	3317067
Propene	ppbv	<1.6	1.6	<2.75	2.75	3317067
2,2,4-Trimethylpentane	ppbv	0.28	0.22	1.30	1.03	3317067
Carbon Disulfide	ppbv	2.52	0.55	7.84	1.71	3317067
Vinyl Acetate	ppbv	<0.22	0.22	<0.775	0.775	3317067
Surrogate Recovery (%)						
Bromochloromethane	%	88		N/A	N/A	3317067

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

Maxxam Job #: B3C8546
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Tiamat Environmental
Client Project #: 12-435

Sampler Initials: JAL

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		SN8303				
Sampling Date		2013/08/02				
COC Number		18283				
	Units	**VW-01 (CONVENT HILL) / 1360**	**RDL**	**ug/m3**	**DL (ug/m3)**	**QC Batch**
D5-Chlorobenzene	%	77		N/A	N/A	3317067
Difluorobenzene	%	90		N/A	N/A	3317067

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

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Tiamat Environmental
Client Project #: 12-435

Sampler Initials: JAL

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		SN8304				
Sampling Date		2013/08/02				
COC Number		18283				
	Units	**VW-01 (RDM) / 00291**	**RDL**	**ug/m3**	**DL (ug/m3)**	**QC Batch**
Volatile Organics						
Dichlorodifluoromethane (FREON 12)	ppbv	<58	58	<285	285	3315967
1,2-Dichlorotetrafluoroethane	ppbv	<16	16	<113	113	3315967
Chloromethane	ppbv	<29	29	<58.9	58.9	3315967
Vinyl Chloride	ppbv	519	17	1330	43.7	3315967
Chloroethane	ppbv	<29	29	<75.2	75.2	3315967
1,3-Butadiene	ppbv	<48	48	<105	105	3315967
Trichlorofluoromethane (FREON 11)	ppbv	<19	19	<107	107	3315967
Ethanol (ethyl alcohol)	ppbv	322	220	606	412	3315967
Trichlorotrifluoroethane	ppbv	<14	14	<109	109	3315967
2-propanol	ppbv	<290	290	<701	701	3315967
2-Propanone	ppbv	<76	76	<181	181	3315967
Methyl Ethyl Ketone (2-Butanone)	ppbv	<290	290	<841	841	3315967
Methyl Isobutyl Ketone	ppbv	<300	300	<1250	1250	3315967
Methyl Butyl Ketone (2-Hexanone)	ppbv	<190	190	<778	778	3315967
Methyl t-butyl ether (MTBE)	ppbv	<19	19	<68.5	68.5	3315967
Ethyl Acetate	ppbv	<210	210	<753	753	3315967
1,1-Dichloroethylene	ppbv	<24	24	<94.2	94.2	3315967
cis-1,2-Dichloroethylene	ppbv	123	18	486	71.6	3315967
trans-1,2-Dichloroethylene	ppbv	30	19	118	75.3	3315967
Methylene Chloride(Dichloromethane)	ppbv	<120	120	<433	433	3315967
Chloroform	ppbv	<14	14	<69.6	69.6	3315967
Carbon Tetrachloride	ppbv	<29	29	<179	179	3315967
1,1-Dichloroethane	ppbv	<19	19	<76.9	76.9	3315967
1,2-Dichloroethane	ppbv	<19	19	<76.9	76.9	3315967
Ethylene Dibromide	ppbv	<16	16	<124	124	3315967
1,1,1-Trichloroethane	ppbv	<29	29	<155	155	3315967
1,1,2-Trichloroethane	ppbv	<14	14	<77.7	77.7	3315967
1,1,2,2-Tetrachloroethane	ppbv	<19	19	<130	130	3315967
cis-1,3-Dichloropropene	ppbv	<17	17	<77.6	77.6	3315967
trans-1,3-Dichloropropene	ppbv	<16	16	<73.3	73.3	3315967
1,2-Dichloropropane	ppbv	<38	38	<176	176	3315967
Bromomethane	ppbv	<17	17	<66.4	66.4	3315967

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B3C8546
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Tiamat Environmental
Client Project #: 12-435

Sampler Initials: JAL

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		SN8304				
Sampling Date		2013/08/02				
COC Number		18283				
	Units	**VW-01 (RDM) / 00291**	**RDL**	**ug/m3**	**DL (ug/m3)**	**QC Batch**
Bromoform	ppbv	<19	19	<196	196	3315967
Bromodichloromethane	ppbv	<19	19	<127	127	3315967
Dibromochloromethane	ppbv	<19	19	<162	162	3315967
Trichloroethylene	ppbv	<29	29	<153	153	3315967
Tetrachloroethylene	ppbv	<19	19	<129	129	3315967
Benzene	ppbv	<17	17	<54.6	54.6	3315967
Toluene	ppbv	<81	81	<304	304	3315967
Ethylbenzene	ppbv	<27	27	<119	119	3315967
p+m-Xylene	ppbv	<99	99	<428	428	3315967
o-Xylene	ppbv	<19	19	<82.5	82.5	3315967
Styrene	ppbv	42	19	181	80.9	3315967
4-ethyltoluene	ppbv	<210	210	<1030	1030	3315967
1,3,5-Trimethylbenzene	ppbv	<48	48	<233	233	3315967
1,2,4-Trimethylbenzene	ppbv	<48	48	<233	233	3315967
Chlorobenzene	ppbv	<19	19	<87.5	87.5	3315967
Benzyl chloride	ppbv	<95	95	<492	492	3315967
1,3-Dichlorobenzene	ppbv	<38	38	<228	228	3315967
1,4-Dichlorobenzene	ppbv	<38	38	<228	228	3315967
1,2-Dichlorobenzene	ppbv	<38	38	<228	228	3315967
1,2,4-Trichlorobenzene	ppbv	<190	190	<1410	1410	3315967
Hexachlorobutadiene	ppbv	<290	290	<3040	3040	3315967
Hexane	ppbv	17800	29	62700	100	3315967
Heptane	ppbv	1970	29	8060	117	3315967
Cyclohexane	ppbv	4900	19	16900	65.4	3315967
Tetrahydrofuran	ppbv	<38	38	<112	112	3315967
1,4-Dioxane	ppbv	<190	190	<685	685	3315967
Xylene (Total)	ppbv	<99	99	<429	429	3315967
Vinyl Bromide	ppbv	<19	19	<83.1	83.1	3315967
Propene	ppbv	371	29	639	49.1	3315967
2,2,4-Trimethylpentane	ppbv	<19	19	<88.8	88.8	3315967
Carbon Disulfide	ppbv	<48	48	<148	148	3315967
Vinyl Acetate	ppbv	<19	19	<66.9	66.9	3315967
Surrogate Recovery (%)						
Bromochloromethane	%	80		N/A	N/A	3315967

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

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Maxxam Job #: B3C8546
Report Date: 2013/08/25

Tiamat Environmental
Client Project #: 12-435

Sampler Initials: JAL

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		SN8304				
Sampling Date		2013/08/02				
COC Number		18283				
	Units	**VW-01 (RDM) / 00291**	**RDL**	**ug/m3**	**DL (ug/m3)**	**QC Batch**
D5-Chlorobenzene	%	77		N/A	N/A	3315967
Difluorobenzene	%	84		N/A	N/A	3315967

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

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Maxxam Job #: B3C8546
Report Date: 2013/08/25

Tiamat Environmental
Client Project #: 12-435

Sampler Initials: JAL

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		SN8305				
Sampling Date		2013/08/02				
COC Number		18283				
	Units	**VW-03 (RDM) / 1929**	**RDL**	**ug/m3**	**DL (ug/m3)**	**QC Batch**
Volatile Organics						
Dichlorodifluoromethane (FREON 12)	ppbv	1.60	0.20	7.92	0.989	3317067
1,2-Dichlorotetrafluoroethane	ppbv	0.58	0.17	4.07	1.19	3317067
Chloromethane	ppbv	1.03	0.30	2.12	0.620	3317067
Vinyl Chloride	ppbv	<0.18	0.18	<0.460	0.460	3317067
Chloroethane	ppbv	<0.30	0.30	<0.792	0.792	3317067
1,3-Butadiene	ppbv	<0.50	0.50	<1.11	1.11	3317067
Trichlorofluoromethane (FREON 11)	ppbv	0.42	0.20	2.35	1.12	3317067
Ethanol (ethyl alcohol)	ppbv	648	23	1220	43.3	3317067
Trichlorotrifluoroethane	ppbv	<0.15	0.15	<1.15	1.15	3317067
2-propanol	ppbv	5.1	3.0	12.4	7.37	3317067
2-Propanone	ppbv	18.0	0.80	42.9	1.90	3317067
Methyl Ethyl Ketone (2-Butanone)	ppbv	5.8	3.0	17.2	8.85	3317067
Methyl Isobutyl Ketone	ppbv	<3.2	3.2	<13.1	13.1	3317067
Methyl Butyl Ketone (2-Hexanone)	ppbv	<2.0	2.0	<8.19	8.19	3317067
Methyl t-butyl ether (MTBE)	ppbv	<0.20	0.20	<0.721	0.721	3317067
Ethyl Acetate	ppbv	<2.2	2.2	<7.93	7.93	3317067
1,1-Dichloroethylene	ppbv	<0.25	0.25	<0.991	0.991	3317067
cis-1,2-Dichloroethylene	ppbv	0.42	0.19	1.68	0.753	3317067
trans-1,2-Dichloroethylene	ppbv	<0.20	0.20	<0.793	0.793	3317067
Methylene Chloride(Dichloromethane)	ppbv	1.06	0.80	3.67	2.78	3317067
Chloroform	ppbv	0.52	0.15	2.55	0.732	3317067
Carbon Tetrachloride	ppbv	<0.30	0.30	<1.89	1.89	3317067
1,1-Dichloroethane	ppbv	<0.20	0.20	<0.809	0.809	3317067
1,2-Dichloroethane	ppbv	<0.20	0.20	<0.809	0.809	3317067
Ethylene Dibromide	ppbv	<0.17	0.17	<1.31	1.31	3317067
1,1,1-Trichloroethane	ppbv	<0.30	0.30	<1.64	1.64	3317067
1,1,2-Trichloroethane	ppbv	<0.15	0.15	<0.818	0.818	3317067
1,1,2,2-Tetrachloroethane	ppbv	<0.20	0.20	<1.37	1.37	3317067
cis-1,3-Dichloropropene	ppbv	<0.18	0.18	<0.817	0.817	3317067
trans-1,3-Dichloropropene	ppbv	<0.17	0.17	<0.772	0.772	3317067
1,2-Dichloropropane	ppbv	<0.40	0.40	<1.85	1.85	3317067
Bromomethane	ppbv	<0.18	0.18	<0.699	0.699	3317067

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B3C8546
Report Date: 2013/08/25

Tiamat Environmental
Client Project #: 12-435

Sampler Initials: JAL

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		SN8305				
Sampling Date		2013/08/02				
COC Number		18283				
	Units	**VW-03 (RDM) / 1929**	**RDL**	**ug/m3**	**DL (ug/m3)**	**QC Batch**
Bromoform	ppbv	<0.20	0.20	<2.07	2.07	3317067
Bromodichloromethane	ppbv	<0.20	0.20	<1.34	1.34	3317067
Dibromochloromethane	ppbv	<0.20	0.20	<1.70	1.70	3317067
Trichloroethylene	ppbv	1.32	0.30	7.08	1.61	3317067
Tetrachloroethylene	ppbv	<0.20	0.20	<1.36	1.36	3317067
Benzene	ppbv	0.79	0.18	2.51	0.575	3317067
Toluene	ppbv	3.95	0.20	14.8	0.753	3317067
Ethylbenzene	ppbv	0.92	0.20	3.98	0.868	3317067
p+m-Xylene	ppbv	3.65	0.37	15.8	1.61	3317067
o-Xylene	ppbv	1.67	0.20	7.23	0.868	3317067
Styrene	ppbv	0.37	0.20	1.57	0.852	3317067
4-ethyltoluene	ppbv	<2.2	2.2	<10.8	10.8	3317067
1,3,5-Trimethylbenzene	ppbv	<1.9	1.9	<9.29	9.29	3317067
1,2,4-Trimethylbenzene	ppbv	2.74	0.50	13.5	2.46	3317067
Chlorobenzene	ppbv	<0.20	0.20	<0.921	0.921	3317067
Benzyl chloride	ppbv	<1.0	1.0	<5.18	5.18	3317067
1,3-Dichlorobenzene	ppbv	<0.40	0.40	<2.40	2.40	3317067
1,4-Dichlorobenzene	ppbv	<0.40	0.40	<2.40	2.40	3317067
1,2-Dichlorobenzene	ppbv	<0.40	0.40	<2.40	2.40	3317067
1,2,4-Trichlorobenzene	ppbv	<2.0	2.0	<14.8	14.8	3317067
Hexachlorobutadiene	ppbv	<3.0	3.0	<32.0	32.0	3317067
Hexane	ppbv	<1.3	1.3	<4.65	4.65	3317067
Heptane	ppbv	0.58	0.30	2.39	1.23	3317067
Cyclohexane	ppbv	0.35	0.20	1.19	0.688	3317067
Tetrahydrofuran	ppbv	5.14	0.40	15.2	1.18	3317067
1,4-Dioxane	ppbv	<2.0	2.0	<7.21	7.21	3317067
Xylene (Total)	ppbv	5.31	0.60	23.1	2.61	3317067
Vinyl Bromide	ppbv	<0.20	0.20	<0.875	0.875	3317067
Propene	ppbv	<3.9	3.9	<6.69	6.69	3317067
2,2,4-Trimethylpentane	ppbv	0.64	0.20	2.99	0.934	3317067
Carbon Disulfide	ppbv	3.21	0.50	9.99	1.56	3317067
Vinyl Acetate	ppbv	<0.20	0.20	<0.704	0.704	3317067
Surrogate Recovery (%)						
Bromochloromethane	%	92		N/A	N/A	3317067

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

Maxxam Job #: B3C8546
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Client Project #: 12-435

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VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		SN8305				
Sampling Date		2013/08/02				
COC Number		18283				
	Units	**VW-03 (RDM) / 1929**	**RDL**	**ug/m3**	**DL (ug/m3)**	**QC Batch**
D5-Chlorobenzene	%	85		N/A	N/A	3317067
Difluorobenzene	%	95		N/A	N/A	3317067

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

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Maxxam Job #: B3C8546
Report Date: 2013/08/25

Tiamat Environmental
Client Project #: 12-435

Sampler Initials: JAL

Test Summary

Maxxam ID SN8303 **Collected** 2013/08/02
Sample ID VW-01 (CONVENT HILL) / 1360 **Shipped**
Matrix AIR **Received** 2013/08/07

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
BTEX Fractionation in Air (TO-15mod)	GC/MS	3319686	N/A	2013/08/14	Jie Wu
Canister Pressure (TO-15)	PRES	3317031	N/A	2013/08/14	Jie Wu
Light Hydrocarbons	GC/FID	3322553	N/A	2013/08/21	Vijay Lad
Matrix Gases	GC/TCD	3324319	N/A	2013/08/22	Tonghui (Jenny) Chen
Volatile Organics in Air (TO-15)	GC/MS	3317067	N/A	2013/08/14	Jie Wu

Maxxam ID SN8304 **Collected** 2013/08/02
Sample ID VW-01 (RDM) / 00291 **Shipped**
Matrix AIR **Received** 2013/08/07

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
BTEX Fractionation in Air (TO-15mod)	GC/MS	3320596	N/A	2013/08/15	Jie Wu
Canister Pressure (TO-15)	PRES	3320530	N/A	2013/08/15	Jie Wu
Light Hydrocarbons	GC/FID	3322553	N/A	2013/08/21	Vijay Lad
Matrix Gases	GC/TCD	3324319	N/A	2013/08/22	Tonghui (Jenny) Chen
Volatile Organics in Air (TO-15)	GC/MS	3315967	N/A	2013/08/15	Jie Wu

Maxxam ID SN8305 **Collected** 2013/08/02
Sample ID VW-03 (RDM) / 1929 **Shipped**
Matrix AIR **Received** 2013/08/07

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
BTEX Fractionation in Air (TO-15mod)	GC/MS	3319686	N/A	2013/08/14	Jie Wu
Canister Pressure (TO-15)	PRES	3317031	N/A	2013/08/14	Jie Wu
Light Hydrocarbons	GC/FID	3322553	N/A	2013/08/21	Vijay Lad
Matrix Gases	GC/TCD	3324319	N/A	2013/08/22	Tonghui (Jenny) Chen
Volatile Organics in Air (TO-15)	GC/MS	3317067	N/A	2013/08/14	Jie Wu

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Maxxam Job #: B3C8546
Report Date: 2013/08/25

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GENERAL COMMENTS

ws:3317067
Ethanol exceeds 130% recovery criteria in Reference Standard. It meets %RSD criteria in the Continuing Calibration Standard. Data was accepted and flagged.

Light Hydrocarbon/Matrix Gas Analysis: Canisters were pressurized with Helium to enable sampling. Results and DLs adjusted accordingly.

Matrix Gas Analysis: Results normalized to 100% dry volume.

Sample SN8303-01: A 1.1x dilution was analyzed. The DLs were adjusted accordingly.

Increased DL further for propene and 1,3,5-trimethylbenzene due to possible interference.

Sample SN8304-01: Canister received at -1.4psig and was pressurized to 10psig, for a 1.9x pressure dilution.
A 50x dilution was prepared and analyzed, resulting in a 95x final dilution. The DLs were adjusted accordingly.

The amount reported for propene represents the mixture of propene and propane.

Increased DL further for methylene chloride, toluene, m/p-xylene and total xylenes due to airbag background.

Sample SN8305-01: A 10x dilution was prepared and analyzed for ethanol. The DL was adjusted accordingly.

Increased DL further for propene, hexane and 1,3,5-trimethylbenzene due to possible interference.

Results relate only to the items tested.

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Attention: Leon T. Mah
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Quality Assurance Report

Maxxam Job Number: GB3C8546

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	%Recovery	Units	QC Limits
3315967	JIW	Spiked Blank	Bromochloromethane	2013/08/15		102	%	60 - 140
			D5-Chlorobenzene	2013/08/15		105	%	60 - 140
			Difluorobenzene	2013/08/15		104	%	60 - 140
			Dichlorodifluoromethane (FREON 12)	2013/08/15		104	%	70 - 130
			1,2-Dichlorotetrafluoroethane	2013/08/15		110	%	70 - 130
			Chloromethane	2013/08/15		108	%	70 - 130
			Vinyl Chloride	2013/08/15		103	%	70 - 130
			Chloroethane	2013/08/15		98	%	70 - 130
			1,3-Butadiene	2013/08/15		106	%	70 - 130
			Trichlorofluoromethane (FREON 11)	2013/08/15		101	%	70 - 130
			Ethanol (ethyl alcohol)	2013/08/15		132 (1)	%	70 - 130
			Trichlorotrifluoroethane	2013/08/15		94	%	70 - 130
			2-propanol	2013/08/15		117	%	70 - 130
			2-Propanone	2013/08/15		103	%	70 - 130
			Methyl Ethyl Ketone (2-Butanone)	2013/08/15		103	%	70 - 130
			Methyl Isobutyl Ketone	2013/08/15		109	%	70 - 130
			Methyl Butyl Ketone (2-Hexanone)	2013/08/15		114	%	70 - 130
			Methyl t-butyl ether (MTBE)	2013/08/15		104	%	70 - 130
			Ethyl Acetate	2013/08/15		108	%	70 - 130
			1,1-Dichloroethylene	2013/08/15		101	%	70 - 130
			cis-1,2-Dichloroethylene	2013/08/15		105	%	70 - 130
			trans-1,2-Dichloroethylene	2013/08/15		102	%	70 - 130
			Methylene Chloride(Dichloromethane)	2013/08/15		96	%	70 - 130
			Chloroform	2013/08/15		100	%	70 - 130
			Carbon Tetrachloride	2013/08/15		100	%	70 - 130
			1,1-Dichloroethane	2013/08/15		102	%	70 - 130
			1,2-Dichloroethane	2013/08/15		103	%	70 - 130
			Ethylene Dibromide	2013/08/15		101	%	70 - 130
			1,1,1-Trichloroethane	2013/08/15		99	%	70 - 130
			1,1,2-Trichloroethane	2013/08/15		100	%	70 - 130
			1,1,2,2-Tetrachloroethane	2013/08/15		98	%	70 - 130
			cis-1,3-Dichloropropene	2013/08/15		104	%	70 - 130
			trans-1,3-Dichloropropene	2013/08/15		112	%	70 - 130
			1,2-Dichloropropane	2013/08/15		100	%	70 - 130
			Bromomethane	2013/08/15		94	%	70 - 130
			Bromoform	2013/08/15		96	%	70 - 130
			Bromodichloromethane	2013/08/15		103	%	70 - 130
			Dibromochloromethane	2013/08/15		100	%	70 - 130
			Trichloroethylene	2013/08/15		94	%	70 - 130
			Tetrachloroethylene	2013/08/15		95	%	70 - 130
			Benzene	2013/08/15		99	%	70 - 130
			Toluene	2013/08/15		99	%	70 - 130
			Ethylbenzene	2013/08/15		100	%	70 - 130
			p+m-Xylene	2013/08/15		100	%	70 - 130
			o-Xylene	2013/08/15		102	%	70 - 130
			Styrene	2013/08/15		105	%	70 - 130
			4-ethyltoluene	2013/08/15		101	%	70 - 130
			1,3,5-Trimethylbenzene	2013/08/15		100	%	70 - 130
			1,2,4-Trimethylbenzene	2013/08/15		104	%	70 - 130
			Chlorobenzene	2013/08/15		97	%	70 - 130
			Benzyl chloride	2013/08/15		100	%	70 - 130
			1,3-Dichlorobenzene	2013/08/15		102	%	70 - 130
			1,4-Dichlorobenzene	2013/08/15		99	%	70 - 130
			1,2-Dichlorobenzene	2013/08/15		96	%	70 - 130
			1,2,4-Trichlorobenzene	2013/08/15		117	%	70 - 130

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Tiamat Environmental
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Client Project #: 12-435
P.O. #:
Site Location:

Quality Assurance Report (Continued)

Maxxam Job Number: GB3C8546

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	%Recovery	Units	QC Limits
3315967	JIW	Spiked Blank	Hexachlorobutadiene	2013/08/15		110	%	70 - 130
			Hexane	2013/08/15		108	%	70 - 130
			Heptane	2013/08/15		108	%	70 - 130
			Cyclohexane	2013/08/15		104	%	70 - 130
			Tetrahydrofuran	2013/08/15		113	%	70 - 130
			1,4-Dioxane	2013/08/15		106	%	70 - 130
			Xylene (Total)	2013/08/15		101	%	70 - 130
			Vinyl Bromide	2013/08/15		94	%	70 - 130
			Propene	2013/08/15		102	%	70 - 130
			2,2,4-Trimethylpentane	2013/08/15		105	%	70 - 130
			Carbon Disulfide	2013/08/15		104	%	70 - 130
			Vinyl Acetate	2013/08/15		110	%	70 - 130
		Method Blank	Bromochloromethane	2013/08/15		91	%	60 - 140
			D5-Chlorobenzene	2013/08/15		82	%	60 - 140
			Difluorobenzene	2013/08/15		96	%	60 - 140
			Dichlorodifluoromethane (FREON 12)	2013/08/15	ND, RDL=0.20		ppbv	
			1,2-Dichlorotetrafluoroethane	2013/08/15	ND, RDL=0.17		ppbv	
			Chloromethane	2013/08/15	ND, RDL=0.30		ppbv	
			Vinyl Chloride	2013/08/15	ND, RDL=0.18		ppbv	
			Chloroethane	2013/08/15	ND, RDL=0.30		ppbv	
			1,3-Butadiene	2013/08/15	ND, RDL=0.50		ppbv	
			Trichlorofluoromethane (FREON 11)	2013/08/15	ND, RDL=0.20		ppbv	
			Ethanol (ethyl alcohol)	2013/08/15	ND, RDL=2.3		ppbv	
			Trichlorotrifluoroethane	2013/08/15	ND, RDL=0.15		ppbv	
			2-propanol	2013/08/15	ND, RDL=3.0		ppbv	
			2-Propanone	2013/08/15	ND, RDL=0.80		ppbv	
			Methyl Ethyl Ketone (2-Butanone)	2013/08/15	ND, RDL=3.0		ppbv	
			Methyl Isobutyl Ketone	2013/08/15	ND, RDL=3.2		ppbv	
			Methyl Butyl Ketone (2-Hexanone)	2013/08/15	ND, RDL=2.0		ppbv	
			Methyl t-butyl ether (MTBE)	2013/08/15	ND, RDL=0.20		ppbv	
			Ethyl Acetate	2013/08/15	ND, RDL=2.2		ppbv	
			1,1-Dichloroethylene	2013/08/15	ND, RDL=0.25		ppbv	
			cis-1,2-Dichloroethylene	2013/08/15	ND, RDL=0.19		ppbv	
			trans-1,2-Dichloroethylene	2013/08/15	ND, RDL=0.20		ppbv	
			Methylene Chloride(Dichloromethane)	2013/08/15	ND, RDL=0.80		ppbv	
			Chloroform	2013/08/15	ND, RDL=0.15		ppbv	
			Carbon Tetrachloride	2013/08/15	ND, RDL=0.30		ppbv	
			1,1-Dichloroethane	2013/08/15	ND, RDL=0.20		ppbv	
			1,2-Dichloroethane	2013/08/15	ND, RDL=0.20		ppbv	
			Ethylene Dibromide	2013/08/15	ND, RDL=0.17		ppbv	
			1,1,1-Trichloroethane	2013/08/15	ND, RDL=0.30		ppbv	
			1,1,2-Trichloroethane	2013/08/15	ND, RDL=0.15		ppbv	
			1,1,2,2-Tetrachloroethane	2013/08/15	ND, RDL=0.20		ppbv	
			cis-1,3-Dichloropropene	2013/08/15	ND, RDL=0.18		ppbv	
			trans-1,3-Dichloropropene	2013/08/15	ND, RDL=0.17		ppbv	
			1,2-Dichloropropane	2013/08/15	ND, RDL=0.40		ppbv	
			Bromomethane	2013/08/15	ND, RDL=0.18		ppbv	
			Bromoform	2013/08/15	ND, RDL=0.20		ppbv	
			Bromodichloromethane	2013/08/15	ND, RDL=0.20		ppbv	
			Dibromochloromethane	2013/08/15	ND, RDL=0.20		ppbv	
			Trichloroethylene	2013/08/15	ND, RDL=0.30		ppbv	
			Tetrachloroethylene	2013/08/15	ND, RDL=0.20		ppbv	
			Benzene	2013/08/15	ND, RDL=0.18		ppbv	
			Toluene	2013/08/15	ND, RDL=0.20		ppbv	
			Ethylbenzene	2013/08/15	ND, RDL=0.20		ppbv	

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Quality Assurance Report (Continued)

Maxxam Job Number: GB3C8546

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	%Recovery	Units	QC Limits
3315967	JIW	Method Blank	p+m-Xylene	2013/08/15	ND, RDL=0.37		ppbv	
			o-Xylene	2013/08/15	ND, RDL=0.20		ppbv	
			Styrene	2013/08/15	ND, RDL=0.20		ppbv	
			4-ethyltoluene	2013/08/15	ND, RDL=2.2		ppbv	
			1,3,5-Trimethylbenzene	2013/08/15	ND, RDL=0.50		ppbv	
			1,2,4-Trimethylbenzene	2013/08/15	ND, RDL=0.50		ppbv	
			Chlorobenzene	2013/08/15	ND, RDL=0.20		ppbv	
			Benzyl chloride	2013/08/15	ND, RDL=1.0		ppbv	
			1,3-Dichlorobenzene	2013/08/15	ND, RDL=0.40		ppbv	
			1,4-Dichlorobenzene	2013/08/15	ND, RDL=0.40		ppbv	
			1,2-Dichlorobenzene	2013/08/15	ND, RDL=0.40		ppbv	
			1,2,4-Trichlorobenzene	2013/08/15	ND, RDL=2.0		ppbv	
			Hexachlorobutadiene	2013/08/15	ND, RDL=3.0		ppbv	
			Hexane	2013/08/15	ND, RDL=0.30		ppbv	
			Heptane	2013/08/15	ND, RDL=0.30		ppbv	
			Cyclohexane	2013/08/15	ND, RDL=0.20		ppbv	
			Tetrahydrofuran	2013/08/15	ND, RDL=0.40		ppbv	
			1,4-Dioxane	2013/08/15	ND, RDL=2.0		ppbv	
			Xylene (Total)	2013/08/15	ND, RDL=0.60		ppbv	
			Vinyl Bromide	2013/08/15	ND, RDL=0.20		ppbv	
			Propene	2013/08/15	ND, RDL=0.30		ppbv	
			2,2,4-Trimethylpentane	2013/08/15	ND, RDL=0.20		ppbv	
			Carbon Disulfide	2013/08/15	ND, RDL=0.50		ppbv	
			Vinyl Acetate	2013/08/15	ND, RDL=0.20		ppbv	
3317067	JIW	Spiked Blank	Bromochloromethane	2013/08/14		101	%	60 - 140
			D5-Chlorobenzene	2013/08/14		111	%	60 - 140
			Difluorobenzene	2013/08/14		107	%	60 - 140
			Dichlorodifluoromethane (FREON 12)	2013/08/14		108	%	70 - 130
			1,2-Dichlorotetrafluoroethane	2013/08/14		115	%	70 - 130
			Chloromethane	2013/08/14		113	%	70 - 130
			Vinyl Chloride	2013/08/14		107	%	70 - 130
			Chloroethane	2013/08/14		100	%	70 - 130
			1,3-Butadiene	2013/08/14		109	%	70 - 130
			Trichlorofluoromethane (FREON 11)	2013/08/14		103	%	70 - 130
			Ethanol (ethyl alcohol)	2013/08/14		141 (1)	%	70 - 130
			Trichlorotrifluoroethane	2013/08/14		97	%	70 - 130
			2-propanol	2013/08/14		118	%	70 - 130
			2-Propanone	2013/08/14		107	%	70 - 130
			Methyl Ethyl Ketone (2-Butanone)	2013/08/14		109	%	70 - 130
			Methyl Isobutyl Ketone	2013/08/14		110	%	70 - 130
			Methyl Butyl Ketone (2-Hexanone)	2013/08/14		115	%	70 - 130
			Methyl t-butyl ether (MTBE)	2013/08/14		106	%	70 - 130
			Ethyl Acetate	2013/08/14		114	%	70 - 130
			1,1-Dichloroethylene	2013/08/14		103	%	70 - 130
			cis-1,2-Dichloroethylene	2013/08/14		106	%	70 - 130
			trans-1,2-Dichloroethylene	2013/08/14		104	%	70 - 130
			Methylene Chloride(Dichloromethane)	2013/08/14		99	%	70 - 130
			Chloroform	2013/08/14		102	%	70 - 130
			Carbon Tetrachloride	2013/08/14		99	%	70 - 130
			1,1-Dichloroethane	2013/08/14		105	%	70 - 130
			1,2-Dichloroethane	2013/08/14		106	%	70 - 130
			Ethylene Dibromide	2013/08/14		100	%	70 - 130
			1,1,1-Trichloroethane	2013/08/14		100	%	70 - 130
			1,1,2-Trichloroethane	2013/08/14		97	%	70 - 130
			1,1,2,2-Tetrachloroethane	2013/08/14		98	%	70 - 130

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Quality Assurance Report (Continued)

Maxxam Job Number: GB3C8546

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	%Recovery	Units	QC Limits
3317067	JIW	Spiked Blank	cis-1,3-Dichloropropene	2013/08/14		104	%	70 - 130
			trans-1,3-Dichloropropene	2013/08/14		111	%	70 - 130
			1,2-Dichloropropane	2013/08/14		100	%	70 - 130
			Bromomethane	2013/08/14		96	%	70 - 130
			Bromoform	2013/08/14		95	%	70 - 130
			Bromodichloromethane	2013/08/14		102	%	70 - 130
			Dibromochloromethane	2013/08/14		99	%	70 - 130
			Trichloroethylene	2013/08/14		92	%	70 - 130
			Tetrachloroethylene	2013/08/14		94	%	70 - 130
			Benzene	2013/08/14		97	%	70 - 130
			Toluene	2013/08/14		99	%	70 - 130
			Ethylbenzene	2013/08/14		97	%	70 - 130
			p+m-Xylene	2013/08/14		97	%	70 - 130
			o-Xylene	2013/08/14		100	%	70 - 130
			Styrene	2013/08/14		102	%	70 - 130
			4-ethyltoluene	2013/08/14		99	%	70 - 130
			1,3,5-Trimethylbenzene	2013/08/14		99	%	70 - 130
			1,2,4-Trimethylbenzene	2013/08/14		102	%	70 - 130
			Chlorobenzene	2013/08/14		95	%	70 - 130
			Benzyl chloride	2013/08/14		101	%	70 - 130
			1,3-Dichlorobenzene	2013/08/14		103	%	70 - 130
			1,4-Dichlorobenzene	2013/08/14		100	%	70 - 130
			1,2-Dichlorobenzene	2013/08/14		97	%	70 - 130
			1,2,4-Trichlorobenzene	2013/08/14		117	%	70 - 130
			Hexachlorobutadiene	2013/08/14		110	%	70 - 130
			Hexane	2013/08/14		111	%	70 - 130
			Heptane	2013/08/14		109	%	70 - 130
			Cyclohexane	2013/08/14		105	%	70 - 130
			Tetrahydrofuran	2013/08/14		118	%	70 - 130
			1,4-Dioxane	2013/08/14		106	%	70 - 130
			Xylene (Total)	2013/08/14		98	%	70 - 130
			Vinyl Bromide	2013/08/14		94	%	70 - 130
			Propene	2013/08/14		106	%	70 - 130
			2,2,4-Trimethylpentane	2013/08/14		102	%	70 - 130
			Carbon Disulfide	2013/08/14		104	%	70 - 130
			Vinyl Acetate	2013/08/14		115	%	70 - 130
		Method Blank	Bromochloromethane	2013/08/14		92	%	60 - 140
			D5-Chlorobenzene	2013/08/14		84	%	60 - 140
			Difluorobenzene	2013/08/14		96	%	60 - 140
			Dichlorodifluoromethane (FREON 12)	2013/08/14	ND, RDL=0.20		ppbv	
			1,2-Dichlorotetrafluoroethane	2013/08/14	ND, RDL=0.17		ppbv	
			Chloromethane	2013/08/14	ND, RDL=0.30		ppbv	
			Vinyl Chloride	2013/08/14	ND, RDL=0.18		ppbv	
			Chloroethane	2013/08/14	ND, RDL=0.30		ppbv	
			1,3-Butadiene	2013/08/14	ND, RDL=0.50		ppbv	
			Trichlorofluoromethane (FREON 11)	2013/08/14	ND, RDL=0.20		ppbv	
			Ethanol (ethyl alcohol)	2013/08/14	ND, RDL=2.3		ppbv	
			Trichlorotrifluoroethane	2013/08/14	ND, RDL=0.15		ppbv	
			2-propanol	2013/08/14	ND, RDL=3.0		ppbv	
			2-Propanone	2013/08/14	ND, RDL=0.80		ppbv	
			Methyl Ethyl Ketone (2-Butanone)	2013/08/14	ND, RDL=3.0		ppbv	
			Methyl Isobutyl Ketone	2013/08/14	ND, RDL=3.2		ppbv	
			Methyl Butyl Ketone (2-Hexanone)	2013/08/14	ND, RDL=2.0		ppbv	
			Methyl t-butyl ether (MTBE)	2013/08/14	ND, RDL=0.20		ppbv	
			Ethyl Acetate	2013/08/14	ND, RDL=2.2		ppbv	

This document is in electronic format, hard copy is available on request.

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Tiamat Environmental
Attention: Leon T. Mah
Client Project #: 12-435
P.O. #:
Site Location:

Quality Assurance Report (Continued)

Maxxam Job Number: GB3C8546

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	%Recovery	Units	QC Limits
3317067	JIW	Method Blank	1,1-Dichloroethylene	2013/08/14	ND, RDL=0.25		ppbv	
			cis-1,2-Dichloroethylene	2013/08/14	ND, RDL=0.19		ppbv	
			trans-1,2-Dichloroethylene	2013/08/14	ND, RDL=0.20		ppbv	
			Methylene Chloride(Dichloromethane)	2013/08/14	ND, RDL=0.80		ppbv	
			Chloroform	2013/08/14	ND, RDL=0.15		ppbv	
			Carbon Tetrachloride	2013/08/14	ND, RDL=0.30		ppbv	
			1,1-Dichloroethane	2013/08/14	ND, RDL=0.20		ppbv	
			1,2-Dichloroethane	2013/08/14	ND, RDL=0.20		ppbv	
			Ethylene Dibromide	2013/08/14	ND, RDL=0.17		ppbv	
			1,1,1-Trichloroethane	2013/08/14	ND, RDL=0.30		ppbv	
			1,1,2-Trichloroethane	2013/08/14	ND, RDL=0.15		ppbv	
			1,1,2,2-Tetrachloroethane	2013/08/14	ND, RDL=0.20		ppbv	
			cis-1,3-Dichloropropene	2013/08/14	ND, RDL=0.18		ppbv	
			trans-1,3-Dichloropropene	2013/08/14	ND, RDL=0.17		ppbv	
			1,2-Dichloropropane	2013/08/14	ND, RDL=0.40		ppbv	
			Bromomethane	2013/08/14	ND, RDL=0.18		ppbv	
			Bromoform	2013/08/14	ND, RDL=0.20		ppbv	
			Bromodichloromethane	2013/08/14	ND, RDL=0.20		ppbv	
			Dibromochloromethane	2013/08/14	ND, RDL=0.20		ppbv	
			Trichloroethylene	2013/08/14	ND, RDL=0.30		ppbv	
			Tetrachloroethylene	2013/08/14	ND, RDL=0.20		ppbv	
			Benzene	2013/08/14	ND, RDL=0.18		ppbv	
			Toluene	2013/08/14	ND, RDL=0.20		ppbv	
			Ethylbenzene	2013/08/14	ND, RDL=0.20		ppbv	
			p+m-Xylene	2013/08/14	ND, RDL=0.37		ppbv	
			o-Xylene	2013/08/14	ND, RDL=0.20		ppbv	
			Styrene	2013/08/14	ND, RDL=0.20		ppbv	
			4-ethyltoluene	2013/08/14	ND, RDL=2.2		ppbv	
			1,3,5-Trimethylbenzene	2013/08/14	ND, RDL=0.50		ppbv	
			1,2,4-Trimethylbenzene	2013/08/14	ND, RDL=0.50		ppbv	
			Chlorobenzene	2013/08/14	ND, RDL=0.20		ppbv	
			Benzyl chloride	2013/08/14	ND, RDL=1.0		ppbv	
			1,3-Dichlorobenzene	2013/08/14	ND, RDL=0.40		ppbv	
			1,4-Dichlorobenzene	2013/08/14	ND, RDL=0.40		ppbv	
			1,2-Dichlorobenzene	2013/08/14	ND, RDL=0.40		ppbv	
			1,2,4-Trichlorobenzene	2013/08/14	ND, RDL=2.0		ppbv	
			Hexachlorobutadiene	2013/08/14	ND, RDL=3.0		ppbv	
			Hexane	2013/08/14	ND, RDL=0.30		ppbv	
			Heptane	2013/08/14	ND, RDL=0.30		ppbv	
			Cyclohexane	2013/08/14	ND, RDL=0.20		ppbv	
			Tetrahydrofuran	2013/08/14	ND, RDL=0.40		ppbv	
			1,4-Dioxane	2013/08/14	ND, RDL=2.0		ppbv	
			Xylene (Total)	2013/08/14	ND, RDL=0.60		ppbv	
			Vinyl Bromide	2013/08/14	ND, RDL=0.20		ppbv	
			Propene	2013/08/14	ND, RDL=0.30		ppbv	
			2,2,4-Trimethylpentane	2013/08/14	ND, RDL=0.20		ppbv	
			Carbon Disulfide	2013/08/14	ND, RDL=0.50		ppbv	
			Vinyl Acetate	2013/08/14	ND, RDL=0.20		ppbv	
		RPD - Sample/Sample Dup	Dichlorodifluoromethane (FREON 12)	2013/08/14	NC		%	25
			1,2-Dichlorotetrafluoroethane	2013/08/14	NC		%	25
			Chloromethane	2013/08/14	NC		%	25
			Chloroethane	2013/08/14	NC		%	25
			1,3-Butadiene	2013/08/14	NC		%	25

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Tiamat Environmental
Attention: Leon T. Mah
Client Project #: 12-435
P.O. #:
Site Location:

Quality Assurance Report (Continued)

Maxxam Job Number: GB3C8546

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	%Recovery	Units	QC Limits
3317067	JIW	RPD - Sample/Sample Dup	Trichlorofluoromethane (FREON 11)	2013/08/14	NC		%	25
			Ethanol (ethyl alcohol)	2013/08/14	NC		%	25
			Trichlorotrifluoroethane	2013/08/14	NC		%	25
			2-propanol	2013/08/14	NC		%	25
			2-Propanone	2013/08/14	4.5		%	25
			Methyl Ethyl Ketone (2-Butanone)	2013/08/14	NC		%	25
			Methyl Isobutyl Ketone	2013/08/14	NC		%	25
			Methyl Butyl Ketone (2-Hexanone)	2013/08/14	NC		%	25
			Methyl t-butyl ether (MTBE)	2013/08/14	NC		%	25
			Ethyl Acetate	2013/08/14	NC		%	25
			1,1-Dichloroethylene	2013/08/14	NC		%	25
			cis-1,2-Dichloroethylene	2013/08/14	NC		%	25
			trans-1,2-Dichloroethylene	2013/08/14	NC		%	25
			Methylene Chloride(Dichloromethane)	2013/08/14	NC		%	25
			Chloroform	2013/08/14	NC		%	25
			Carbon Tetrachloride	2013/08/14	NC		%	25
			1,1-Dichloroethane	2013/08/14	NC		%	25
			1,2-Dichloroethane	2013/08/14	NC		%	25
			Ethylene Dibromide	2013/08/14	NC		%	25
			1,1,1-Trichloroethane	2013/08/14	NC		%	25
			1,1,2-Trichloroethane	2013/08/14	NC		%	25
			1,1,2,2-Tetrachloroethane	2013/08/14	NC		%	25
			cis-1,3-Dichloropropene	2013/08/14	NC		%	25
			trans-1,3-Dichloropropene	2013/08/14	NC		%	25
			1,2-Dichloropropane	2013/08/14	NC		%	25
			Bromomethane	2013/08/14	NC		%	25
			Bromoform	2013/08/14	NC		%	25
			Bromodichloromethane	2013/08/14	NC		%	25
			Dibromochloromethane	2013/08/14	NC		%	25
			Trichloroethylene	2013/08/14	NC		%	25
			Tetrachloroethylene	2013/08/14	NC		%	25
			Benzene	2013/08/14	NC		%	25
			Toluene	2013/08/14	NC		%	25
			Ethylbenzene	2013/08/14	NC		%	25
			p+m-Xylene	2013/08/14	NC		%	25
			o-Xylene	2013/08/14	NC		%	25
			Styrene	2013/08/14	NC		%	25
			4-ethyltoluene	2013/08/14	NC		%	25
			1,3,5-Trimethylbenzene	2013/08/14	NC		%	25
			1,2,4-Trimethylbenzene	2013/08/14	NC		%	25
			Chlorobenzene	2013/08/14	NC		%	25
			Benzyl chloride	2013/08/14	NC		%	25
			1,3-Dichlorobenzene	2013/08/14	NC		%	25
			1,4-Dichlorobenzene	2013/08/14	NC		%	25
			1,2-Dichlorobenzene	2013/08/14	NC		%	25
			1,2,4-Trichlorobenzene	2013/08/14	NC		%	25
			Hexachlorobutadiene	2013/08/14	NC		%	25
			Hexane	2013/08/14	NC		%	25
			Heptane	2013/08/14	NC		%	25
			Cyclohexane	2013/08/14	NC		%	25
			Tetrahydrofuran	2013/08/14	NC		%	25
			1,4-Dioxane	2013/08/14	NC		%	25
			Xylene (Total)	2013/08/14	NC		%	25

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Tiamat Environmental
Attention: Leon T. Mah
Client Project #: 12-435
P.O. #:
Site Location:

Quality Assurance Report (Continued)

Maxxam Job Number: GB3C8546

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	%Recovery	Units	QC Limits
3317067	JIW	RPD - Sample/Sample Dup	Vinyl Bromide	2013/08/14	NC		%	25
			Propene	2013/08/14	NC		%	25
			2,2,4-Trimethylpentane	2013/08/14	NC		%	25
			Carbon Disulfide	2013/08/14	NC		%	25
			Vinyl Acetate	2013/08/14	NC		%	25
3319686	JIW	Method Blank	Aliphatic >C5-C6	2013/08/14	ND, RDL=5.0		ug/m3	
			Aliphatic >C6-C8	2013/08/14	ND, RDL=5.0		ug/m3	
			Aliphatic >C8-C10	2013/08/14	ND, RDL=5.0		ug/m3	
			Aliphatic >C10-C12	2013/08/14	ND, RDL=5.0		ug/m3	
			Aliphatic >C12-C16	2013/08/14	ND, RDL=5.0		ug/m3	
			Aromatic >C7-C8 (TEX Excluded)	2013/08/14	ND, RDL=5.0		ug/m3	
			Aromatic >C8-C10	2013/08/14	ND, RDL=5.0		ug/m3	
			Aromatic >C10-C12	2013/08/14	ND, RDL=5.0		ug/m3	
			Aromatic >C12-C16	2013/08/14	ND, RDL=5.0		ug/m3	
3320596	JIW	Method Blank	Aliphatic >C5-C6	2013/08/15	ND, RDL=5.0		ug/m3	
			Aliphatic >C6-C8	2013/08/15	ND, RDL=5.0		ug/m3	
			Aliphatic >C8-C10	2013/08/15	ND, RDL=5.0		ug/m3	
			Aliphatic >C10-C12	2013/08/15	ND, RDL=5.0		ug/m3	
			Aliphatic >C12-C16	2013/08/15	ND, RDL=5.0		ug/m3	
			Aromatic >C7-C8 (TEX Excluded)	2013/08/15	ND, RDL=5.0		ug/m3	
			Aromatic >C8-C10	2013/08/15	ND, RDL=5.0		ug/m3	
			Aromatic >C10-C12	2013/08/15	ND, RDL=5.0		ug/m3	
			Aromatic >C12-C16	2013/08/15	ND, RDL=5.0		ug/m3	
3322553	VLA	Method Blank	Acetylene	2013/08/21	ND, RDL=0.1		ppm	
			Ethane	2013/08/21	ND, RDL=0.1		ppm	
			Ethylene	2013/08/21	ND, RDL=0.1		ppm	
			Methane	2013/08/21	ND, RDL=2		ppm	
			n-Butane	2013/08/21	ND, RDL=0.2		ppm	
			n-Pentane	2013/08/21	ND, RDL=0.1		ppm	
			Propane	2013/08/21	ND, RDL=0.1		ppm	
			Propene	2013/08/21	ND, RDL=0.1		ppm	
			Propyne	2013/08/21	ND, RDL=0.2		ppm	
		RPD - Sample/Sample Dup	Acetylene	2013/08/21	NC		%	20
			Ethane	2013/08/21	NC		%	20
			Ethylene	2013/08/21	NC		%	20
			Methane	2013/08/21	19.3		%	20
			n-Butane	2013/08/21	NC		%	20
			n-Pentane	2013/08/21	NC		%	20
			Propane	2013/08/21	NC		%	20
			Propene	2013/08/21	NC		%	20
			Propyne	2013/08/21	NC		%	20
3324319	TJC	Method Blank	Oxygen	2013/08/22	ND, RDL=0.1		% v/v	
			Nitrogen	2013/08/22	ND, RDL=0.1		% v/v	
			Carbon Monoxide	2013/08/22	ND, RDL=0.1		% v/v	
			Methane	2013/08/22	ND, RDL=0.1		% v/v	
			Carbon Dioxide	2013/08/22	ND, RDL=0.1		% v/v	
		RPD - Sample/Sample Dup	Oxygen	2013/08/22	0.1		%	20
			Nitrogen	2013/08/22	0.1		%	20
			Methane	2013/08/22	NC		%	20

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Tiamat Environmental
Attention: Leon T. Mah
Client Project #: 12-435
P.O. #:
Site Location:

Quality Assurance Report (Continued)

Maxxam Job Number: GB3C8546

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	%Recovery	Units	QC Limits
3324319	TJC	RPD - Sample/Sample Dup	Carbon Dioxide	2013/08/22	0		%	20

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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Success Through Science®

Your Project #: 12-435
Site Location: ROM
Your C.O.C. #: 18285

Attention: Leon T. Mah
Tiamat Environmental
107, 2719-7 Ave. NE
Calgary, AB
CANADA T2A 2L9

Report Date: 2013/08/25

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B3C8605
Received: 2013/08/07, 09:43

Sample Matrix: AIR
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
BTEX Fractionation in Air (TO-15mod)	1	N/A	2013/08/14	BRL SOP-00304	EPA TO-15mod
Canister Pressure (TO-15)	1	N/A	2013/08/14	BRL SOP-00304	EPA TO-15
Light Hydrocarbons	1	N/A	2013/08/21	CAM SOP-00227	GC/FID
Matrix Gases	1	N/A	2013/08/22	CAM SOP-00225, CAM SOP-00209	ASTM D1946-90
Volatile Organics in Air (TO-15) (1)	1	N/A	2013/08/14	BRL SOP-00304	EPA TO-15

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

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

Encryption Key

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

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

==========

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

Maxxam Analytics Inc. is a NELAC accredited laboratory. Certificate # CANA001. Use of the NELAC logo however does not insure that

Your Project #: 12-435
Site Location: ROM
Your C.O.C. #: 18285

Attention: Leon T. Mah
Tiamat Environmental
107, 2719-7 Ave. NE
Calgary, AB
CANADA T2A 2L9

Report Date: 2013/08/25

CERTIFICATE OF ANALYSIS

Total cover pages: 2

Maxxam Job #: B3C8605
Report Date: 2013/08/25

Tiamat Environmental
Client Project #: 12-435
Site Location: ROM
Sampler Initials: JAL

RESULTS OF ANALYSES OF AIR

Maxxam ID		SN8568		
Sampling Date		2013/08/03		
COC Number		18285		
	Units	**VW-02 / 1921**	**RDL**	**QC Batch**
Gas				
Acetylene	ppm	ND	0.28	3322553
Ethane	ppm	ND	0.28	3322553
Ethylene	ppm	ND	0.28	3322553
Methane	ppm	67	5.6	3322553
n-Butane	ppm	ND	0.56	3322553
n-Pentane	ppm	ND	0.28	3322553
Propane	ppm	ND	0.28	3322553
Propene	ppm	ND	0.28	3322553
Propyne	ppm	ND	0.56	3322553
Volatile Organics				
Pressure on Receipt	psig	(-3.6)	N/A	3317031

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B3C8605
Report Date: 2013/08/25

Tiamat Environmental
Client Project #: 12-435
Site Location: ROM
Sampler Initials: JAL

COMPRESSED GAS PARAMETERS (AIR)

Maxxam ID		SN8568		
Sampling Date		2013/08/03		
COC Number		18285		
	Units	**VW-02 / 1921**	**RDL**	**QC Batch**
Fixed Gases				
Oxygen	% v/v	17.2	0.3	3324319
Nitrogen	% v/v	77.8	0.3	3324319
Carbon Monoxide	% v/v	ND	0.3	3324319
Methane	% v/v	ND	0.3	3324319
Carbon Dioxide	% v/v	4.6	0.3	3324319

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Site Location: ROM
Sampler Initials: JAL

VOLATILE ORGANIC HYDROCARBONS BY GC/MS (AIR)

Maxxam ID		SN8568		
Sampling Date		2013/08/03		
COC Number		18285		
	Units	**VW-02 / 1921**	**RDL**	**QC Batch**
Volatile Organics				
Aliphatic >C5-C6	ug/m3	332	5.0	3319686
Aliphatic >C6-C8	ug/m3	2990	5.0	3319686
Aliphatic >C8-C10	ug/m3	577	5.0	3319686
Aliphatic >C10-C12	ug/m3	345	5.0	3319686
Aliphatic >C12-C16	ug/m3	106	5.0	3319686
Aromatic >C7-C8 (TEX Excluded)	ug/m3	ND	5.0	3319686
Aromatic >C8-C10	ug/m3	44.8	5.0	3319686
Aromatic >C10-C12	ug/m3	78.4	5.0	3319686
Aromatic >C12-C16	ug/m3	ND	5.0	3319686

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Site Location: ROM
Sampler Initials: JAL

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		SN8568				
Sampling Date		2013/08/03				
COC Number		18285				
	Units	**VW-02 / 1921**	**RDL**	**ug/m3**	**DL (ug/m3)**	**QC Batch**
Volatile Organics						
Dichlorodifluoromethane (FREON 12)	ppbv	348	1.1	1720	5.54	3317067
1,2-Dichlorotetrafluoroethane	ppbv	34.4	0.17	240	1.19	3317067
Chloromethane	ppbv	<0.30	0.30	<0.620	0.620	3317067
Vinyl Chloride	ppbv	0.51	0.18	1.29	0.460	3317067
Chloroethane	ppbv	<0.30	0.30	<0.792	0.792	3317067
1,3-Butadiene	ppbv	<0.50	0.50	<1.11	1.11	3317067
Trichlorofluoromethane (FREON 11)	ppbv	50.6	0.20	284	1.12	3317067
Ethanol (ethyl alcohol)	ppbv	180	13	338	24.3	3317067
Trichlorotrifluoroethane	ppbv	<0.15	0.15	<1.15	1.15	3317067
2-propanol	ppbv	3.6	3.0	8.94	7.37	3317067
2-Propanone	ppbv	36.5	0.80	86.7	1.90	3317067
Methyl Ethyl Ketone (2-Butanone)	ppbv	<3.0	3.0	<8.85	8.85	3317067
Methyl Isobutyl Ketone	ppbv	<3.2	3.2	<13.1	13.1	3317067
Methyl Butyl Ketone (2-Hexanone)	ppbv	<2.0	2.0	<8.19	8.19	3317067
Methyl t-butyl ether (MTBE)	ppbv	<0.20	0.20	<0.721	0.721	3317067
Ethyl Acetate	ppbv	<2.2	2.2	<7.93	7.93	3317067
1,1-Dichloroethylene	ppbv	1.41	0.25	5.60	0.991	3317067
cis-1,2-Dichloroethylene	ppbv	13.2	0.19	52.3	0.753	3317067
trans-1,2-Dichloroethylene	ppbv	<0.20	0.20	<0.793	0.793	3317067
Methylene Chloride(Dichloromethane)	ppbv	1.47	0.80	5.10	2.78	3317067
Chloroform	ppbv	18.2	0.15	88.8	0.732	3317067
Carbon Tetrachloride	ppbv	<0.30	0.30	<1.89	1.89	3317067
1,1-Dichloroethane	ppbv	<2.7	2.7	<11.1	11.1	3317067
1,2-Dichloroethane	ppbv	<0.20	0.20	<0.809	0.809	3317067
Ethylene Dibromide	ppbv	<0.17	0.17	<1.31	1.31	3317067
1,1,1-Trichloroethane	ppbv	3.45	0.30	18.8	1.64	3317067
1,1,2-Trichloroethane	ppbv	<0.15	0.15	<0.818	0.818	3317067
1,1,2,2-Tetrachloroethane	ppbv	<0.20	0.20	<1.37	1.37	3317067
cis-1,3-Dichloropropene	ppbv	<0.18	0.18	<0.817	0.817	3317067
trans-1,3-Dichloropropene	ppbv	<0.17	0.17	<0.772	0.772	3317067
1,2-Dichloropropane	ppbv	<0.40	0.40	<1.85	1.85	3317067
Bromomethane	ppbv	<0.18	0.18	<0.699	0.699	3317067
Bromoform	ppbv	<0.20	0.20	<2.07	2.07	3317067

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B3C8605
Report Date: 2013/08/25

Tiamat Environmental
Client Project #: 12-435
Site Location: ROM
Sampler Initials: JAL

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		SN8568				
Sampling Date		2013/08/03				
COC Number		18285				
	Units	**VW-02 / 1921**	**RDL**	**ug/m3**	**DL (ug/m3)**	**QC Batch**
Bromodichloromethane	ppbv	<0.20	0.20	<1.34	1.34	3317067
Dibromochloromethane	ppbv	<0.20	0.20	<1.70	1.70	3317067
Trichloroethylene	ppbv	81.9	0.30	440	1.61	3317067
Tetrachloroethylene	ppbv	221	1.1	1500	7.60	3317067
Benzene	ppbv	5.17	0.18	16.5	0.575	3317067
Toluene	ppbv	4.80	0.20	18.1	0.753	3317067
Ethylbenzene	ppbv	0.75	0.20	3.24	0.868	3317067
p+m-Xylene	ppbv	1.89	0.37	8.23	1.61	3317067
o-Xylene	ppbv	1.22	0.20	5.29	0.868	3317067
Styrene	ppbv	<0.20	0.20	<0.852	0.852	3317067
4-ethyltoluene	ppbv	<2.2	2.2	<10.8	10.8	3317067
1,3,5-Trimethylbenzene	ppbv	4.05	0.50	19.9	2.46	3317067
1,2,4-Trimethylbenzene	ppbv	2.31	0.50	11.3	2.46	3317067
Chlorobenzene	ppbv	<0.20	0.20	<0.921	0.921	3317067
Benzyl chloride	ppbv	<1.0	1.0	<5.18	5.18	3317067
1,3-Dichlorobenzene	ppbv	<0.40	0.40	<2.40	2.40	3317067
1,4-Dichlorobenzene	ppbv	<0.40	0.40	<2.40	2.40	3317067
1,2-Dichlorobenzene	ppbv	<0.40	0.40	<2.40	2.40	3317067
1,2,4-Trichlorobenzene	ppbv	<2.0	2.0	<14.8	14.8	3317067
Hexachlorobutadiene	ppbv	<3.0	3.0	<32.0	32.0	3317067
Hexane	ppbv	142	0.30	501	1.06	3317067
Heptane	ppbv	181	0.30	740	1.23	3317067
Cyclohexane	ppbv	219	1.1	753	3.86	3317067
Tetrahydrofuran	ppbv	<0.40	0.40	<1.18	1.18	3317067
1,4-Dioxane	ppbv	<2.0	2.0	<7.21	7.21	3317067
Xylene (Total)	ppbv	3.11	0.60	13.5	2.61	3317067
Vinyl Bromide	ppbv	<0.20	0.20	<0.875	0.875	3317067
Propene	ppbv	<8.7	8.7	<14.9	14.9	3317067
2,2,4-Trimethylpentane	ppbv	<0.20	0.20	<0.934	0.934	3317067
Carbon Disulfide	ppbv	40.5	0.50	126	1.56	3317067
Vinyl Acetate	ppbv	<0.20	0.20	<0.704	0.704	3317067
Surrogate Recovery (%)						
Bromochloromethane	%	99		N/A	N/A	3317067
D5-Chlorobenzene	%	103		N/A	N/A	3317067

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

Maxxam Job #: B3C8605
Report Date: 2013/08/25

Tiamat Environmental
Client Project #: 12-435
Site Location: ROM
Sampler Initials: JAL

VOLATILE ORGANICS BY GC/MS (AIR)

Maxxam ID		SN8568				
Sampling Date		2013/08/03				
COC Number		18285				
	Units	**VW-02 / 1921**	**RDL**	**ug/m3**	**DL (ug/m3)**	**QC Batch**
Difluorobenzene	%	106		N/A	N/A	3317067

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

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Maxxam Job #: B3C8605
Report Date: 2013/08/25

Tiamat Environmental
Client Project #: 12-435
Site Location: ROM
Sampler Initials: JAL

Test Summary

Maxxam ID SN8568
Sample ID VW-02 / 1921
Matrix AIR

Collected 2013/08/03
Shipped
Received 2013/08/07

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
BTEX Fractionation in Air (TO-15mod)	GC/MS	3319686	N/A	2013/08/14	Jie Wu
Canister Pressure (TO-15)	PRES	3317031	N/A	2013/08/14	Jie Wu
Light Hydrocarbons	GC/FID	3322553	N/A	2013/08/21	Vijay Lad
Matrix Gases	GC/TCD	3324319	N/A	2013/08/22	Tonghui (Jenny) Chen
Volatile Organics in Air (TO-15)	GC/MS	3317067	N/A	2013/08/14	Jie Wu

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Maxxam Job #: B3C8605
Report Date: 2013/08/25

Tiamat Environmental
Client Project #: 12-435
Site Location: ROM
Sampler Initials: JAL

GENERAL COMMENTS

ws:3317067
Ethanol exceeds 130% recovery criteria in Reference Standard. It meets %RSD criteria in the Continuing Calibration Standard. Data was accepted and flagged.

Light Hydrocarbon/Matrix Gas Analysis: Canister was pressurized with Helium to enable sampling. Results and DLs adjusted accordingly.

Sample SN8568-01: Increased DL further for propene and 1,1-dichloroethane due to possible interference.

A 5.6x dilution was prepared and analyzed for dichlorodifluoromethane, ethanol, cyclohexane and tetrachloroethylene. The DLs were adjusted accordingly.

Results relate only to the items tested.

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Tiamat Environmental
Attention: Leon T. Mah
Client Project #: 12-435
P.O. #:
Site Location: ROM

Quality Assurance Report

Maxxam Job Number: GB3C8605

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	%Recovery	Units	QC Limits
3317067	JIW	Spiked Blank	Bromochloromethane	2013/08/14		101	%	60 - 140
			D5-Chlorobenzene	2013/08/14		111	%	60 - 140
			Difluorobenzene	2013/08/14		107	%	60 - 140
			Dichlorodifluoromethane (FREON 12)	2013/08/14		108	%	70 - 130
			1,2-Dichlorotetrafluoroethane	2013/08/14		115	%	70 - 130
			Chloromethane	2013/08/14		113	%	70 - 130
			Vinyl Chloride	2013/08/14		107	%	70 - 130
			Chloroethane	2013/08/14		100	%	70 - 130
			1,3-Butadiene	2013/08/14		109	%	70 - 130
			Trichlorofluoromethane (FREON 11)	2013/08/14		103	%	70 - 130
			Ethanol (ethyl alcohol)	2013/08/14		141 (1)	%	70 - 130
			Trichlorotrifluoroethane	2013/08/14		97	%	70 - 130
			2-propanol	2013/08/14		118	%	70 - 130
			2-Propanone	2013/08/14		107	%	70 - 130
			Methyl Ethyl Ketone (2-Butanone)	2013/08/14		109	%	70 - 130
			Methyl Isobutyl Ketone	2013/08/14		110	%	70 - 130
			Methyl Butyl Ketone (2-Hexanone)	2013/08/14		115	%	70 - 130
			Methyl t-butyl ether (MTBE)	2013/08/14		106	%	70 - 130
			Ethyl Acetate	2013/08/14		114	%	70 - 130
			1,1-Dichloroethylene	2013/08/14		103	%	70 - 130
			cis-1,2-Dichloroethylene	2013/08/14		106	%	70 - 130
			trans-1,2-Dichloroethylene	2013/08/14		104	%	70 - 130
			Methylene Chloride(Dichloromethane)	2013/08/14		99	%	70 - 130
			Chloroform	2013/08/14		102	%	70 - 130
			Carbon Tetrachloride	2013/08/14		99	%	70 - 130
			1,1-Dichloroethane	2013/08/14		105	%	70 - 130
			1,2-Dichloroethane	2013/08/14		106	%	70 - 130
			Ethylene Dibromide	2013/08/14		100	%	70 - 130
			1,1,1-Trichloroethane	2013/08/14		100	%	70 - 130
			1,1,2-Trichloroethane	2013/08/14		97	%	70 - 130
			1,1,2,2-Tetrachloroethane	2013/08/14		98	%	70 - 130
			cis-1,3-Dichloropropene	2013/08/14		104	%	70 - 130
			trans-1,3-Dichloropropene	2013/08/14		111	%	70 - 130
			1,2-Dichloropropane	2013/08/14		100	%	70 - 130
			Bromomethane	2013/08/14		96	%	70 - 130
			Bromoform	2013/08/14		95	%	70 - 130
			Bromodichloromethane	2013/08/14		102	%	70 - 130
			Dibromochloromethane	2013/08/14		99	%	70 - 130
			Trichloroethylene	2013/08/14		92	%	70 - 130
			Tetrachloroethylene	2013/08/14		94	%	70 - 130
			Benzene	2013/08/14		97	%	70 - 130
			Toluene	2013/08/14		99	%	70 - 130
			Ethylbenzene	2013/08/14		97	%	70 - 130
			p+m-Xylene	2013/08/14		97	%	70 - 130
			o-Xylene	2013/08/14		100	%	70 - 130
			Styrene	2013/08/14		102	%	70 - 130
			4-ethyltoluene	2013/08/14		99	%	70 - 130
			1,3,5-Trimethylbenzene	2013/08/14		99	%	70 - 130
			1,2,4-Trimethylbenzene	2013/08/14		102	%	70 - 130
			Chlorobenzene	2013/08/14		95	%	70 - 130
			Benzyl chloride	2013/08/14		101	%	70 - 130
			1,3-Dichlorobenzene	2013/08/14		103	%	70 - 130
			1,4-Dichlorobenzene	2013/08/14		100	%	70 - 130
			1,2-Dichlorobenzene	2013/08/14		97	%	70 - 130
			1,2,4-Trichlorobenzene	2013/08/14		117	%	70 - 130

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Tiamat Environmental
Attention: Leon T. Mah
Client Project #: 12-435
P.O. #:
Site Location: ROM

Quality Assurance Report (Continued)

Maxxam Job Number: GB3C8605

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	%Recovery	Units	QC Limits
3317067	JIW	Spiked Blank	Hexachlorobutadiene	2013/08/14		110	%	70 - 130
			Hexane	2013/08/14		111	%	70 - 130
			Heptane	2013/08/14		109	%	70 - 130
			Cyclohexane	2013/08/14		105	%	70 - 130
			Tetrahydrofuran	2013/08/14		118	%	70 - 130
			1,4-Dioxane	2013/08/14		106	%	70 - 130
			Xylene (Total)	2013/08/14		98	%	70 - 130
			Vinyl Bromide	2013/08/14		94	%	70 - 130
			Propene	2013/08/14		106	%	70 - 130
			2,2,4-Trimethylpentane	2013/08/14		102	%	70 - 130
			Carbon Disulfide	2013/08/14		104	%	70 - 130
			Vinyl Acetate	2013/08/14		115	%	70 - 130
		Method Blank	Bromochloromethane	2013/08/14		92	%	60 - 140
			D5-Chlorobenzene	2013/08/14		84	%	60 - 140
			Difluorobenzene	2013/08/14		96	%	60 - 140
			Dichlorodifluoromethane (FREON 12)	2013/08/14	ND, RDL=0.20		ppbv	
			1,2-Dichlorotetrafluoroethane	2013/08/14	ND, RDL=0.17		ppbv	
			Chloromethane	2013/08/14	ND, RDL=0.30		ppbv	
			Vinyl Chloride	2013/08/14	ND, RDL=0.18		ppbv	
			Chloroethane	2013/08/14	ND, RDL=0.30		ppbv	
			1,3-Butadiene	2013/08/14	ND, RDL=0.50		ppbv	
			Trichlorofluoromethane (FREON 11)	2013/08/14	ND, RDL=0.20		ppbv	
			Ethanol (ethyl alcohol)	2013/08/14	ND, RDL=2.3		ppbv	
			Trichlorotrifluoroethane	2013/08/14	ND, RDL=0.15		ppbv	
			2-propanol	2013/08/14	ND, RDL=3.0		ppbv	
			2-Propanone	2013/08/14	ND, RDL=0.80		ppbv	
			Methyl Ethyl Ketone (2-Butanone)	2013/08/14	ND, RDL=3.0		ppbv	
			Methyl Isobutyl Ketone	2013/08/14	ND, RDL=3.2		ppbv	
			Methyl Butyl Ketone (2-Hexanone)	2013/08/14	ND, RDL=2.0		ppbv	
			Methyl t-butyl ether (MTBE)	2013/08/14	ND, RDL=0.20		ppbv	
			Ethyl Acetate	2013/08/14	ND, RDL=2.2		ppbv	
			1,1-Dichloroethylene	2013/08/14	ND, RDL=0.25		ppbv	
			cis-1,2-Dichloroethylene	2013/08/14	ND, RDL=0.19		ppbv	
			trans-1,2-Dichloroethylene	2013/08/14	ND, RDL=0.20		ppbv	
			Methylene Chloride(Dichloromethane)	2013/08/14	ND, RDL=0.80		ppbv	
			Chloroform	2013/08/14	ND, RDL=0.15		ppbv	
			Carbon Tetrachloride	2013/08/14	ND, RDL=0.30		ppbv	
			1,1-Dichloroethane	2013/08/14	ND, RDL=0.20		ppbv	
			1,2-Dichloroethane	2013/08/14	ND, RDL=0.20		ppbv	
			Ethylene Dibromide	2013/08/14	ND, RDL=0.17		ppbv	
			1,1,1-Trichloroethane	2013/08/14	ND, RDL=0.30		ppbv	
			1,1,2-Trichloroethane	2013/08/14	ND, RDL=0.15		ppbv	
			1,1,2,2-Tetrachloroethane	2013/08/14	ND, RDL=0.20		ppbv	
			cis-1,3-Dichloropropene	2013/08/14	ND, RDL=0.18		ppbv	
			trans-1,3-Dichloropropene	2013/08/14	ND, RDL=0.17		ppbv	
			1,2-Dichloropropane	2013/08/14	ND, RDL=0.40		ppbv	
			Bromomethane	2013/08/14	ND, RDL=0.18		ppbv	
			Bromoform	2013/08/14	ND, RDL=0.20		ppbv	
			Bromodichloromethane	2013/08/14	ND, RDL=0.20		ppbv	
			Dibromochloromethane	2013/08/14	ND, RDL=0.20		ppbv	
			Trichloroethylene	2013/08/14	ND, RDL=0.30		ppbv	
			Tetrachloroethylene	2013/08/14	ND, RDL=0.20		ppbv	
			Benzene	2013/08/14	ND, RDL=0.18		ppbv	
			Toluene	2013/08/14	ND, RDL=0.20		ppbv	
			Ethylbenzene	2013/08/14	ND, RDL=0.20		ppbv	

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Tiamat Environmental
Attention: Leon T. Mah
Client Project #: 12-435
P.O. #:
Site Location: ROM

Quality Assurance Report (Continued)

Maxxam Job Number: GB3C8605

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	%Recovery	Units	QC Limits
3317067	JIW	Method Blank	p+m-Xylene	2013/08/14	ND, RDL=0.37		ppbv	
			o-Xylene	2013/08/14	ND, RDL=0.20		ppbv	
			Styrene	2013/08/14	ND, RDL=0.20		ppbv	
			4-ethyltoluene	2013/08/14	ND, RDL=2.2		ppbv	
			1,3,5-Trimethylbenzene	2013/08/14	ND, RDL=0.50		ppbv	
			1,2,4-Trimethylbenzene	2013/08/14	ND, RDL=0.50		ppbv	
			Chlorobenzene	2013/08/14	ND, RDL=0.20		ppbv	
			Benzyl chloride	2013/08/14	ND, RDL=1.0		ppbv	
			1,3-Dichlorobenzene	2013/08/14	ND, RDL=0.40		ppbv	
			1,4-Dichlorobenzene	2013/08/14	ND, RDL=0.40		ppbv	
			1,2-Dichlorobenzene	2013/08/14	ND, RDL=0.40		ppbv	
			1,2,4-Trichlorobenzene	2013/08/14	ND, RDL=2.0		ppbv	
			Hexachlorobutadiene	2013/08/14	ND, RDL=3.0		ppbv	
			Hexane	2013/08/14	ND, RDL=0.30		ppbv	
			Heptane	2013/08/14	ND, RDL=0.30		ppbv	
			Cyclohexane	2013/08/14	ND, RDL=0.20		ppbv	
			Tetrahydrofuran	2013/08/14	ND, RDL=0.40		ppbv	
			1,4-Dioxane	2013/08/14	ND, RDL=2.0		ppbv	
			Xylene (Total)	2013/08/14	ND, RDL=0.60		ppbv	
			Vinyl Bromide	2013/08/14	ND, RDL=0.20		ppbv	
			Propene	2013/08/14	ND, RDL=0.30		ppbv	
			2,2,4-Trimethylpentane	2013/08/14	ND, RDL=0.20		ppbv	
			Carbon Disulfide	2013/08/14	ND, RDL=0.50		ppbv	
			Vinyl Acetate	2013/08/14	ND, RDL=0.20		ppbv	
		RPD - Sample/Sample Dup	Dichlorodifluoromethane (FREON 12)	2013/08/14	NC		%	25
			1,2-Dichlorotetrafluoroethane	2013/08/14	NC		%	25
			Chloromethane	2013/08/14	NC		%	25
			Chloroethane	2013/08/14	NC		%	25
			1,3-Butadiene	2013/08/14	NC		%	25
			Trichlorofluoromethane (FREON 11)	2013/08/14	NC		%	25
			Ethanol (ethyl alcohol)	2013/08/14	NC		%	25
			Trichlorotrifluoroethane	2013/08/14	NC		%	25
			2-propanol	2013/08/14	NC		%	25
			2-Propanone	2013/08/14	4.5		%	25
			Methyl Ethyl Ketone (2-Butanone)	2013/08/14	NC		%	25
			Methyl Isobutyl Ketone	2013/08/14	NC		%	25
			Methyl Butyl Ketone (2-Hexanone)	2013/08/14	NC		%	25
			Methyl t-butyl ether (MTBE)	2013/08/14	NC		%	25
			Ethyl Acetate	2013/08/14	NC		%	25
			1,1-Dichloroethylene	2013/08/14	NC		%	25
			cis-1,2-Dichloroethylene	2013/08/14	NC		%	25
			trans-1,2-Dichloroethylene	2013/08/14	NC		%	25
			Methylene Chloride(Dichloromethane)	2013/08/14	NC		%	25
			Chloroform	2013/08/14	NC		%	25
			Carbon Tetrachloride	2013/08/14	NC		%	25
			1,1-Dichloroethane	2013/08/14	NC		%	25
			1,2-Dichloroethane	2013/08/14	NC		%	25
			Ethylene Dibromide	2013/08/14	NC		%	25
			1,1,1-Trichloroethane	2013/08/14	NC		%	25
			1,1,2-Trichloroethane	2013/08/14	NC		%	25
			1,1,2,2-Tetrachloroethane	2013/08/14	NC		%	25
			cis-1,3-Dichloropropene	2013/08/14	NC		%	25
			trans-1,3-Dichloropropene	2013/08/14	NC		%	25

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Tiamat Environmental
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Client Project #: 12-435
P.O. #:
Site Location: ROM

Quality Assurance Report (Continued)

Maxxam Job Number: GB3C8605

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	%Recovery	Units	QC Limits
3317067	JIW	RPD - Sample/Sample Dup	1,2-Dichloropropane	2013/08/14	NC		%	25
			Bromomethane	2013/08/14	NC		%	25
			Bromoform	2013/08/14	NC		%	25
			Bromodichloromethane	2013/08/14	NC		%	25
			Dibromochloromethane	2013/08/14	NC		%	25
			Trichloroethylene	2013/08/14	NC		%	25
			Tetrachloroethylene	2013/08/14	NC		%	25
			Benzene	2013/08/14	NC		%	25
			Toluene	2013/08/14	NC		%	25
			Ethylbenzene	2013/08/14	NC		%	25
			p+m-Xylene	2013/08/14	NC		%	25
			o-Xylene	2013/08/14	NC		%	25
			Styrene	2013/08/14	NC		%	25
			4-ethyltoluene	2013/08/14	NC		%	25
			1,3,5-Trimethylbenzene	2013/08/14	NC		%	25
			1,2,4-Trimethylbenzene	2013/08/14	NC		%	25
			Chlorobenzene	2013/08/14	NC		%	25
			Benzyl chloride	2013/08/14	NC		%	25
			1,3-Dichlorobenzene	2013/08/14	NC		%	25
			1,4-Dichlorobenzene	2013/08/14	NC		%	25
			1,2-Dichlorobenzene	2013/08/14	NC		%	25
			1,2,4-Trichlorobenzene	2013/08/14	NC		%	25
			Hexachlorobutadiene	2013/08/14	NC		%	25
			Hexane	2013/08/14	NC		%	25
			Heptane	2013/08/14	NC		%	25
			Cyclohexane	2013/08/14	NC		%	25
			Tetrahydrofuran	2013/08/14	NC		%	25
			1,4-Dioxane	2013/08/14	NC		%	25
			Xylene (Total)	2013/08/14	NC		%	25
			Vinyl Bromide	2013/08/14	NC		%	25
			Propene	2013/08/14	NC		%	25
			2,2,4-Trimethylpentane	2013/08/14	NC		%	25
			Carbon Disulfide	2013/08/14	NC		%	25
			Vinyl Acetate	2013/08/14	NC		%	25
3319686	JIW	Method Blank	Aliphatic >C5-C6	2013/08/14	ND, RDL=5.0		ug/m3	
			Aliphatic >C6-C8	2013/08/14	ND, RDL=5.0		ug/m3	
			Aliphatic >C8-C10	2013/08/14	ND, RDL=5.0		ug/m3	
			Aliphatic >C10-C12	2013/08/14	ND, RDL=5.0		ug/m3	
			Aliphatic >C12-C16	2013/08/14	ND, RDL=5.0		ug/m3	
			Aromatic >C7-C8 (TEX Excluded)	2013/08/14	ND, RDL=5.0		ug/m3	
			Aromatic >C8-C10	2013/08/14	ND, RDL=5.0		ug/m3	
			Aromatic >C10-C12	2013/08/14	ND, RDL=5.0		ug/m3	
			Aromatic >C12-C16	2013/08/14	ND, RDL=5.0		ug/m3	
3322553	VLA	Method Blank	Acetylene	2013/08/21	ND, RDL=0.1		ppm	
			Ethane	2013/08/21	ND, RDL=0.1		ppm	
			Ethylene	2013/08/21	ND, RDL=0.1		ppm	
			Methane	2013/08/21	ND, RDL=2		ppm	
			n-Butane	2013/08/21	ND, RDL=0.2		ppm	
			n-Pentane	2013/08/21	ND, RDL=0.1		ppm	
			Propane	2013/08/21	ND, RDL=0.1		ppm	
			Propene	2013/08/21	ND, RDL=0.1		ppm	
			Propyne	2013/08/21	ND, RDL=0.2		ppm	
		RPD - Sample/Sample Dup	Acetylene	2013/08/21	NC		%	20

This document is in electronic format, hard copy is available on request.

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

Tiamat Environmental
Attention: Leon T. Mah
Client Project #: 12-435
P.O. #:
Site Location: ROM

Quality Assurance Report (Continued)

Maxxam Job Number: GB3C8605

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	%Recovery	Units	QC Limits
3322553	VLA	RPD - Sample/Sample Dup	Ethane	2013/08/21	NC		%	20
			Ethylene	2013/08/21	NC		%	20
			Methane	2013/08/21	19.3		%	20
			n-Butane	2013/08/21	NC		%	20
			n-Pentane	2013/08/21	NC		%	20
			Propane	2013/08/21	NC		%	20
			Propene	2013/08/21	NC		%	20
			Propyne	2013/08/21	NC		%	20
3324319	TJC	Method Blank	Oxygen	2013/08/22	ND, RDL=0.1		% v/v	
			Nitrogen	2013/08/22	ND, RDL=0.1		% v/v	
			Carbon Monoxide	2013/08/22	ND, RDL=0.1		% v/v	
			Methane	2013/08/22	ND, RDL=0.1		% v/v	
			Carbon Dioxide	2013/08/22	ND, RDL=0.1		% v/v	
		RPD - Sample/Sample Dup	Oxygen	2013/08/22	0.1		%	20
			Nitrogen	2013/08/22	0.1		%	20
			Methane	2013/08/22	NC		%	20
			Carbon Dioxide	2013/08/22	0		%	20

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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REPORT OF ANALYSIS: Maxxam Analytics - B3C8489/B3C8505/B3C8538/B3C8549 - Selected Siloxanes (TIVA)

REPORT: 13033/13034/13035/13036si (Method -SCANATD-GC-MSD Cryogenic Oven Control)

	DESCRIPTION	13080918	13080918	13080918	13080918	13081202	13081202	13081202	13081202	13081204	13081204	13081204	13081204
CAS #	COMPOUND	SN8076-01 VM-01 V=10.0mL	SN8076-01 VM-01 V=10.0mL	Silicon Equivalent	Silicon Equivalent	SN8077-01 VM-02 V=25mL	SN8077-01 VM-02 V=25mL	Silicon Equivalent	Silicon Equivalent	SN8148-01 VW-03 (RDM) V=200mL	SN8148-01 VW-03 (RDM) V=200mL	Silicon Equivalent	Silicon Equivalent
		mg/m³	ppm	mg/m³	ppm	mg/m³	ppm	mg/m³	ppm	mg/m³	ppm	mg/m³	ppm
420-56-4	Trimethylsilyl Fluoride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
75-76-3	Tetramethylsilane	<0.0022	<0.0006	<0.0007	<0.0006	<0.0010	<0.0003	<0.0003	<0.0003	<0.0001	<0.0001	<0.0001	<0.0001
1825-61-2	Methoxytrimethylsilane	<0.0563	<0.0132	<0.0152	<0.0132	<0.0265	<0.0062	<0.0071	<0.0062	<0.0032	<0.0007	<0.0009	<0.0007
1825-62-3	Ethoxytrimethylsilane	<0.0543	<0.0112	<0.0129	<0.0112	<0.0255	<0.0053	<0.0061	<0.0053	<0.0031	<0.0006	<0.0007	<0.0006
1066-40-6	Trimethylsilanol	0.0338	0.0092	0.0105	0.0092	ND	ND	ND	ND	0.0098	0.0027	0.0031	0.0027
1825-64-5	Isopropoxytrimethylsilane	<0.0229	<0.0042	<0.0049	<0.0042	<0.0108	<0.0020	<0.0023	<0.0020	<0.0013	<0.0002	<0.0003	<0.0002
1185-55-3	Trimethoxymethyl Silane #	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
107-46-0	Hexamethyl Disiloxane - L2	<0.0021	<0.0003	<0.0007	<0.0006	<0.0010	<0.0001	<0.0003	<0.0003	<0.0001	<0.0001	<0.0001	<0.0001
1825-63-4	Propoxytrimethylsilane	<0.0621	<0.0115	<0.0132	<0.0115	<0.0292	<0.0054	<0.0062	<0.0054	<0.0035	<0.0006	<0.0007	<0.0006
1825-67-8	1-Methylbutoxytrimethylsilane *	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1825-65-6	Butoxytrimethylsilane *	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2768-02-7	Trimethoxyvinyl Silane #	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
541-05-9	Hexamethyl Cyclotrisiloxane - D3	0.1927	0.0212	0.0730	0.0636	0.0844	0.0093	0.0320	0.0278	0.0146	0.0016	0.0055	0.0048
107-51-7	Octamethyl Trisiloxane - L3	<0.0041	<0.0004	<0.0014	<0.0013	<0.0019	<0.0002	<0.0007	<0.0006	<0.0002	<0.0001	<0.0001	<0.0001
78-08-0	Triethoxyvinyl Silane #	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
78-07-9	Triethoxyethyl Silane #	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
556-67-2	Octamethyl Cyclotetrasiloxane - D4	0.0739	0.0061	0.0280	0.0244	0.0299	0.0025	0.0113	0.0099	0.0234	0.0019	0.0089	0.0077
141-62-8	Decamethyl Tetrasiloxane - L4	<0.0053	<0.0004	<0.0019	<0.0017	<0.0025	<0.0002	<0.0009	<0.0008	<0.0003	<0.0001	<0.0001	<0.0001
78-10-4	Tetraethylsilicate #	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
541-02-6	Decamethyl Cyclopentasiloxane - D	0.0349	0.0023	0.0132	0.0115	0.0321	0.0021	0.0122	0.0106	0.0420	0.0028	0.0159	0.0138
141-63-9	Dodecamethyl Pentasiloxane - L5	<0.0528	<0.0034	<0.0193	<0.0168	<0.0249	<0.0016	<0.0091	<0.0079	<0.0030	<0.0002	<0.0011	<0.0009
540-97-6	Dodecamethyl Cyclohexasiloxane -	<0.0531	<0.0029	<0.0201	<0.0175	0.1454	0.0080	0.0551	0.0480	0.1513	0.0083	0.0573	0.0499
	Sum	0.6503	0.0870	0.2150	0.1873	0.4152	0.0432	0.1436	0.1251	0.2559	0.0198	0.0946	0.0824

< (ND) = Characteristic ions are not present therefore Not Detected
< (TRACE) = Characteristic ions present but too low to be quantified
V = Volume of air/gas sampled
* = Semiquantitative (Response Factor set at 5)
# = Unstable, poor detectability, commercial standards tested

APPENDIX B

TESTHOLE LOGS

TERMS USED ON BOREHOLE LOGS

Terminology Common Soil Genesis

Rootmat	vegetation roots and moss with organic matter and topsoil typically forming a mattress at the ground surface.
Topsoil	mixture of soil and humus capable of supporting good vegetative growth
Peat	fibrous aggregate of visible and invisible fragments of decayed organic matter
Loam	silty sand or sand mixed with silt and organics
Till	unstratified glacial deposit which may range from clay to boulders
Fill	any materials below the surface identified as placed by excavation activities (excluding buried services)

Common Soil Structure

Slickensided	Having inclined planes of weakness that are slick and glossy in appearance.
Fissured	Containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical.
Laminated	Composed of thin layers of varying color and texture.
Interbedded	Composed of alternate layers of different soil types.
Calcareous	Containing appreciable quantities of calcium carbonate.
Well Graded	Having wide range in grain sizes and substantial amounts of intermediate particle sizes.
Poorly graded	Predominantly of one grain size, or having a range of sizes with some intermediate sizes missing.
Homogeneous	same color and appearance throughout
Stratified	composed of alternating successions of different soil types, eg. silt and sand
Lensed	inclusion of small pockets of different soils
Laminated	alternating layers of varying material or color with the layers less than 6 mm thick
Layer	thickness > 75mm
Seam	thickness between 2 mm and 75 mm
Parting	thickness <2 mm

Grain Size and Plasticity

Description of soils on the basis of grain size and plasticity is based on the Unified Soil Classification System (USCS) (ASTM D-2487). The classification excludes particles larger than 76 mm (3 inches). This system provides a ground symbol (eg., SM) and group name (eg., silty SAND) for identification. Note: terminology describing materials in the absence of laboratory analysis is based on a visual method (ASTM D-2488).

Descriptors for soil materials outside the USCS (eg., particles larger that 76 mm, visible organic matter, construction debris) is based on the (visually estimated) proportion of these materials present:

Trace, or occasional	Less than approximately 10%
Some	Approximately 10 – 20%
Frequent	Greater than approximately 20%

Solid lines between soil strata indicate the interpreted boundary between different soil types. Dashed line between soil strata indicates the contact between different soil units has been inferred.

Consistency of Cohesive Soils (Fine-Grained Soils)

Fine-grained soils (major portion passing 0.075mm sieve): includes (1) inorganic and organic silts and clays. (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as estimated from laboratory or in-situ tests.

The standard nomenclature to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by in situ tests, penetrometer tests, unconfined compression tests, or occasionally by standard penetration tests.

Standard Penetration Test 'N-Value'

The Standard Penetration Test provides an "N-value; the number of blows of a 64 kg (140 pound) hammer falling 760 mm (30 inches) required to drive a 51 mm (2 inch) O.D. split spoon sampler 305 mm (one foot) into the soil. For split spoon samples where insufficient penetration is achieved and 'N' values cannot be determined, the number of blows is reported over sampler penetration in millimeters; e.g. blows/penetration = 50/75.

Consistency	Unconfined Compressive Strength (kPa)	N-Value
Very Soft	<25	<2
Soft	25-50	2-4
Firm	50-100	4-8
Stiff	100-200	8-15
Very Stiff	200-400	15-30
Hard	>400	>30

NOTE: Slackened and fissured clays may have lower unconfined compressive strengths than shown above, because of naturally occurring planes of weakness or cracks in the soil.

Density of Cohesionless Soils (Coarse-grained Soils)

Coarse-grained soils (major portion retained on 0.075 mm sieve): includes (1) clean gravels and sands, and (2) silty or clayey gravels and sands. Condition is rated according to relative density, as inferred from laboratory or in-situ tests.

The standard terminology to describe cohesionless soils includes the compactness (former "relative density"), as determined by laboratory test or by the Standard Penetration Test 'N-Value'.

Density	N Value (Blows per 0.3m)	Relative Density - % Compactness
Very Loose	0-4	0-20
Loose	4-10	20-40
Compact	10-30	40-75
Dense	30-50	75-90
Very Dense	>50	90-100

PROJECT: Phase II Environmental Site Assessment	**BOREHOLE No.:** MW-01
PROJECT No.: 12-435	**DRILL TYPE:** SS Auger
LOCATION: Red Deer Motors Site	**GROUND ELEVATION:** 874.014 m
CLIENT: The City of Red Deer	**COMPLETION DATE:** 06/26/2013

Sample Type: Shelby Tube | Split Spoon | Core | Disturbed | No Recovery

Backfill Type: Bentonite | Silica Sand | Grout | Pea Gravel | Drill Cuttings | Bentonite : Sand

Notes: Groundwater Monitoring Well is ~ 6 m east of trees along Taylor Drive and ~7 m south of 32 Street, near the northwest corner of the site.

Depth (m)	Soil Description	Sample Type	Sample No.	SPT (N)	Combustible Soil Vapours (ppm)
0.0	Grass/loam - soft, silty, sandy, moist, olive. (~ 3 cm thick).				
	Sand (fill) - dense to compact, silty, trace clay, damp, yellow.				
1.0	Loam (fill) - compact, silty, sandy, trace clay, damp, dark olive.				
	Clay (fill) - firm, loamy, silty, trace fine rounded gravel, distinctive slough gas odour, moist, dark olive. wood debris at 1.8 m to 2.4 m.				
2.0	No obvious waste material.		J		
3.0	Sand (fill) - compact to loose, silty, trace clay, mild hydrocarbon odour, moist, light olive.				
	becomes wet and trace silt at 3.8 m.				
4.0	some gravel at 4.3 m.				
	Clay (fill) - stiff, trace silt, trace sand, moist, olive. mild hydrocarbon odour at 4.6 m - 5.2 m				
5.0			J		
6.0	End of hole at 6.1 m. 51 mm diameter 4.6 m length 010 PVC screen. Aboveground lockable steel casing set in concrete.				
7.0					
8.0					
9.0					
10.0					
11.0					
12.0					

Well Details

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Slough :	Completion Depth (m): 6.1
Depth to Groundwater :	Checked By: LTM
Logged By: JAL	Page: 1 of 1

PROJECT: Phase II Environmental Site Assessment	**BOREHOLE No.:** VW-01
PROJECT No.: 12-435	**DRILL TYPE:** SS Auger
LOCATION: Red Deer Motors Site	**GROUND ELEVATION:** 874.194 m
CLIENT: The City of Red Deer	**COMPLETION DATE:** 06/26/2013

Sample Type: Shelby Tube | Split Spoon | Core | Disturbed | No Recovery

Backfill Type: Bentonite | Silica Sand | Grout | Pea Gravel | Drill Cuttings | Bentonite : Sand

Notes: Soil Vapour Well is ~ 2 m east of MW-01, near the northwest corner of the site.

Depth (m)	Soil Description	Sample Type	Sample No.	SPT (N)	Combustible Soil Vapours (ppm)	Well Details
0.0	Grass (~ 3 cm thick). Sand (fill) - compact, silty, clayey, damp, light olive brown.					
	becomes dark olive and loamy at 0.8 m.					
1.0	Silt (fill) - firm, clayey, moist, dark olive.					
2.0	wood fragments at 2.3 m.					
3.0	mild hydrocarbon odour at 3 m.					
	End of hole at 3.5 m. 25 mm diameter 30 cm length 020 PVC screen. Aboveground lockable steel casing set in concrete.					
4.0						
5.0						
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						

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Slough :	Completion Depth (m): 3.5
Depth to Groundwater :	Checked By: LTM
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PROJECT: Phase II Environmental Site Assessment	**BOREHOLE No.:** TH-03
PROJECT No.: 12-435	**DRILL TYPE:** SS Auger
LOCATION: Red Deer Motors Site	**GROUND ELEVATION:** 875.332 m
CLIENT: The City of Red Deer	**COMPLETION DATE:** 06/26/2013

Sample Type: Shelby Tube | Split Spoon | Core | Disturbed | No Recovery

Backfill Type: Bentonite | Silica Sand | Grout | Pea Gravel | Drill Cuttings | Bentonite : Sand

Notes: Testhole is about 6 m east of trees along the west margin of the site, ~ 6 m north of the overhead electrical traversing the site.

Depth (m)	Soil Description	Sample Type	Sample No.	SPT (N)	Combustible Soil Vapours (ppm)		Well Details	
0.0	Grass/loam - soft, silty, sandy, moist, olive. (~ 3 cm thick).							
	Sand and Silt (fill) mixed with MSW - brick, wood debris, plastic, some clay.							
1.0	Sand (fill) - compact, silty, trace clay, trace fine rounded gravel, damp, dark olive grey. mild hydrocarbon odour at 1.5 m to 2.1 m.							
2.0	becomes wet at 2.7 m.							
3.0	glass fragments at 3.8 m.							
4.0	some wood debris at 4 m.							
	Clay (fill) - stiff, some gravel, wood debris, moist, dark olive.							
5.0	Clay (till) - very stiff, silty, trace carbonates, trace sand, moist, dark olive.							
6.0	End of hole at 6.1 m. Backfilled with ~ 50:50 bentonite and silica sand.							
7.0								
8.0								
9.0								
10.0								
11.0								
12.0								

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Slough :	Completion Depth (m): 6.1
Depth to Groundwater :	Checked By: LTM
Logged By: JAL	Page: 1 of 1

PROJECT: Phase II Environmental Site Assessment	**BOREHOLE No.:** VW-02
PROJECT No.: 12-435	**DRILL TYPE:** SS Auger
LOCATION: Red Deer Motors Site	**GROUND ELEVATION:** 877.321 m
CLIENT: The City of Red Deer	**COMPLETION DATE:** 06/26/2013

Sample Type: Shelby Tube | Split Spoon | Core | Disturbed | No Recovery

Backfill Type: Bentonite | Silica Sand | Grout | Pea Gravel | Drill Cuttings | Bentonite : Sand

Notes: Soil Vapour Well is located on the southeast side of the site.

Depth (m)	Soil Description	Sample Type	Sample No.	SPT (N)	Combustible Soil Vapours (ppm)	Well Details
0.0	Grass (~ 3 cm thick).					
	Sand (fill) - loose, trace silt, trace loam, trace clay, damp, light olive brown.					
	trace rootlets to 1.2 m					
	trace plastic bags at 0.9 m to 1.1 m.					
1.0						
	Clay (fill) - stiff, silty, trace sand, moist, light olive.					
2.0						
	No obvious waste material.					
3.0	Sand (fill) - compact, silty, moist, light olive.					
	trace coal at 3 m.					
4.0	trace gravel at 4 m.					
	becomes loose at 4.6 m					
5.0	trace gravel and becomes wet at 5 m.					
6.0	End of hole at 6.1 m.					
	25 mm diameter 30 cm length 020 PVC screen.					
	Aboveground lockable steel casing set in concrete.					
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						

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Slough :	Completion Depth (m): 6.1
Depth to Groundwater :	Checked By: LTM
Logged By: JAL	Page: 1 of 1

PROJECT: Phase II Environmental Site Assessment	**BOREHOLE No.:** TH-05
PROJECT No.: 12-435	**DRILL TYPE:** SS Auger
LOCATION: Red Deer Motors Site	**GROUND ELEVATION:** 875.567 m
CLIENT: The City of Red Deer	**COMPLETION DATE:** 06/26/2013

Sample Type: Shelby Tube | Split Spoon | Core | Disturbed | No Recovery

Backfill Type: Bentonite | Silica Sand | Grout | Pea Gravel | Drill Cuttings | Bentonite : Sand

Notes: Testhole is located near the south perimeter of site.

Depth (m)	Soil Description	Sample Type	Sample No.	SPT (N)	Combustible Soil Vapours (ppm)		Well Details	
0.0	Grass. (~ 3 cm thick).							
	Sand (fill) - loose, silty, some clay,damp, light olive.							
	plastic and trace coal at 0.5 m.							
1.0								
	becomes moist at 1.7 m.							
2.0								
	No obvious waste material.							
3.0	becomes wet at 3 m.							
4.0								
	Clay (till) - very stiff, silty, trace fine gravel, trace sand, wet, dark olive.							
5.0								
6.0	End of hole at 6.1 m.							
	Backfilled with ~ 50:50 bentonite and silica sand.							
7.0								
8.0								
9.0								
10.0								
11.0								
12.0								

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Slough :	Completion Depth (m): 6.1
Depth to Groundwater :	Checked By: LTM
Logged By: JAL	Page: 1 of 1

PROJECT: Phase II Environmental Site Assessment	**BOREHOLE No.:** TH-06
PROJECT No.: 12-435	**DRILL TYPE:** SS Auger
LOCATION: Red Deer Motors Site	**GROUND ELEVATION:** 876.597 m
CLIENT: The City of Red Deer	**COMPLETION DATE:** 06/27/2013

Sample Type: Shelby Tube | Split Spoon | Core | Disturbed | No Recovery

Backfill Type: Bentonite | Silica Sand | Grout | Pea Gravel | Drill Cuttings | Bentonite : Sand

Notes: Testhole is located about 38 m northwest of VW-02 in the south central area of the site.

Depth (m)	Soil Description	Sample Type	Sample No.	SPT (N)	Combustible Soil Vapours (ppm)		Well Details	
0.0	Grass. (~ 3 cm thick). Sand (fill) mixed with MSW - newspaper, paper, porcelain, tin can, plastic bags, plastic, wood debris, glass fragments, steel wire, tin can, firm to stiff, silty, clayey, strong pungent bitter odour, damp to moist, olive brown.							
1.0								
2.0								
3.0	refusal at 3.7 m (suspected boulder).							
	End of hole at 3.7 m. Backfilled with ~ 50:50 bentonite and silica sand.							
4.0								
5.0								
6.0								
7.0								
8.0								
9.0								
10.0								
11.0								
12.0								

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Slough :	Completion Depth (m): 3.7
Depth to Groundwater :	Checked By: LTM
Logged By: JAL	Page: 1 of 1

PROJECT: Phase II Environmental Site Assessment	**BOREHOLE No.:** TH-07
PROJECT No.: 12-435	**DRILL TYPE:** SS Auger
LOCATION: Red Deer Motors Site	**GROUND ELEVATION:** 876.925 m
CLIENT: The City of Red Deer	**COMPLETION DATE:** 06/27/2013

Sample Type: Shelby Tube | Split Spoon | Core | Disturbed | No Recovery

Backfill Type: Bentonite | Silica Sand | Grout | Pea Gravel | Drill Cuttings | Bentonite : Sand

Notes: Testhole is ~ 6 m south of the overhead power line along east perimeter of the site.

Depth (m)	Soil Description	Sample Type	Sample No.	SPT (N)	Combustible Soil Vapours (ppm)		Well Details
0.0	Grass. (~ 3 cm thick). Clay (fill) mixed with MSW - paper, wood debris, plastic bag, nylon string, firm, silty, trace sand, damp, olive grey.						
1.0	becomes moist at 1.5 m.						
2.0	No obvious waste below 3 m.						
3.0	Clay (fill) - stiff, trace coal, trace oxides, moist, olive.						
4.0	Sand (fill) - compact, silty, wet, light olive brown.						
5.0	refusal at 6.1 m (suspected boulder).						
6.0	End of hole at 6.1 m. Backfilled with 50:50 bentonite and silica sand.						
7.0							
8.0							
9.0							
10.0							
11.0							
12.0							

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Slough :	Completion Depth (m): 6.1
Depth to Groundwater :	Checked By: LTM
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PROJECT: Phase II Environmental Site Assessment	**BOREHOLE No.:** TH-08
PROJECT No.: 12-435	**DRILL TYPE:** SS Auger
LOCATION: Red Deer Motors Site	**GROUND ELEVATION:** 876.812 m
CLIENT: The City of Red Deer	**COMPLETION DATE:** 06/27/2013

Sample Type: Shelby Tube | Split Spoon | Core | Disturbed | No Recovery

Backfill Type: Bentonite | Silica Sand | Grout | Pea Gravel | Drill Cuttings | Bentonite : Sand

Notes: Due to refussal at TH-07, Testhole is ~ 9 m south.

Depth (m)	Soil Description	Sample Type	Sample No.	SPT (N)	Combustible Soil Vapours (ppm)		Well Details	
0.0	Grass/loam - soft, silty, sandy, moist, olive. (~ 3 cm thick). Sand and loam (fill) mixed with MSW - plastic bag, nail, glass, nylon, paper, wood debris, tin can, compact, trace clay, strong bitter pungent odour, damp, olive brown.							
1.0	becomes moist at 1.5 m.							
2.0								
3.0								
4.0	refusal at 4.3 m (suspected boulder), no recovery at 3 m to 4.3 m, wet.							
	End of hole at 4.3 m. Backfilled with 50:50 bentonite and silica sand.							
5.0								
6.0								
7.0								
8.0								
9.0								
10.0								
11.0								
12.0								

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Slough :	Completion Depth (m): 4.3
Depth to Groundwater :	Checked By: LTM
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PROJECT: Phase II Environmental Site Assessment	**BOREHOLE No.:** TH-09
PROJECT No.: 12-435	**DRILL TYPE:** SS Auger
LOCATION: Red Deer Motors Site	**GROUND ELEVATION:** 875.907 m
CLIENT: The City of Red Deer	**COMPLETION DATE:** 06/27/2013

Sample Type: Shelby Tube | Split Spoon | Core | Disturbed | No Recovery

Backfill Type: Bentonite | Silica Sand | Grout | Pea Gravel | Drill Cuttings | Bentonite : Sand

Notes: Testhole is ~ 3 m east of AENV groundwater monitoring wells MW-02 and MW-03.

Depth (m)	Soil Description	Sample Type	Sample No.	SPT (N)	Combustible Soil Vapours (ppm)		Well Details
0.0	Grass. (~ 3 cm thick).						
	Sand (fill) mixed with MSW - masonry brick, plastic bag, wood debris, plastic bags, glass fragments, silty, some clay, trace fine rounded gravel, damp, olive brown.						
1.0	becomes moist at 1.5 m.						
	moderate hydrocarbon odour at 1.5 m to 3.2 m.						
2.0	No obvious wate material below 2.6 m.						
	Sand (fill) - compact, trace silt, trace coal, trace pebbles, moist, light olive brown.						
3.0	Sand (native) - compact, trace silt, trace coal, trace pebbles, moist, light olive brown.						
4.0							
	Clay (till) - very stiff, silty, trace sand, moist, dark olive.						
5.0							
6.0	End of hole at 6.1 m. Backfilled with ~ 50:50 bentonite and silica sand.						
7.0							
8.0							
9.0							
10.0							
11.0							
12.0							

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Slough :	Completion Depth (m): 6.1
Depth to Groundwater :	Checked By: LTM
Logged By: JAL	Page: 1 of 1

PROJECT: Phase II Environmental Site Assessment	**BOREHOLE No.:** VW-03
PROJECT No.: 12-435	**DRILL TYPE:** SS Auger
LOCATION: Red Deer Motors Site	**GROUND ELEVATION:** 877.316 m
CLIENT: The City of Red Deer	**COMPLETION DATE:** 06/27/2013

Sample Type: Shelby Tube | Split Spoon | Core | Disturbed | No Recovery

Backfill Type: Bentonite | Silica Sand | Grout | Pea Gravel | Drill Cuttings | Bentonite : Sand

Notes: Soil Vapour Well is near the northeast corner of the site.

Depth (m)	Soil Description	Sample Type	Sample No.	SPT (N)	Combustible Soil Vapours (ppm)		Well Details
0.0	Grass. (~ 3 cm thick).						
	Clay (fill) - firm to stiff, silty, moist, olive.						
	trace plastic bags at 0.9 m.						
1.0							
2.0	trace coal at 2.1 m.						
	trace gravel at 2.6 m.						
3.0	No obvious waste material.						
4.0	becomes wet at 4 m.						
5.0							
6.0	Sand (fill) - loose, silty, wet, olive.						
7.0							
	End of hole at 7.6 m.						
	25 mm diameter 30 cm length 020 PVC screen.						
8.0	Flush mount lockable steel casing set in concrete.						
9.0							
10.0							
11.0							
12.0							

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Slough :	Completion Depth (m): 7.6
Depth to Groundwater :	Checked By: LTM
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APPENDIX C

SELECT PHOTOGRAPHS

Photograph No. 1: View of site looking north.

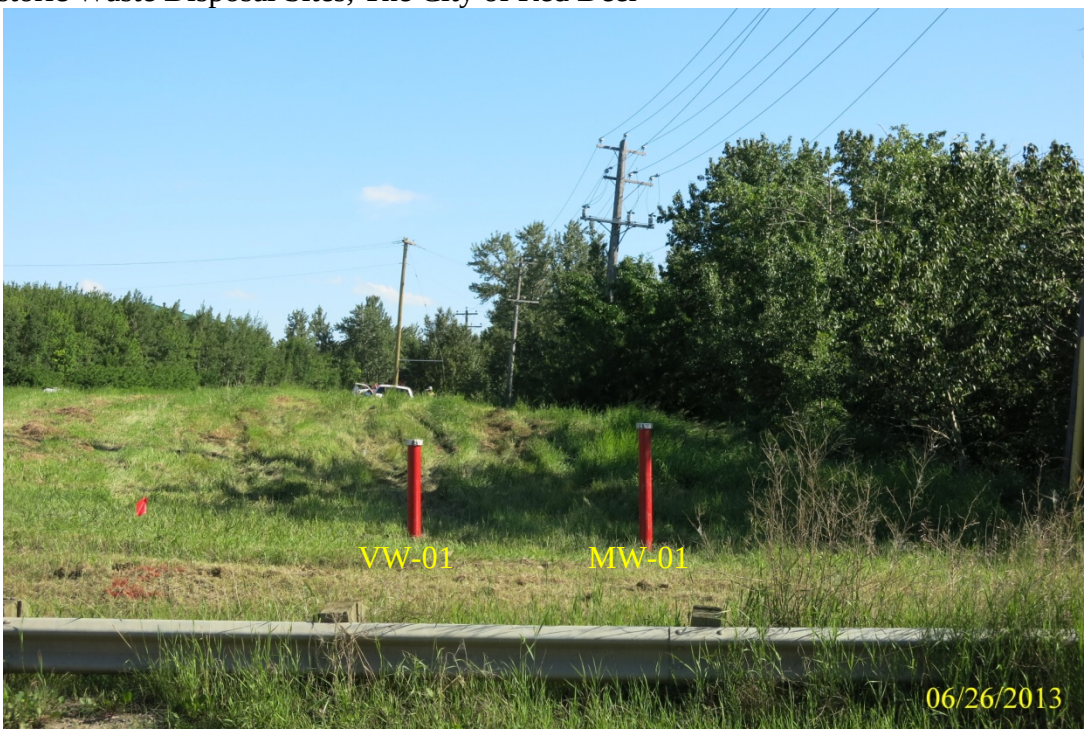
Photograph No. 2: View of west boundary of site looking southwest.

Photograph No. 3: View of east boundary of the site looking southeast.

Photograph No. 4: View of the north boundary of site, looking east. Note, 32 Street runs parallel with north boundary.

Photograph No. 5: View of south boundary of the site. Note site boundaries taper to the south.

Photograph No. 6: Drilling MW-01 and VW-01 in northwest corner of the site. Note intersection of 32 Street and Taylor Drive in the background.



Photograph No. 7: View of completed wells MW-01 and VW-01, looking south.

Photograph No. 8: View of completed well VW-01.

Photograph No. 9: Drilling VW-02, located at the southeast site of the site. Note truck mounted auger drill.

Photograph No. 10: View of Groundwater Wells, MW-02 and MW-03, previously installed by Alberta Environment.