Appendix V4-2H

Doris North Project: 2014 Air Quality Compliance Program

TMAC RESOURCES

Prepared for:

TMAC RESOURCES

DORIS NORTH PROJECT

2014 Air Quality Compliance Program

December 2014

The world's leading sustainability consultancy

ERM

TMAC Resources Inc.

DORIS NORTH PROJECT
2014 Air Quality Compliance Program

December 2014

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EXECUTIVE SUMMARY

The Doris North Project (the Project) is located on the Hope Bay Belt, an 80 by 20 km property located along the south shore of Melville Sound in Nunavut. The property consists of a greenstone belt (the Hope Bay Belt) that contains three main gold deposits. The Doris and Madrid deposits are located in the northern portion of the belt, and the Boston deposit is at the southern end. The Project is located approximately 125 km southwest of Cambridge Bay (Iqaluktuttiaq) on the southern shore of Melville Sound. The nearest communities are Umingmaktok (75 km to the southwest of the property), Cambridge Bay, and Bathurst Inlet (Kingaok; 160 km to the southwest of the property).

TMAC Resources Inc. (TMAC) acquired the Hope Bay Belt property from Newmont Corporation in March 2013. The acquisition included exploration and mineral rights over the Hope Bay Belt, including the Doris North Project and its permits, licences and authorizations for development received by previous owners. In late 2012, prior to the sale, the Project was placed into care and maintenance, and was seasonally closed during the winter of 2012/2013. TMAC re-opened the Doris North Camp in March of 2013 for the purposes of conducting site water management and environmental compliance programs and to support exploration activities which have continued through 2014. The Project remains in care and maintenance at this time, with reduced staffing and activities over winter.

The Doris North Gold Mine Project Certificate (Nunavut Impact Review Board (NIRB) No. 003, issued September 15, 2006; NIRB 2006) contains the following compliance requirement for air quality monitoring:

1. *Section 4.0 of Project Certificate. Item 30. MHBL will install and fund an atmospheric monitoring station. This station and its location shall be developed in consultation with Environment Canada and Health Canada air quality officials and focus on particulates of concern generated at the mine site. The results of air quality monitoring are to be reported every six months to NIRB through the Monitoring Officer, and from there to all of the parties.*
    - Commentary: NIRB expects that Canada-wide Standards for Dioxins and Furans and the Canada-wide Standards for Mercury will apply and should be followed including stack testing of incinerators.

This report addresses the NIRB requirement for reporting air quality monitoring results, as outlined above. On June 20, 2013, the NIRB approved TMAC Resources Inc.'s request for annual reporting during care and maintenance, rather than reporting every six months. An annual reporting year-end of September 30 was agreed upon. All data obtained since the last annual report (ERM Rescan 2014) for the current reporting period of October 2013 to September 2014 are reported herein. The Canada-wide Standards (CWS) for Dioxins and Furans and Mercury (point 1 commentary, above) were met through consistent waste handling practices developed to meet CWS emissions standards, as verified in 2012 (A. Lanfranco & Associates Inc. 2012).

To comply with Item 30 in Section 4.0 of the Project Certificate, TMAC contracted ERM Consultants Canada Ltd. (ERM Rescan) to undertake the following activities in 2013 and 2014:

- collect measurements of particulates of concern, including suspended particulate matter (using Partisol samplers which measured PM_{10}, $PM_{2.5}$, and TSP);
- collect measurements of ambient air quality, including sulphur dioxide, nitrogen dioxide, and ozone (SO_2, NO_2, and O_3) using one Passive Air Sampling System (PASS);
- update established datasets on air quality at the site; and
- summarize air quality data in relation to relevant standards and guidelines.

All samples collected for particulate matter (PM_{10}, $PM_{2.5}$, and TSP) were analyzed by ALS Laboratory Group (CALA accreditation number; 1719). PASS (SO_2, NO_2, and O_3) were analyzed by Maxxam Analytics (CALA accreditation number; 2996). All parameters were compared with the Nunavut Environmental Guidelines for Air Quality and the Canada Wide Standards and Canadian National Ambient Air Quality Objectives (NAAQOs) established under the Canadian Environmental Protection Act (CEPA). In addition, comparisons were made to predictions presented in the Environmental Impact Statement (EIS) for the Doris North Project (Miramar 2005).

TSP, PM_{10}, and $PM_{2.5}$ data collected between October and November 2013 and June through September 2014 were typical of background concentrations for remote undisturbed areas in Canada. TSP, PM_{10}, and $PM_{2.5}$ concentrations were less than the predicted maximum concentrations reported in the EIS for the Doris North Project. TSP, PM_{10}, and $PM_{2.5}$ concentrations were not collected from December 2013 to June 2014 due to observed inconsistencies in TSP and PM_{10} concentrations collected from October 2013 to November 2013 wherein TSP concentrations were less than PM_{10} concentrations collected on the same day. Sampling was suspended until a certified technician could be brought to site to service the Partisol samplers. Partisol sampling resumed on June 4, 2014.

Passive ambient air quality monitoring included monthly sampling for SO_2, NO_2, and O_3. Monthly mean concentrations cannot be directly compared to the relevant objectives, guidelines and standards or the EIS predictions which are based on hourly and daily concentrations; however, SO_2 and NO_2 concentrations can be compared to mean annual concentrations. Annual Project SO_2 and NO_2 concentrations were less than the EIS predicted concentrations. Monthly concentrations of O_3 were within the lower range of concentrations estimated by Health Canada for areas with negligible exposure to anthropogenic pollution.

ACKNOWLEDGEMENTS

This report was prepared for TMAC Resources Inc. by ERM Rescan. Data collection was conducted by Jem Morrison (B.Sc.). The report was prepared and written by Jem Morrison (B.Sc.) and technically reviewed by Derek Shaw (M.A.Sc., P.Eng.). The compliance program was coordinated by Cassie Chow (B.Eng., E.I.T.) and managed by April Hayward (Ph.D.). Marc Wen (M.Sc., R.P.Bio.) was the Partner in Charge.

Field-related logistics support was provided by TMAC, Great Slave Helicopters, Braden Burry Expediting, and Nuna Logistics.

DORIS NORTH PROJECT

2014 Air Quality Compliance Program

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GLOSSARY AND ABBREVIATIONS

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

Air Quality Guideline, Objective or Standard	Guidelines, objectives or Canada-wide standards for maximum concentrations of criteria air contaminants in the atmosphere developed to ensure long-tern protection of public health and the environment.
Ambient Air Quality	The outdoor air quality at a particular site.
BC MoE	British Columbia Ministry of Environment
CAC	Criteria Air Contaminants: Contaminants for which environmental regulatory agencies have established ambient air concentration limits.
CALA	Canadian Association for Laboratory Accreditation
CEPA	*Canadian Environmental Protection Act*
CWS	Canada Wide Standards
Dustfall	The settleable fraction of total particulate matter in ambient air.
EC	Environment Canada
EIS	Environmental Impact Statement
ERM Rescan	ERM Consultants Canada Ltd.
Fugitive Dust	Particulate matter, often sand or mineral dust, released to the atmosphere by mechanical disruption of soil or by wind scouring.
Geometric Mean	The geometric mean is a type of mean or average, which indicates the central tendency or typical value of a set of numbers. The numbers in a data set are multiplied together and then the n^{th} root (where n is the count of numbers in the set) of the resulting product is taken. The geometric mean of a data set is less than or equal to the data set's arithmetic mean/average.
GN	Government of Nunavut
GNWT	Government of the Northwest Territories
HBML	Hope Bay Mining Limited
Hope Bay Belt, the	The Hope Bay Greenstone Belt
MHBL	Miramar Hope Bay Limited
NAAQO	National Ambient Air Quality Objective
NAPS	National Air Pollution Surveillance

NIRB	Nunavut Impact Review Board
Nitrogen Dioxide (NO_2)	NO_2 can cause adverse effects on respiratory systems of humans and animals, and damage to vegetation. When dissolved by water vapour, the acids formed can have adverse effects on the respiratory systems of humans and animals. Nitric acid (HNO_3) can cause damage to vegetation, buildings and materials, and contribute to acidification of aquatic and terrestrial ecosystems. When NO_2 is transformed into nitrate particles that are subsequently deposited on aquatic and terrestrial ecosystems, acidification can result. When nitrate is combined with other compounds in the atmosphere, such as ammonia, it becomes an important contributor to the secondary formation of respirable particulate matter ($PM_{2.5}$). NO_2 is one of the two primary contributing pollutants, along with volatile organic compounds (VOCs), to the formation of ground-level ozone
NWB	Nunavut Water Board
NWT	Northwest Territories
Ozone (O_3)	A colourless, odourless reactive gas naturally found in the earth's stratosphere, where it absorbs the ultraviolet component of incoming solar radiation that could be harmful to life on earth. It is also found near earth's surface where pollutants emitted from human activities react in the presence of sunlight to form ozone. Sunny weather and stagnant conditions favour ozone formulation. The principal pollutants involved in these reactions are NO_x, volatile organic compounds (VOCs) and carbon monoxide (CO).
PASS	Passive Air Sampling System
Partisol Samplers	Partisol Ambient Air Samplers
$PM_{2.5}$	Respirable particulate matter. $PM_{2.5}$ particles are a subset of PM_{10} and are defined as particles with a diameter less than 2.5 µm. These particles are small enough to enter deep into the respiratory system. The majority of PM emitted in diesel engine exhaust is $PM_{2.5}$.
PM_{10}	Inhalable particulate matter. PM_{10} particles are airborne particles that have a diameter of 10 µm or less and are thus a subset of total suspended particulate. The majority of PM_{10} particles are from fugitive dust sources.
Project, the	The Doris North Project
Sulphur Dioxide (SO_2)	Fossil fuel contains a small amount of sulphur containing organic compounds. During fuel combustion, the sulphur is oxidized and emitted as SO_2 gas with the engine exhaust. In the atmosphere, SO_2 can further oxidize to sulphuric acid, which contributes to acid deposition.
TMAC	TMAC Resources Inc.

TSP	Total suspended particulates (TSP) are solid matter or liquid droplets from smoke, dust, fuel ash, or condensing vapours that can be suspended in the air.
US EPA	United States Environmental Protection Agency. The USEPA has promulgated a variety of guidelines, objectives, emission factors, air dispersion modelling procedures and statutes for the protection of ambient air quality.

1. INTRODUCTION

1.1 PROJECT BACKGROUND

The Doris North Project (the Project) is located on the Hope Bay Belt, an 80 by 20 km property located along the south shore of Melville Sound in Nunavut. The property consists of a greenstone belt (the Hope Bay Belt) that contains three main gold deposits. The Doris and Madrid deposits are located in the northern portion of the belt and the Boston deposit is at the southern end. The Project is located approximately 125 km southwest of Cambridge Bay (Iqaluktuttiaq) on the southern shore of Melville Sound. The nearest communities are Umingmaktok (75 km to the southwest of the property), Cambridge Bay, and Bathurst Inlet (Kingaok; 160 km to the southwest of the property).

TMAC Resources Inc. (TMAC) acquired the Hope Bay Belt property from Newmont Corporation in March 2013. The acquisition included exploration and mineral rights over the Hope Bay Belt, including the Doris North Project and its permits, licences and authorizations for development received by previous owners. In late 2012, prior to the sale, the Project was placed into care and maintenance, and was seasonally closed during the winter of 2012/2013. TMAC re-opened the Doris North Camp in March of 2013 for the purposes of conducting site water management and environmental compliance programs and to support exploration activities which have continued through 2014. The Project remains in care and maintenance at this time, with reduced staffing numbers and activities over winter.

1.2 COMPLIANCE MONITORING REQUIREMENTS

The Doris North Gold Mine Project Certificate (Nunavut Impact Review Board (NIRB) No. 003, issued September 15, 2006; NIRB 2006) and Type A Water Licence (Nunavut Water Board (NWB) Licence No. 2AM-DOH1323 Type A, issued August 16, 2013,; NWB 2013) contain the following compliance requirements for atmospheric monitoring:

1. *Section 4.0 of Project Certificate. Item 8. HBML will fund and install a weather station at the mine site to collect atmospheric data, including air temperature and precipitation. The design and location of this station shall be developed in consultation with Environment Canada officials.*
2. *Section 4.0 of Project Certificate. Item 30. HBML will install and fund an atmospheric monitoring station. This station and its location shall be developed in consultation with Environment Canada and Health Canada air quality officials and focus on particulates of concern generated at the mine site. The results of air quality monitoring are to be reported every six months to NIRB through the Monitoring Officer, and from there to all of the parties.*
   - Commentary: NIRB expects that Canada Wide Standards for Dioxins and Furans and the Canada Wide Standards for Mercury will apply and should be followed including stack testing of incinerators.
3. *Schedule D of the Type A Water Licence. Item 1i. Monitoring of dust generation and use of water by the contractor to manage dust emissions from crushing and construction activity.*

This report is intended to specifically address the NIRB requirements for reporting air quality monitoring results, as outlined in point number two in the list above. Requirements outlined in point one are addressed in a separate, meteorology report. Dustfall monitoring (required under point 3, above) was not performed in 2014 as no crushing or construction activity took place. Water use for dust suppression is tracked and reported monthly and annually to the NWB in accordance with the requirements of the Type A Licence.

1.3 2014 AIR QUALITY COMPLIANCE MONITORING PROGRAM OBJECTIVES

The objective of the 2014 Air Quality Compliance Monitoring Program was to ensure compliance with Item 30 in Section 4.0 of the Project Certificate. To this end, TMAC contracted ERM Consultants Canada Ltd. (ERM Rescan) to undertake the following activities in 2013 and 2014:

- collect measurements of particulates of concern, including suspended particulate matter (using Partisol samplers that measure PM_{10}, $PM_{2.5}$, and TSP);
- collect measurements of ambient air quality, including sulphur dioxide, nitrogen dioxide, and ozone (SO_2, NO_2, and O_3) using a PASS;
- update established datasets on air quality at the site; and
- summarize air quality data in relation to relevant standards and guidelines.

The Canada Wide Standards (CWS) for Dioxins and Furans and Mercury (Section 4.0 of Project Certificate, Item 30 commentary above) were met through incineration practices developed to meet CWS emissions standards, as verified in 2012 (A. Lanfranco & Associates Inc. 2012). In accordance with the CWS, smaller facilities (burning <26 tonnes of municipal waste/yr) may meet the standard's requirements as proven by a one-time stack test once "determined efforts" to apply the best available pollution prevention and control techniques have been implemented. TMAC continues to apply established waste segregation and incinerator waste stream diversion practices since emissions compliance was demonstrated in 2012. In 2013, based on information provided by Environment Canada (EC), the NIRB acknowledged stack testing would not be required during care and maintenance if incineration volumes remained below the 26 tonne threshold (Appendix A). Between October 2013 and September 2014, 21.2 tonnes of domestic waste was incinerated.

This report summarizes the results of the 2014 Air Quality Compliance Monitoring Program. Section 2 provides the results from particulate matter measurements. Section 3 provides the PASS results for SO_2, NO_2, and O_3. Section 4 provides a summary of all results from this reporting period. All data obtained in Q4 of 2013 and Q1, Q2, and Q3 of 2014 are reported herein, with data available for reporting from October 2013 to September 2014 for the Passive Air Sampling System (PASS) and from October through November 2013 and June through September 2014 for particulate monitoring. Particulate monitoring was suspended from December 2013 to June 2014 due to observed inconsistencies in TSP and PM_{10} concentrations collected from October 2013 to November 2013 wherein TSP concentrations were less than PM_{10} concentrations collected on the same day. A certified technician was brought on site to service the Partisol samplers in May 2014 and sampling recommenced June 4, 2014.

2. SUSPENDED PARTICULATE MATTER

Particulate matter is a criteria air quality contaminant (CAC) associated with mining and mineral processing operations (EC 2014). It is generated by mobile equipment, crushing, blasting, bulk handling and storage and other associated mineral processing and construction activities. Suspended particulate matter in ambient air is generally a complex, multi-phase system of all airborne solid and low vapour pressure liquid particles having aerodynamic particle sizes from 0.01 to 100 µm in diameter.

Airborne suspended particulate matter concentrations were monitored using two Partisol samplers. The sampling site selection process, monitoring methods and results are presented below. Where possible, measured concentrations were compared to ambient air quality references given in the 2011 update of the Air Quality Management Plan for the Project (HMBL 2012), predictions in the Doris North EIS (Miramar 2005), and Nunavut ambient air quality guidelines (GN 2011).

2.1 SITE SELECTION

Nunavut does not have established siting requirements for ambient air samplers. Therefore, the siting criteria provided by the British Columbia Ministry of the Environment (BC MoE 2009) and the United States Environmental Protection Agency (US EPA; US EPA 2009 and US EPA 1999) were used. Additional factors not specified in standard site selection criteria were also considered. The Partisol air sampler location was free from obstructions and nearby pollutant sources that may cause interference in suspended particulate monitoring (Figure 2.1-1; Plates 2.1-1 and 2.1-2). Due to the very cold climate, the Partisol samplers were installed inside a temperature controlled shelter in an attempt to reduce interruptions to the sampling schedule caused by cold weather, wet conditions, excess humidity, air leaks and pump malfunctions.

The samplers were initially installed on the butte near Doris Camp, but were relocated in October 2011 in consultation with Environment Canada (EC; D. Fox, pers. comm.) to allow for more frequent maintenance checks and a more reliable source of continuous power (Rescan 2011b).

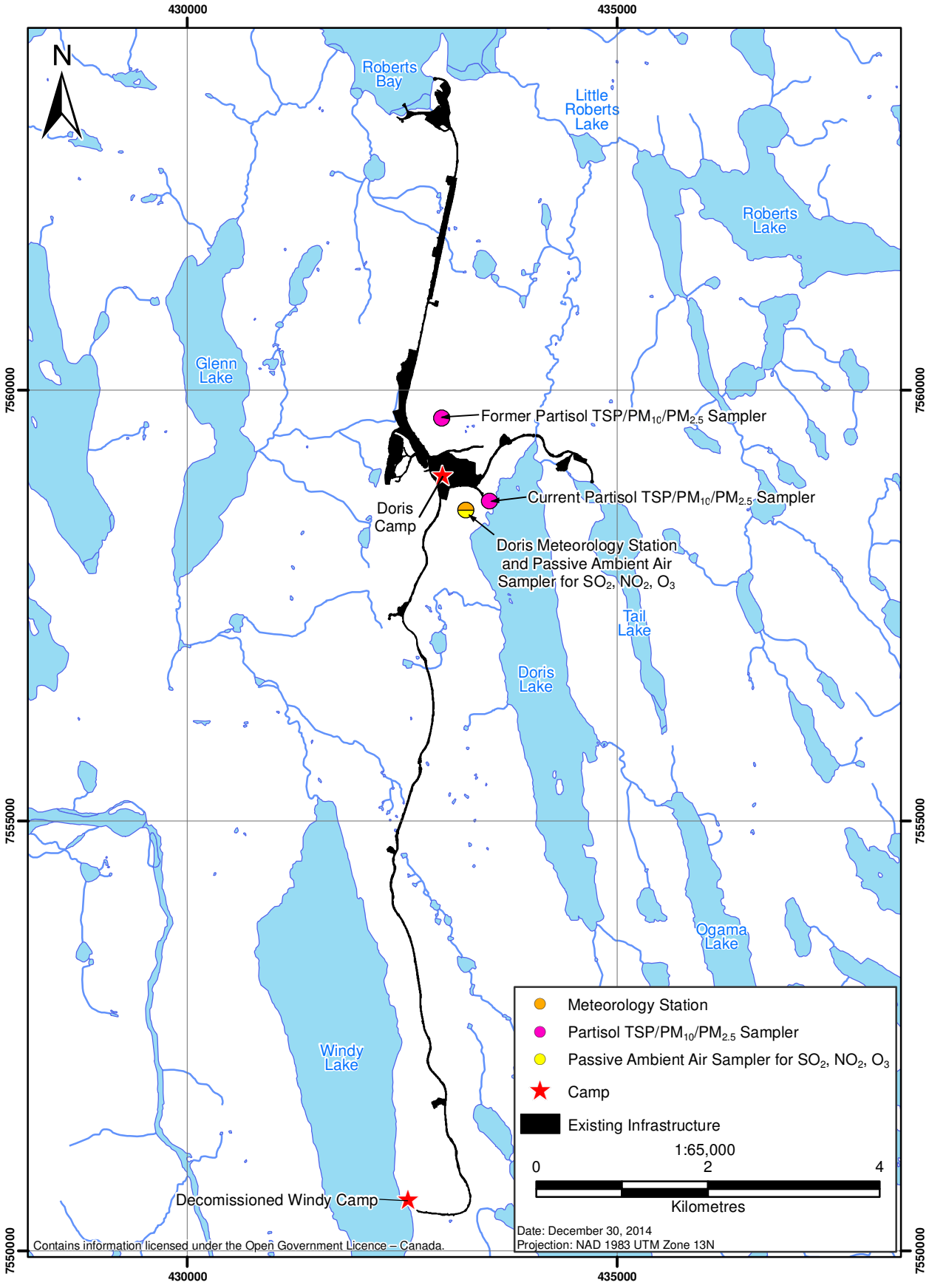
2.2 MONITORING METHOD

Suspended particulate matter is monitored by the Partisol ambient air samplers (Partisol samplers) in three forms: TSP (solid matter or liquid suspended in air), PM_{10} (particulate matter, sized 0-10 µm), and $PM_{2.5}$ (particulate matter, sized 0-2.5 µm). A Partisol Plus Model 2025 ambient air sampler monitors TSP and a Partisol Sequential Dichotomous Model 2025-D ambient air sampler monitors PM_{10} and $PM_{2.5}$ simultaneously (Plate 2.2-1). The Partisol instruments are widely used in Canada for compliance monitoring programs and are recognized as reference equivalent methods by the US EPA (US EPA 2009).

The Partisol samplers draw a particulate-laden ambient air stream first through a size-selective inlet and then through a 47 mm diameter filter. A built-in pump provides the vacuum required to pull the air through the sample filter and a volume flow controller monitors and automatically adjusts the flow rate (Figure 2.2-1).

Figure 2.1-1

Ambient Air Quality Monitoring Program Stations, Doris North Project, 2014



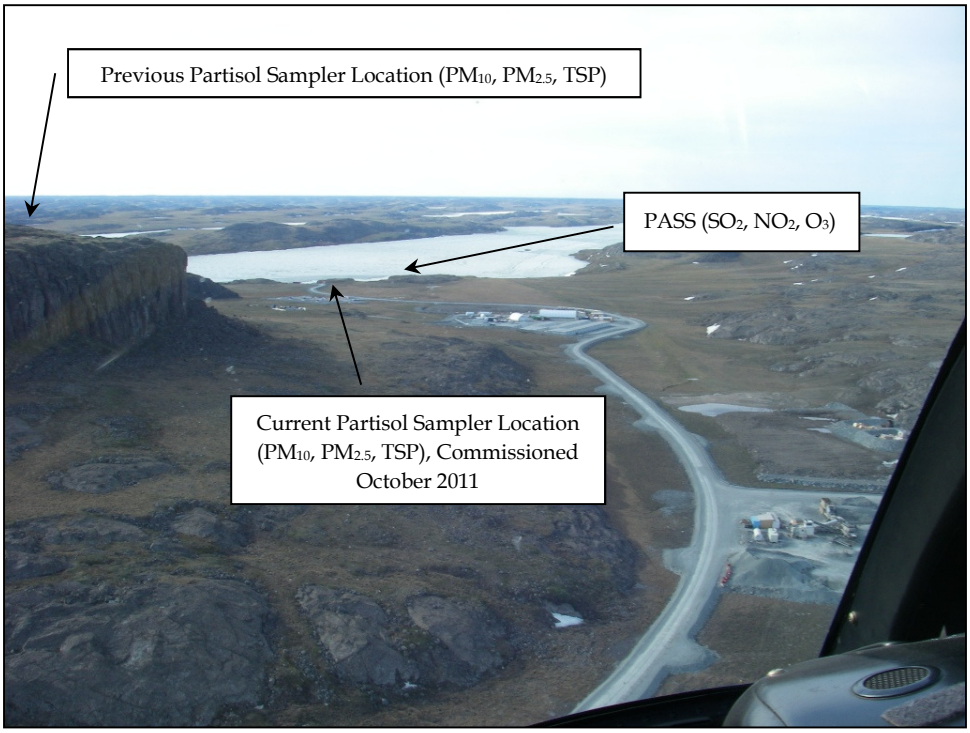
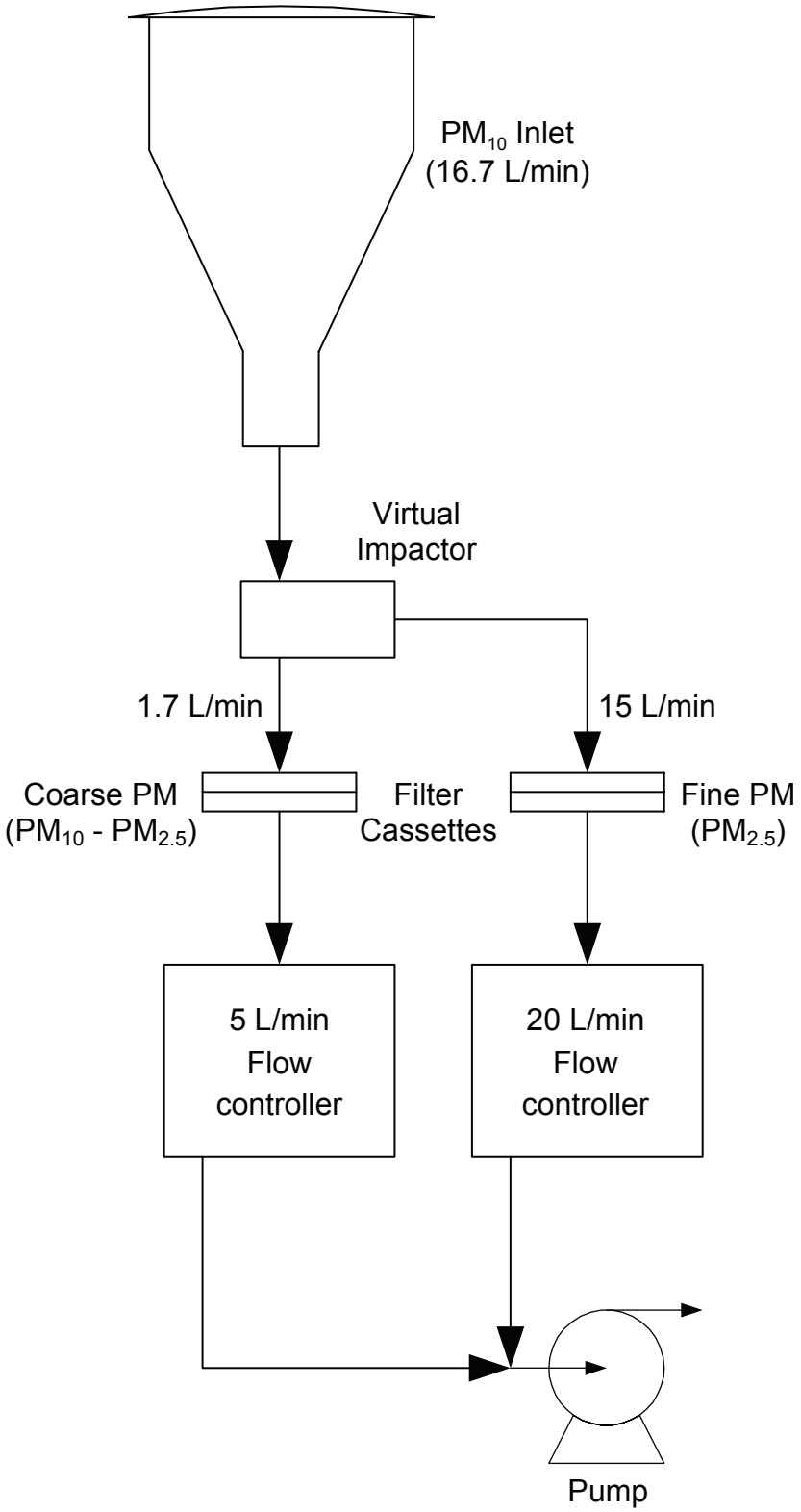


Plate 2.1-1. Location of previous and current Partisol ambient air samplers and PASS station. Doris Lake is shown in the background, June 2009.

Plate 2.1-2. Temperature-controlled shelter housing the Partisol samplers, October 2011.

Figure 2.2-1

Simplified Diagram for the Partisol Sequential Dichotomous Model 2025D Ambient Air Sampler



Source: Thermo Fisher Scientific, 2007

Plate 2.2-1. Inside the temperature controlled shelter. The Partisol sampler for TSP is shown on the right and the PM_{10}/$PM_{2.5}$ sampler is on the left, July 2013.

The Pallflex TX40H120-WW Teflon coated fibre glass type filters that were used are approved by the manufacturer for use with the Partisol samplers. The Partisol air sampler filters were pre- and post-weighed at a laboratory that is accredited by the Canadian Association for Laboratory Accreditation (CALA 2011). The ALS Laboratory Group analyzed the 2014 samples. Values reported by the laboratory as being less than the detection limit were replaced with values equal to half the detection limit to allow for their use in simple descriptive statistics.

To reduce contamination, filter exchanges were performed using pneumatic pressure from the sample pump and did not involve any special electromechanical components, belts or motors. New filter cassettes from the supply magazine (left, Plate 2.2-2) were pushed up and rightward to the sampling position, while the previous cassette was moved to the storage magazine (right, Plate 2.2-2). The supply and storage magazines were covered to seal off the filter cassettes, thereby protecting them from environmental interference during sampling operations.

The Partisol Sequential Dichotomous Model 2025-D PM_{10}/$PM_{2.5}$ sampler (the sampler on the left in Plate 2.2-1 and shown in Plate 2.2-2) uses a PM_{10} air inlet followed by a US EPA dichotomous virtual impactor that separates the incoming PM_{10} air stream into fine ($PM_{2.5}$) and coarse (PM_{10} minus $PM_{2.5}$) components. These two air components are collected onto separate filter cassettes; one for fine and one for coarse components.

The Partisol Plus 2025 TSP sampler (the sampler on right in Plate 2.2-1) monitors only TSP and does not use a special air inlet or virtual impactor: all air passes though one filter that collects all particulate.

Plate 2.2-2. The Partisol air sampler filters are contained in a magazine on the left side of the unit. The filters laden with suspended particulate matter are contained in a magazine on the right side of the unit (PM_{10} at front and $PM_{2.5}$ at rear).

The Partisol ambient air samplers were programmed to follow Environment Canada's National Air Pollution Surveillance (NAPS) schedule, which requires 24-hour sampling every six days for particulate matter (EC 2013).

Analysis of samples that were collected beginning in October 2013 and ending in November 2013 revealed that numerous TSP concentrations were less than PM_{10} concentrations and sampling was suspended until a certified technician could be brought on site to perform a complete servicing of the Partisol samplers. The technicians' report can be found in Appendix B. The service work performed by the technician included the following:

- leak checks;
- seal checks;
- seal and O-ring replacements;
- pump rebuild;
- inlet cleaning;
- impactor cleaning;
- temperature sensor audit and calibration;
- pressure sensor audit and calibration; and
- flow sensor audit and calibration.

Sampling recommenced on June 4, 2014. During the period the partisol samplers were not in service (December 2013 to May 2014), there was only reduced activity at site as the project remained in a state of extended care and maintenance for the winter of 2013/2014.

2.3 RESULTS

Table 2.3-1 and Figure 2.3-1 summarize ambient PM_{10}, $PM_{2.5}$, and TSP concentrations measured by the Partisol samplers for October to November 2013 and June to September 2014. Laboratory analytical reports are presented in Appendix C.

Table 2.3-1. PM_{10}, $PM_{2.5}$, and TSP Results Summary, Doris North Project[a, b]

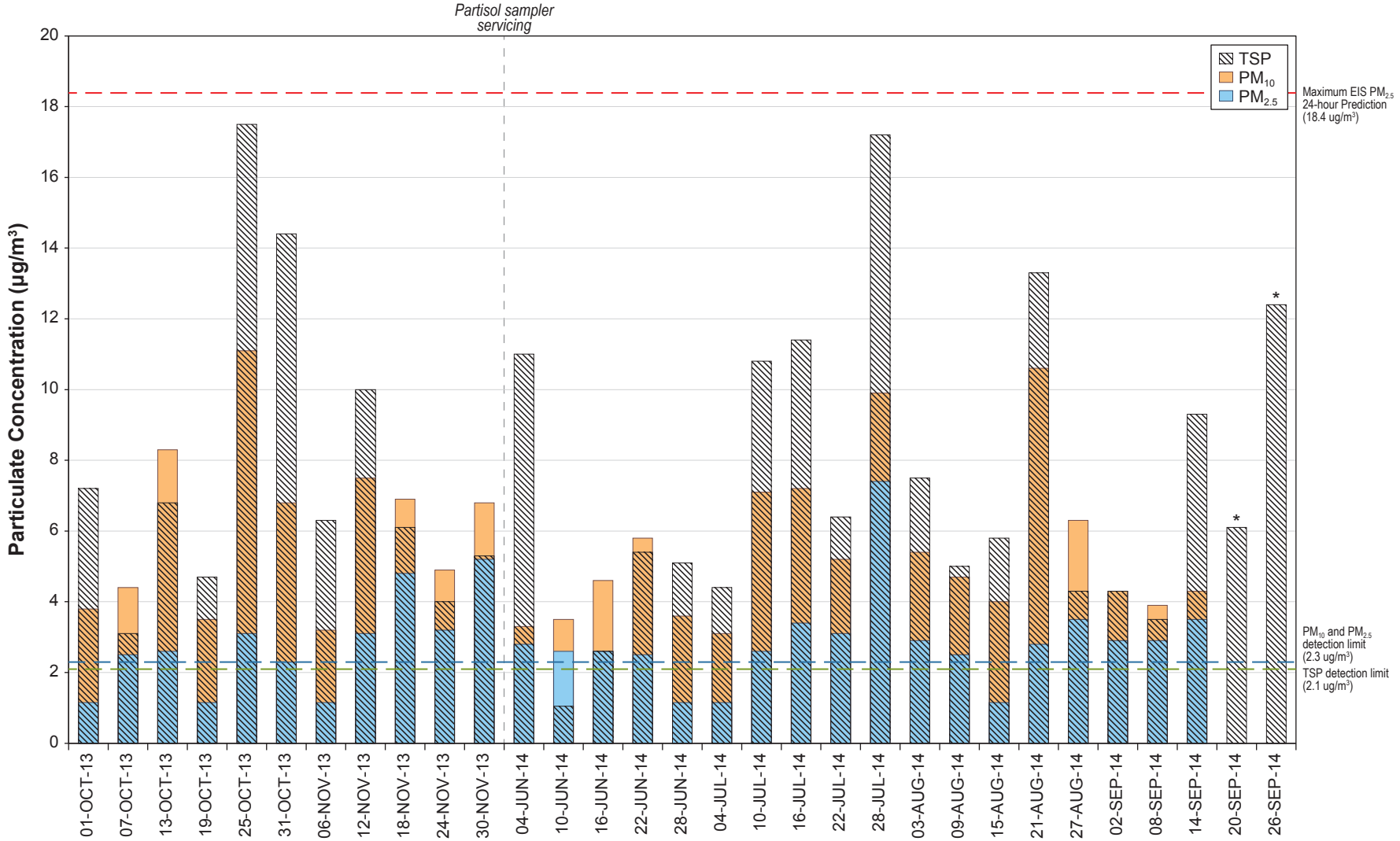
	PM_{10} (µg/m³)[c]	$PM_{2.5}$ (µg/m³)[d]	TSP (µg/m³)[e]
Ambient Air Quality Objective/Standard			
24-hour mean	50[f]	30[g] (98th percentile concentration)	120[h]
Annual mean	n/a	10[g]	60[h]
EIS Predictions (Miramar 2005)			
Maximum 24-hour mean	61.9 (50 µg/m³ exceeded 2 days per year)	18.4 (98th percentile concentration)	76.3
Annual mean	8.0	4.5	14.5
Results[i]			
Annual mean	**5.7[j]**	**2.9[k]**	**7.5[l]**
Annual geometric mean	**5.3[j]**	**2.6[k]**	**6.4[l]**
Range	***3.1* to 11.1**	***1.2* to 7.4**	***3.1* to 17.5**

Notes:
[a] n/a = Not Applicable
[b] Values less than the detection limit are reported as half of the detection limit and are shown in italics.
[c] PM_{10} detection limit was 2.3 µg/m³ for 2013/2014 sample results.
[d] $PM_{2.5}$ detection limit was 2.3 µg/m³ for 2013/2014 sample results.
[e] TSP detection limit was 2.1 µg/m³ for 2013/2014 sample results.
[f] BC MoE Level B 24-hour objective for PM_{10} was used (BC MoE 2013) as there are no ambient air quality references for PM_{10} set by Federal or Nunavut Territorial Governments.
[g] Canada-wide Standard for 24-hour $PM_{2.5}$ (GN 2011).
[h] Government of Nunavut Ambient Air Quality Guideline (GN 2011).
[i] Partisol sampling for 2013 was carried out in October and November. Sampling recommenced on June 4, 2014.
[j] 5 of 29 samples were less than the detection limit.
[k] 6 of 29 samples were less than the detection limit.
[l] 1 of 29 samples was less than the detection limit.

The Government of Nunavut (GN) has not issued ambient air quality guidelines for PM_{10}, therefore results were compared to the BC MoE Level B Objective for PM_{10} (BC MoE 2013). The GN Guideline for $PM_{2.5}$ was used for comparison against $PM_{2.5}$ results (GN 2011). The relevant reference for TSP is the National Ambient Air Quality Objective 24-hour TSP guideline (Health Canada 2006) which has been adopted by the GN (GN 2011). In addition, PM_{10}, $PM_{2.5}$, and TSP concentrations were compared to the predictions presented in the Doris North EIS (Miramar 2005).

Figure 2.3-1

TSP, PM_{10} and $PM_{2.5}$ Concentrations from Partisol Samplers, Doris North Project



Notes: *Values less than the detection limit are reported as half the detection limit.*
The sampling program was suspended from November 30 to June 4, due to a suspected issue with one or both of the samplers.
Vertical dashed line represents the period of Partisol sampler servicing.
**A mechanical malfunction occurred during the September 20 pneumatic filter transfer and there was no sample for $PM_{2.5}$ and PM_{10} on September 20 and 26, 2014.*
Maximum 24- hour EIS prediction for PM_{10} is 61.9 µg/m³
Maximum 24- hour EIS prediction for TSP is 76.3 µg/m³

All data from the reporting period were less than the relevant ambient air quality guidelines, objectives and standards (Table 2.3-1). The Doris North EIS predicted that, at a location 200 m from the proposed ore processing facility, maximum PM_{10} concentrations would be 61.9 micrograms per cubic metre ($\mu g/m^3$), maximum mean annual concentrations would be 8.0 $\mu g/m^3$, and that the PM_{10} 24-hour BC MoE objective of 50.0 $\mu g/m^3$ would be exceeded two days per year (Miramar 2005; Table 2.3-1). PM_{10} concentrations measured during the reporting period were all less than the corresponding values predicted in the EIS (Table 2.3-1).

In the EIS, maximum $PM_{2.5}$ concentrations for the Project were predicted to be 18.4 $\mu g/m^3$ based on the 98th percentile of the 24-hour ambient measurement, averaged over three years (Miramar 2005). None of the 24-hour mean concentrations of $PM_{2.5}$ measured during the monitoring period were greater than the concentration predicted in the EIS (Table 2.3-1). The observed annual mean $PM_{2.5}$ value (2.9 $\mu g/m^3$) was less than the maximum annual EIS predictions of 4.5 $\mu g/m^3$ (Table 2.3-1).

The geometric mean TSP concentration and the individual results for each 24-hour period were all less than relevant ambient air quality guidelines (Table 2.3-1; Figure 2.3-1). The EIS for the Project predicted maximum 24-hour TSP concentration of 76.3 $\mu g/m^3$ and a maximum annual mean concentration of 14.5 $\mu g/m^3$ (Table 2.3-1). All TSP concentrations measured during the reporting period were less than the concentrations predicted in the EIS (Table 2.3-1; Figure 2.3-1).

Ten of the measured TSP concentrations at the Project site were less than the measured PM_{10} concentrations and one was also less than the $PM_{2.5}$ concentration measured on the same sampling day. PM_{10} and $PM_{2.5}$ are subsets of TSP: theoretically, TSP concentrations should always be greater than or equal to PM_{10} and $PM_{2.5}$ concentrations. Five of these instances occurred during the October through November 2013 monitoring period, prior to Partisol sampler servicing in May 2014. Five instances occurred after the Partisol samplers were serviced. In three of the cases that occurred post-servicing, the TSP and PM_{10} concentrations were nearly identical, suggesting that the TSP sample was composed primarily of particles less than 10 µm in diameter. In these cases, the discrepancy between TSP and PM_{10} may be related to instrument precision rather than actual differences in concentrations.

In general, concentrations observed throughout the reporting period were low; on numerous occasions concentrations were only slightly greater than the detection limit and the coarse (PM_{10} minus $PM_{2.5}$) particulate analyses were less than the detection limit in three instances. The proximity of observed concentrations to the analytical detection limit may also explain the discrepancies between TSP and PM_{10}, as it suggests that concentrations were close to the limits of analytical precision.

Finally, the discrepancies between TSP and PM_{10} may result from error associated with sample analysis or the loss of material from the mishandling of the filter shipment during the transport of filters to the laboratory. However, given the relatively low observed concentrations, it is unlikely that concentrations were ever greater than Nunavut guidelines or EIS predictions, even when discrepancies between TSP and PM_{10} existed. A working standard operating procedure (SOP) has been created by ERM Rescan and communicated to onsite TMAC personnel to perform filter replacements after the sampling periods. The SOP includes specific handling and filter shipment instructions. Communication and the use of the SOP will help introduce improvements to the program and eliminate or greatly reduce future data gaps.

Particulate concentrations observed at the Project site were less than particulate concentrations observed at nearby locations in the North. Environment Canada undertakes monitoring at various locations across Canada as part of the National Air Pollution Surveillance (NAPS) Network. The nearest suspended particulate matter monitoring station to the Project is the Yellowknife, NWT station, which is operated in partnership with the NAPS program. For the most recent year of published data at this station, the annual mean PM_{10} and $PM_{2.5}$ concentrations were 11.5 and 6.4 $\mu g/m^3$, respectively (GNWT 2013). The only suspended particulate matter monitoring station operated by NAPS in Nunavut is located in Iqaluit and this station monitors $PM_{2.5}$ only. The annual mean $PM_{2.5}$ at the Iqaluit station was 9.6 $\mu g/m^3$ in 2013 (EC 2014). During the monitoring period, mean PM_{10} and $PM_{2.5}$ concentrations at the Project site were approximately 2.6 and 2.0 times lower than the Yellowknife station, respectively, and 3.4 times lower for $PM_{2.5}$ at the Iqaluit station. Monitoring of TSP concentrations by NAPS ceased in 2003. The latest regional dataset available was from 2002 and an annual geometric mean of 27 $\mu g/m^3$ was reported for the Yellowknife, NWT station (EC 2003), which is 3.6 times greater than values observed at the Project site.

3. AMBIENT AIR QUALITY MONITORING BY PASSIVE SAMPLER

As part of the ambient air quality compliance monitoring program, monthly mean concentrations of criteria air contaminants were monitored at the Project site between October 2013 and September 2014. A PASS station at the Project meteorological station was used to monitor SO_2, NO_2, and O_3 (see Plate 3.1-1). Measured concentrations were compared to ambient air quality guidelines, objectives and standards provided in the Air Quality Management Plan for the Project (Rescan 2011a) and predictions in the Doris North EIS (Miramar 2005).

3.1 SITE SELECTION

The GN has not established siting requirements for ambient air samplers. Therefore, the siting criteria provided by the BC MoE (BC MoE 2009) and the US EPA (US EPA 2009) were used to guide the monitoring program. The samplers were sited on a tripod beside the Doris meteorological station under a shelter to protect them from harsh weather and damage by birds (Plate 3.1-1). They were placed away from major airflow obstructions, further than the required minimum distance of four times the obstruction height, and there were no nearby roadways that could influence measurements.

Plate 3.1-1. Passive air samplers under a rain shelter at Doris meteorological station.

3.2 MONITORING METHOD

Passive air sampling is a diffusive method that monitors gas or vapour pollutants from the atmosphere at a rate controlled by a physical process, such as diffusion through a static air layer or permeation through a membrane. The passive method does not involve the active movement of air through a

sampler; therefore, no electric air-moving pump is required. The number of days of contact between the ambient air and the permeation membrane is important for the calculation of concentrations. The local meteorological conditions are also important, and the meteorological parameters that are used in the PASS calculations are air temperature, wind speed and relative humidity. The PASS provides low detection limits, is easy to install and does not require power.

Sampling was undertaken on a monthly basis between October 2013 and September 2014 and PASS samples were sent to Maxxam Analytical Laboratory for analysis following each sampling period. PASS filters were left out over a two month period in October and November 2013 due to a lack of personnel on site to perform the sample swaps. Laboratory results were provided in parts per billion (ppb) and converted to $\mu g/m^3$ using the following factors: 2.61 for SO_2, 1.88 for NO_2, and 1.96 for O_3, assuming 101.3 kPa.

3.3 RESULTS

The mean concentrations for SO_2, NO_2 and O_3 were 0.7, 1.9 and 62.4 $\mu g/m^3$, respectively, during the monitoring period (Table 3.3-1). The relevant ambient air quality objectives/guidelines and the maximum concentrations predicted in the Doris North EIS (Miramar 2005) are presented in Table 3.3-1. PASS results are summarized in Table 3.3-1 and Figure 3.3-1. The original laboratory reports are presented in Appendix D.

The PASS results are expressed as monthly mean concentrations and results cannot be compared to the hourly and daily concentrations predicted in the EIS; however, the mean annual concentrations can be compared to the average concentration found during the 12 month monitoring period. The mean concentrations of SO_2 and NO_2 were less than the concentrations predicted in the EIS. There are no annual, daily or hourly EIS predictions for O_3 (Miramar 2005). The Project SO_2 and NO_2 measurements were less than the relevant guidelines, while the measured O_3 concentrations were greater than the annual objective (Table 3.3-1).

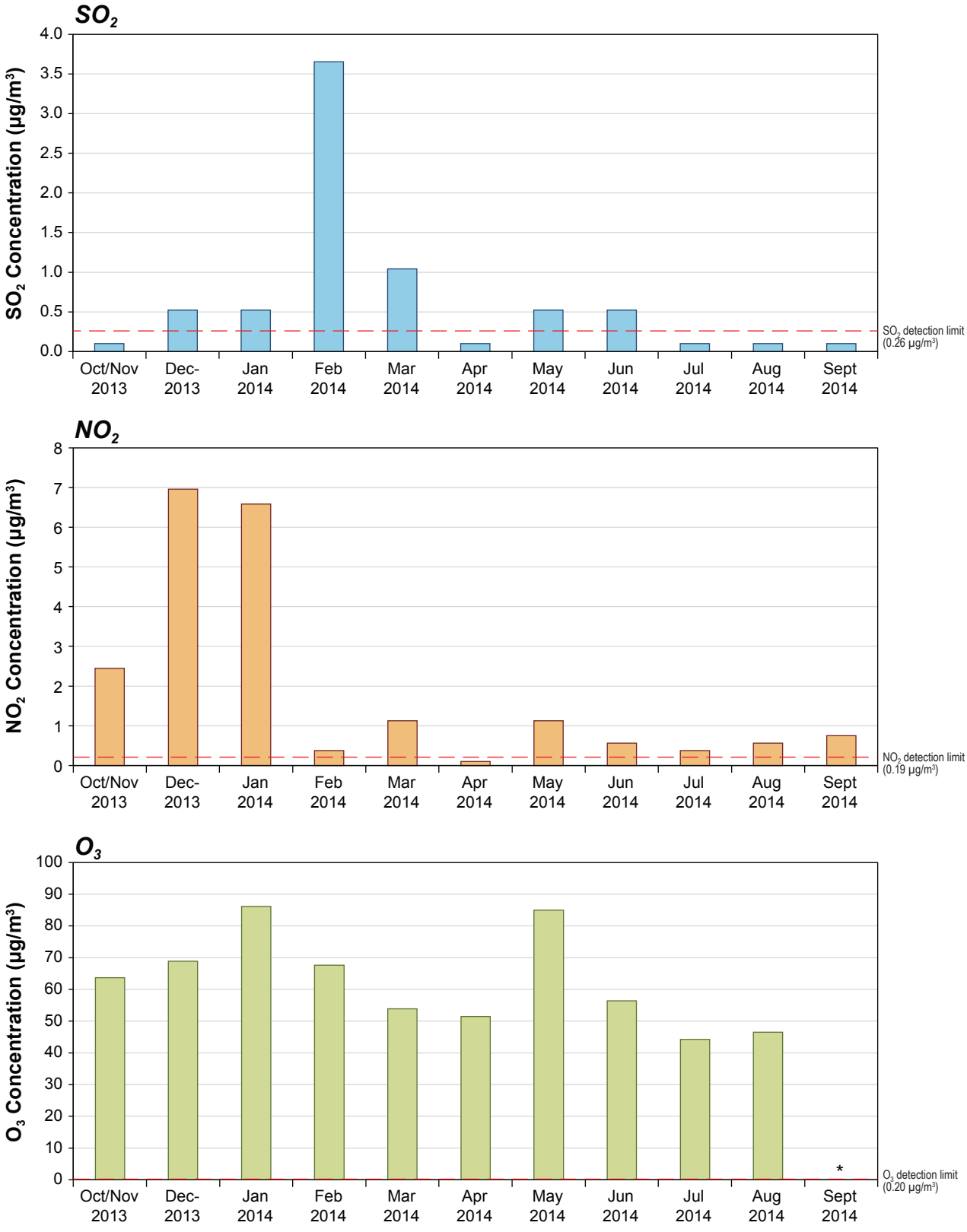
Remote locations may experience greater concentrations of ground level O_3 than urban locations due to the transport of O_3 from urban areas and the lower NO_2 concentrations, which scavenges O_3 from the air through chemical reactions. Health Canada recognises that the annual O_3 objective may not be achievable in remote locations and provides estimates of O_3 concentrations expected in areas that are not influenced by anthropogenic pollution (HC 1999). These estimates are provided for the May to September period, but it is noted that values should be slightly lower when all months of the year are included. The Health Canada estimates are as follows:

- daily 1-hour maximum (May - Sept.) 69 to 94 $\mu g/m^3$ (35 to 48 ppb); and
- monthly 1-hour mean (May - Sept.) 49 to 78 $\mu g/m^3$ (25 to 40 ppb).

Values measured on site were within this range and are considered representative of concentrations in an area relatively un-impacted by anthropogenic pollution.

Figure 3.3-1

SO_2, NO_2 and O_3 Concentrations from the Passive Air Sampling System, Doris North Project



Notes: The October and November 2013 samples were left out for 2 months.
**The wrong filter was provided by the laboratory for O_3 for the September sampling period.*

Table 3.3-1. Ambient Air Quality for SO_2, NO_2, and O_3[a, b]

		SO_2 ($\mu g/m^3$)[c]	NO_2 ($\mu g/m^3$)[d]	O_3 ($\mu g/m^3$)[e]
Objective/guideline	Annual	30[f]	100[g]	30[h,i]
	Daily	150[f]	200[g]	50[h,i]
	1-Hour	450[f]	400[g]	160[h,i]
Predicted	Annual	5.8	47.7	n/a[j]
	Daily	49.6	126.4	n/a[j]
	1-Hour	265.9	306.7	n/a[j]
Monthly Measured	Oct/Nov – 2013[k]	0.1	2.4	63.7
	Dec - 2013	0.5	6.9	68.8
	Jan – 2014	0.5	6.6	86.1
	Feb - 2014	3.7	0.4	67.6
	Mar – 2014	1.0	1.1	53.9
	Apr – 2014	0.1	0.1	51.4
	May – 2014	0.5	1.1	85.0
	Jun - 2014	0.5	0.6	56.4
	Jul – 2014	0.1	0.4	44.3
	Aug – 2014	0.1	0.6	46.5
	Sept – 2014[l]	0.1	0.8	--
	Mean	**0.7**	**1.9**	**62.4**

Notes:
[a] *Results less than the detection limit are reported as half of the detection limit.*
[b] *n/a = not available*
[c] *Detection limit was 0.26 $\mu g/m^3$ (0.1 ppb) for SO_2.*
[d] *Detection limit was 0.19 $\mu g/m^3$ (0.1 ppb) for NO_2*
[e] *Detection limit was 0.20 $\mu g/m^3$ (0.1 ppb) for O_3.*
[f] *GN Guideline for SO_2 (GN 2011).*
[g] *GN Guideline for NO_2 (GN 2011).*
[h] *National Ambient Air Quality Objective maximum acceptable concentration for O_3 (BC MoE 2013).*
[i] *GN Guideline for O_3 has an 8-hour averaging period which cannot be compared with monthly results (GN 2011).*
[j] *Predictions of Ozone concentrations were not included in the EIS for the Project.*
[k] *Samples were left out for two months, but were pro-rated to a 30 day rate.*
[l] *The wrong filter type was provided by the laboratory (H_2S), and analysis was not performed.*

Environment Canada undertakes monitoring at various locations across Canada as part of the National Air Pollution Surveillance (NAPS) Network. The nearest monitoring station to the Project that measures SO_2, NO_2, and O_3 concentrations is the Yellowknife, NWT station, which is operated in partnership with the NAPS program. Annual mean concentrations of SO_2, NO_2, and O_3 were 0.4, 3.2, and 24.4 $\mu g/m^3$ respectively for 2013 (GNWT 2013) which is the most recent year of published data. During the monitoring period, the mean NO_2 concentrations at the Project site were less than the annual mean 2013 measurements from the Yellowknife station, while SO_2 and O_3 concentrations were greater (Table 3.3-1). The relatively elevated O_3 concentrations observed at site compared to those observed at the Yellowknife, NWT station likely reflect differences between urban and rural areas outlined above.

4. SUMMARY

The ambient air quality monitoring program at the Project site included passive ambient air monitoring (PASS) of SO_2, NO_2, and O_3 concentrations from October 2013 through September 2014 and Partisol monitoring of particulate matter (TSP, PM_{10}, and $PM_{2.5}$) from October to November 2013 and June to September 2014. TSP, PM_{10}, and $PM_{2.5}$ concentrations were not collected from December 2013 to June 2014 due to observed inconsistencies in TSP and PM_{10} concentrations collected from October 2013 to November 2013 wherein TSP concentrations were less than PM_{10} concentrations collected on the same day. Sampling was suspended until a certified technician could be brought to site to service the Partisol samplers. Partisol sampling resumed on June 4, 2014. Dustfall was not monitored because crushing and construction activities did not occur during the period.

TSP, PM_{10}, and $PM_{2.5}$ concentrations during the periods measured were less than the relevant guidelines, objectives and standards for the monitoring period. Maximum measured concentrations of TSP, PM_{10}, and $PM_{2.5}$ were also less than the maximum concentrations predicted in the Doris North EIS.

Passive ambient air quality monitoring included monthly sampling for SO_2, NO_2, and O_3. Monthly mean concentrations cannot be directly compared to hourly and daily concentrations; however, given SO_2 and NO_2 concentrations from the 12-month sampling period can be compared to guidelines for annual values. Observed annual SO_2 and NO_2 concentrations were less than both relevant guidelines and the concentrations predicted in the EIS. Monthly O_3 concentrations were within the range of concentrations estimated by Health Canada for areas relatively un-impacted by anthropogenic pollution.

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Personal Communications

Fox, D. 2011. Email from Dave Fox (Environment Canada) to Anqela Holzapfel (Newmont) stating that he agrees with the new location of the Partisol samplers. Personal Communication: September 6, 2011.

Appendix A

Letter to TMAC from the NIRB Regarding Incinerator Stack Testing

NIRB File No. 05MN047

June 26, 2013

Terry MacGibbon
TMAC Resources Inc.
40 King Street West Suite 2100
Toronto, ON M5H 3C2

Sent via email: tmacgibbon@tmacresources.com

Re: Term and Condition 30 - Response to HBML's (TMAC Resources Ltd.) Proposed Suspension of Incinerator Stack Testing at Doris North Gold Mine during Care and Maintenance

---

Dear Terry MacGibbon:

On September 15, 2006 the the Nunavut Impact Review Board (NIRB or Board) issued Project Certificate (No. 003) for the Doris North Gold Project (NIRB File No. 05MN047) in accordance with Section 12.5.12 of the Nunavut Land Claims Agreement (NLCA) which included terms and conditions relating to air quality; specifically, Term and Condition 30 which states:

> *"MHBL will install and fund an atmospheric monitoring station. This station and its location shall be developed in consultation with EC and HC air quality officials and focus on particulates of concern generated at the mine site. The results of air-quality monitoring are to be reported every six (6) months to NIRB through the Monitoring Officer, and from there to all of the parties.*
>
> *Commentary: NIRB expects the Canada Wide Standards for Dioxins and Furans and the Canada Wide Standards for Mercury will apply and should be followed including stack testing of incinerators."*

On January 23, 2013 the NIRB received an email request from then-owner[1] of the Doris North Gold Project, Hope Bay Mining Ltd. (HBML), to consider allowing it to suspend stack testing of its site-based waste incineration and to reduce future stack testing frequency. HBML proposed this adjustment to Term and Condition 30 owing to the reduction in activities at the Doris North

[1] Note that the NIRB received confirmation on April 11, 2013 that TMAC Resources Inc. had acquired the Doris North Project from Hope Bay Mining Ltd. and on April 11, 2013 re-issued the NIRB Project Certificate No. 003 to TMAC Resources Ltd.

Gold Project during care and maintenance and the future predicted decrease in the waste being incinerated due to changes in waste stream management.

On March 6, 2013 the NIRB requested Environment Canada's (EC) advice regarding HBML's requests pertaining to stack testing at the Doris North Gold Project while it remains in care and maintenance and also future operational changes to waste stream management.

On April 15, 2013 the NIRB received EC's response which advised that sites incinerating 26 tonnes of waste per year or more must conduct annual stack testing to confirm compliance with emission standards as set out by the Canadian Council of Ministers of the Environment *Canada-wide Standards for Dioxins and Furans* and the *Canada Wide Standards for Mercury Emissions*. If operations incinerate less than 26 tonnes of waste per year, EC stated that the Proponent would not be expected to conduct annual stack testing; however, it would be required to make determined efforts to achieve these emission standards. EC also recommended that HBML heed the advice provided in its Technical Document for Batch Waste Incineration to guide the Doris North operations in achieving compliance with emissions.

Information pertaining to air quality at Doris North Gold Project, including the current request, the Proponent's Air Quality Management Plan, the advice provided by EC relating to the suspension of stack testing and other information regarding incineration can be obtained from the NIRB's online public registry at the following link:

http://ftp.nirb.ca/03-MONITORING/05MN047-DORIS%20NORTH%20GOLD%20MINE/02-MONITORING%20AND%20MANAGEMENT%20PLANS/AIR%20QUALITY%20PLAN/.

Following a review of the Proponent's request and the information provided by EC, the NIRB would support HBML's request to suspend annual stack testing during care and maintenance *provided* incineration rates can be demonstrated to be less than 26 tonnes per year by TMAC Resources Ltd. (TMAC), current owner of the project, and reported to the NIRB as set out within the NIRB's Project Certificate No. 003.

In respect to HBML's request to eliminate the requirement for future stack testing owing to a planned reduction in the waste stream management, TMAC would be required to provide the Board with evidence that it generated less than 26 tonnes of waste for incineration during the year in question (or projections for future years based on waste management streams), along with a detailed request to revisit the requirements for stack testing and the frequency of testing as per EC's advice.

The Board expects that TMAC will continue to keep the NIRB and other agencies informed as to the status of waste stream management and plans for stack testing. If at any future point in time the site waste volume changes or the Doris North Gold Project comes out of care and maintenance or any other information becomes available, the Board may re-visit this matter and may determine that stack testing resume as is required pursuant to Project Certificate No. 003.

If you have any questions or require clarification, feel free to contact me directly at (867) 983-4619 or kgillard@nirb.ca.

Sincerely,

Kelli Gillard B.Sc., P.Ag
Interim Monitoring Officer for the Doris North Gold Mine Project
Nunavut Impact Review Board

cc: Catharine Farrow, TMAC Resources Inc.
Gordon Morrison, TMAC Resources Inc.
Chris Hanks, Hope Bay Mining Ltd.
Lea-Marie Bowes-Lyon, Hope Bay Mining Ltd.
Distribution List

Appendix B

Partisol Samplers Service Report

AND ASSOCIATED COMPANIES

REPORT

HOPE BAY MINE

THERMO PARTISOL SERVICE

On-site: May 27th – 30th, 2014

Removed both sample tubes from roof of Partisol Shack for servicing of Inlets and ease of troubleshooting TSP and DICHOT Partisols. Serviced TSP Inlet. Serviced PM10 Inlet, thoroughly cleaned interior, inspected and lubricated internal O-ring(s) and replaced 1 ¼" O-rings.

TSP s/n 2025B221230801:

As Found:

TSP s/n 2025B221230801: Unit found to be in wait mode with Status "ZR". Last completed run was Dec 18th, 2013. Proceeded to complete an 'As Found' audit. (Status Z indicates a power failure). Found TSP receiving magazine piston in the down position. Most of the filter cassettes were inverted (filter side down). The receiving magazine piston must be in the up or fully extended position to properly receive the sampled cassette. If this has been the practice then this could be one explanation for the low TSP readings. Pistons can be elevated with a hand pump such as the one used for cassette extraction from the magazine at the testing lab.

Measurement	Reading	Actual	Offset	Span
Ambient Temp	9.2 C	7.7 C	3.77	NA
Filter Temp	14.0 C	12.5 C	0.24	NA
Ambient Press	761 mm Hg	762 mm Hg	-0.1	NA
Filter Comp Temp	9.5 C	12.5 C	-3.51	NA
RH	29.6%	44.6%	13.3	NA
Flow ***	0.00 LPM	0.00 LPM	0.466	1.057

*** Pump was running but zero flow. Suspect pump is damaged. Attempted Leak Check but had instant failure.

Proceeded to extract pump and found pump diaphragms to be badly worn and flapper valves contaminated with debris from disintegrating diaphragms. Rebuilt pump and installed in TSP unit. Continued with flow audit. Tested with 5 different filter cassettes. Results below.

Cassette	Instrument flow reading	Measured flow at inlet
1	16.67 LPM	8.1 LPM
2	16.67 LPM	8.4 LPM
3	16.67 LPM	8.6 LPM
4	16.67 LPM	8.4 LPM
5	16.67 LPM	7.95 LPM

Suspect major leak at cassette. Opened up sampling compartment and found the lower cassette v-seal to be badly cracked. These cracks open under pressure and are allowing at least half of the sample flow to bypass the filter. This is one explanation for the low TSP readings. Proceeded to replace upper and lower v-seals plus the lid v-seal. Attempted leak check and Passed with 5 mm Hg leak rate. Audited flow and got result of 15.3 LPM – needs calibration. Calibrated temperatures, pressure, flow. Note: RH

sensor no longer functioning accurately and impossible to calibrate – not a critical part and do no recommend replacement.

Results of calibration:

Calibrated	Offset	Span
Ambient Temperature	1.65	NA
Filter temperature	0.52	NA
Filter Comp Temperature	-3.53	NA
Ambient Pressure	0.9	NA
Ambient RH	13.3	NA
Flow	-0.007	1.054

Replaced fan foam filters.

Replaced water knock out filter element.

Replaced back up batteries (3 AA).

Set up TSP unit for run to start overnight to confirm operation. Returned next morning and found TSP unit sampling as programmed. Audited flow and found flow to be 16.43 LPM. Re-calibrated flow. New flow calibration factors are: Offset = -0.241, Span = 1.054

Katski Ventner (TMAC) suggested that a new set of filter cassettes should be installed in the TSP unit in order to resume sampling. Acquired lab prepared filter cassettes and created a filter list. Installed filter list in TSP unit and set new start time for the next NAPS sampling day (June 4th, 2014).

FINAL CALIBRATION FACTORS TSP s/n 2025B221230801:

Calibrated	Offset	Span
Ambient Temperature	1.65	NA
Filter temperature	0.52	NA
Filter Comp Temperature	-3.53	NA
Ambient Pressure	0.9	NA
Ambient RH	13.3	NA
Flow	-0.241	1.054

Findings:

Major leak at the lower v-seal can explain the lower TSP readings since only ½ of the sample flow was passing through the filter. Since the last leak check was in June 2013 there is no way to tell how long this condition has lasted. Could have happened immediately after the leak check as the seals look to be several years old. The condition of the pump indicates the last pump rebuild was at least 2 years ago. There was at least one power failure and the failure of the pump stopped any further sampling to occur.

Recommendations:

Perform annual maintenance which must include pump rebuild, all seals and O-rings replaced, filters replaced, back up battery replacement, a leak check and flow, temperature, pressure calibrations. Suggest this be done shortly before the snow flies as the pump will be running continuously during the winter. Ensure that the receiving magazine piston is in the up or fully extended position to prevent loss of TSP particulates.

Comments about TSP sampling:

I have spoken with the manufacturer about possible causes for TSP readings being lower PM10. Apparently, there are difficulties in retaining the collected TSP particulate on filter media. The TSP particulate is being collected but can be very loosely consolidated on the filter media surface. Handling such as the filter transport during a filter exchange or transportation to a lab can cause a loss of TSP particulate from the filter media. Changing the type of filter media does not improve retention either. I can find no solution for this particulate loss.

DICHOT s/n 202DA202970801:

As Found:

DICHOT s/n 202DA202970801: Unit found to be in wait mode with Status "ZRR". Last completed run was Dec 24th, 2013. Proceeded to complete an 'As Found' audit. (Status Z indicates a power failure)

Measurement	Reading	Actual	Offset	Span
Ambient Temp	9.5 C	10.2 C	1.90	NA
Filter 1 Temp	16.3 C	16.0 C	1.96	NA
Filter 2 Temp	16.3 C	16.0 C	1.66	NA
Ambient Press	761 mm Hg	762 mm Hg	-5.6	NA
Filter Comp Temp	14.3 C	16.0 C	-0.59	NA
RH	46.5%	48.5%	11.4	NA
Flow Fine ***	0.00 LPM	0.00 LPM	-0.220	1.025
Flow Coarse***	0.00 LPM	0.00 LPM	0.106	1.034

*** Pump was running but zero flow. Suspect pump is damaged. Attempted Leak Check but had instant failure. Attempted filter exchanger but failed.

Proceeded to extract pump and found pump diaphragms to be badly worn and flapper valves contaminated with debris from disintegrating diaphragms. Rebuilt pump and installed in DICHOT unit. Performed Leak Check – **Passed, leak rate 16 mm Hg**. Continued with flow audit. Results below.

Measurement	Reading	Actual
Flow Fine (High)	15.00 LPM	14.56 LPM
Flow Coarse (Low)	1.67 LPM	1.47 LPM

Replaced all Lower/Upper/Top V-seals and O-Rings.

Performed Leak Check – **Passed, leak rate 7 mm Hg**.

Noticed Low flow calibration range 2.1 – 2.5 LPM. Set point is 1.67 LPM. Changed low flow calibration range to 1.3 – 1.9 LPM. Calibrated temperatures, pressure and flows. RH module no longer functioning correctly – do not recommend replacement as this is not a critical measurement and does not affect any internal calculations.

Results of Calibration:

Calibrated	Offset	Span
Ambient Temperature	0.01	NA
Filter 1 temperature	0.67	NA
Filter 2 temperature	0.11	NA
Filter Comp Temperature	-0.59	NA
Ambient Pressure	-3.9	NA
Ambient RH	12.5	NA
Flow Fine (High)	0.000	0.938
Flow Coarse (Low)	-0.531	1.016

Replaced fan foam filters.

Replaced back up batteries (3 AA).

Water knock out filters in good condition – not replaced.

Set up DICHOT unit for run to start overnight to confirm operation. Returned next morning and found DICHOT unit sampling as programmed. Audited flows and found flows to be:

Total Flow = 16.99 LPM, High Flow = 15.24 LPM, Low Flow 1.74 LPM. Re-calibrated High Flow. New High Flow calibration factors are: Offset = -0.55, Span = 1.018 Re-calibrated Low Flow. New Low Flow calibration factors are: Offset = -0.040, Span = 1.027

FINAL CALIBRATION FACTORS DICHOT s/n 202DA202970801:

Calibrated	Offset	Span
Ambient Temperature	0.01	NA
Filter 1 temperature	0.67	NA
Filter 2 temperature	0.11	NA
Filter Comp Temperature	-0.59	NA
Ambient Pressure	-3.9	NA
Ambient RH	12.5	NA
Flow Fine (High)	-0.550	1.018
Flow Coarse (Low)	-0.040	1.027

Katski Ventner (TMAC) suggested that a new set of filter cassettes should be installed in the DICHOT unit in order to resume sampling. Acquired lab prepared filter cassettes and created a filter list. Installed filter list in DICHOT unit and set new start time for the next NAPS sampling day (June 4th, 2014).

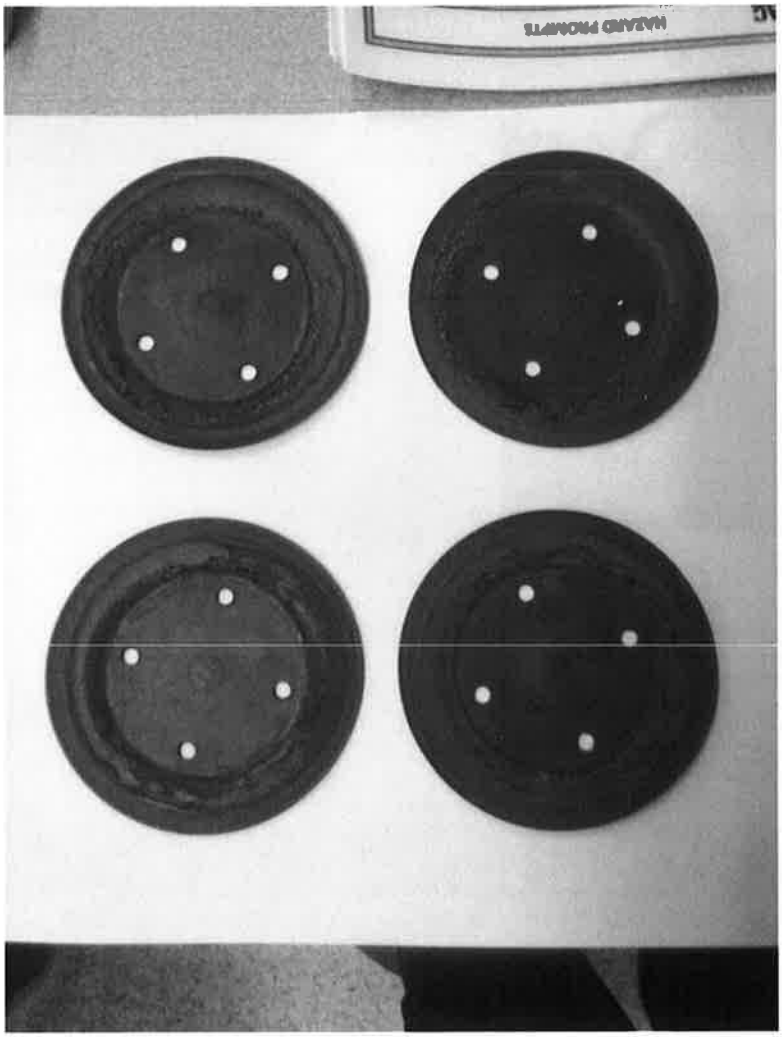
Findings:

The condition of the pump indicates the last pump rebuild was at least 2 years ago. There was at least one power failure and the failure of the pump stopped any further sampling to occur.

Recommendations:

Perform annual maintenance which must include pump rebuild, all seals and O-rings replaced, filters replaced, back up battery replacement, a leak check and flow, temperature, pressure calibrations. Suggest this be done shortly before the snow flies as the pump will be running continuously during the winter. I will supply factory recommend intervals for Audit, Calibration and maintenance. Please note how my recommendations differ from the factory.

Photo's of damaged diaphragms and TSP Lower V–seal.



Report prepared by:

Steve Moulds,
Technical Service Representative,
CD Nova Ltd.
Email: smoulds@cdnova.com
May 30, 2014

Appendix C

Suspended Particulate Matter Results (TSP, PM_{10}, $PM_{2.5}$)

ERM Consultants Canada Ltd.
ATTN: Jem Morrison
Sixth Floor
15th Floor
Vancouver BC V6E 2J3

Date Received: 08-FEB-14
Report Date: 19-FEB-14 10:11 (MT)
Version: FINAL

Client Phone: 604-689-9460

Certificate of Analysis

Lab Work Order #: L1420561

Project P.O. #: NOT SUBMITTED
Job Reference: 0194098-0002
C of C Numbers:
Legal Site Desc:

Amber Springer
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1420561-1	L1420561-2	L1420561-3	L1420561-4	L1420561-5
	Description	Air	Air	Air	Air	Air
	Sampled Date	01-OCT-13	07-OCT-13	13-OCT-13	19-OCT-13	25-OCT-13
	Sampled Time					
	Client ID	27812 (24M^3 SAMPLED)	24904 (24M^3 SAMPLED)	25051 (24M^3 SAMPLED)	27806 (24M^3 SAMPLED)	24924 (24M^3 SAMPLED)
Grouping	**Analyte**					
FILTER						
Particulates	Particulate - PM2.5 (ug)					
	Particulate - PM2.5 (ug/m3)					
	Particulate-Fine (ug/m3)					
	Particulate-Coarse (ug/m3)					
	Particulate-PM10 (ug/m3)					
	Total Suspended Particulate (ug)	173	73	163	113	420
	Total Suspended Particulate (ug/m3)	7.2	3.1	6.8	4.7	17.5

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1420561-6	L1420561-7	L1420561-8	L1420561-9	L1420561-10
	Description	Air	Air	Air	Air	Air
	Sampled Date	31-OCT-13	06-NOV-13	12-NOV-13	18-NOV-13	24-NOV-13
	Sampled Time					
	Client ID	22670 (24M^3 SAMPLED)	24950 (24M^3 SAMPLED)	27584 (24M^3 SAMPLED)	25068 (24M^3 SAMPLED)	24910 (24M^3 SAMPLED)
Grouping	**Analyte**					
FILTER						
Particulates	Particulate - PM2.5 (ug)					
	Particulate - PM2.5 (ug/m3)					
	Particulate-Fine (ug/m3)					
	Particulate-Coarse (ug/m3)					
	Particulate-PM10 (ug/m3)					
	Total Suspended Particulate (ug)	347	150	240	147	97
	Total Suspended Particulate (ug/m3)	14.4	6.3	10.0	6.1	4.0

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1420561-11	L1420561-12	L1420561-13	L1420561-14	L1420561-15
	Description	Air	Air	Air	Air	Air
	Sampled Date	30-NOV-13	01-OCT-13	07-OCT-13	13-OCT-13	19-OCT-13
	Sampled Time					
	Client ID	27445 (24M^3 SAMPLED)	25415 (2.4M^3 SAMPLED)	27819 (2.4M^3 SAMPLED)	27809 (2.4M^3 SAMPLED)	27305 (2.4M^3 SAMPLED)
Grouping	**Analyte**					
FILTER						
Particulates	Particulate - PM2.5 (ug)					
	Particulate - PM2.5 (ug/m3)					
	Particulate-Fine (ug/m3)		<2.0	2.5	2.6	<2.0
	Particulate-Coarse (ug/m3)		<2.0	<2.0	5.7	2.4
	Particulate-PM10 (ug/m3)		3.8	4.4	8.3	3.5
	Total Suspended Particulate (ug)	127				
	Total Suspended Particulate (ug/m3)	5.3				

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1420561-16	L1420561-17	L1420561-18	L1420561-19	L1420561-20
	Description	Air	Air	Air	Air	Air
	Sampled Date	25-OCT-13	31-OCT-13	06-NOV-13	12-NOV-13	18-NOV-13
	Sampled Time					
	Client ID	27572 (2.4M^3 SAMPLED)	27298 (2.4M^3 SAMPLED)	27803 (2.4M^3 SAMPLED)	27798 (2.4M^3 SAMPLED)	27311 (2.4M^3 SAMPLED)
Grouping	**Analyte**					
FILTER						
Particulates	Particulate - PM2.5 (ug)					
	Particulate - PM2.5 (ug/m3)					
	Particulate-Fine (ug/m3)	3.1	2.3	<2.0	3.1	4.8
	Particulate-Coarse (ug/m3)	8.0	4.5	<2.0	4.4	2.2
	Particulate-PM10 (ug/m3)	11.1	6.8	3.2	7.5	6.9
	Total Suspended Particulate (ug)					
	Total Suspended Particulate (ug/m3)					

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1420561-21 Air 24-NOV-13 27302 (2.4M^3 SAMPLED)	L1420561-22 Air 30-NOV-13 25054 (2.4M^3 SAMPLED)	L1420561-23 Air 01-OCT-13 27581 (21.6M^3 SAMPLED)	L1420561-24 Air 07-OCT-13 24936 (21.6M^3 SAMPLED)	L1420561-25 Air 13-OCT-13 27296 (21.6M^3 SAMPLED)
FILTER						
Particulates	Particulate - PM2.5 (ug)			<50	53	57
	Particulate - PM2.5 (ug/m3)			<2.3	2.5	2.6
	Particulate-Fine (ug/m3)	3.2	5.2			
	Particulate-Coarse (ug/m3)	<2.0	<2.0			
	Particulate-PM10 (ug/m3)	4.9	6.8			
	Total Suspended Particulate (ug)					
	Total Suspended Particulate (ug/m3)					

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1420561-26	L1420561-27	L1420561-28	L1420561-29	L1420561-30
	Description	Air	Air	Air	Air	Air
	Sampled Date	19-OCT-13	25-OCT-13	31-OCT-13	06-NOV-13	12-NOV-13
	Sampled Time					
	Client ID	24947 (21.6M^3 SAMPLED)	24920 (21.6M^3 SAMPLED)	25073 (21.6M^3 SAMPLED)	24930 (21.6M^3 SAMPLED)	24921 (21.6M^3 SAMPLED)
Grouping	**Analyte**					
FILTER						
Particulates	Particulate - PM2.5 (ug)	<50	67	50	<50	67
	Particulate - PM2.5 (ug/m3)	<2.3	3.1	2.3	<2.3	3.1
	Particulate-Fine (ug/m3)					
	Particulate-Coarse (ug/m3)					
	Particulate-PM10 (ug/m3)					
	Total Suspended Particulate (ug)					
	Total Suspended Particulate (ug/m3)					

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1420561-31	L1420561-32	L1420561-33		
	Description	Air	Air	Air		
	Sampled Date	18-NOV-13	24-NOV-13	30-NOV-13		
	Sampled Time					
	Client ID	27307 (21.6M^3 SAMPLED)	13768 (21.6M^3 SAMPLED)	27779 (21.6M^3 SAMPLED)		
Grouping	**Analyte**					
FILTER						
Particulates	Particulate - PM2.5 (ug)	103	70	113		
	Particulate - PM2.5 (ug/m3)	4.8	3.2	5.2		
	Particulate-Fine (ug/m3)					
	Particulate-Coarse (ug/m3)					
	Particulate-PM10 (ug/m3)					
	Total Suspended Particulate (ug)					
	Total Suspended Particulate (ug/m3)					

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1420561-1	L1420561-2	L1420561-3	L1420561-4	L1420561-5
	Description	Air	Air	Air	Air	Air
	Sampled Date	01-OCT-13	07-OCT-13	13-OCT-13	19-OCT-13	25-OCT-13
	Sampled Time					
	Client ID	27812 (24M^3 SAMPLED)	24904 (24M^3 SAMPLED)	25051 (24M^3 SAMPLED)	27806 (24M^3 SAMPLED)	24924 (24M^3 SAMPLED)
Grouping	**Analyte**					
MISC.						
Field Tests	Air Volume, Client Supplied (L)	24000	24000	24000	24000	24000

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1420561-6	L1420561-7	L1420561-8	L1420561-9	L1420561-10
	Description	Air	Air	Air	Air	Air
	Sampled Date	31-OCT-13	06-NOV-13	12-NOV-13	18-NOV-13	24-NOV-13
	Sampled Time					
	Client ID	22670 (24M^3 SAMPLED)	24950 (24M^3 SAMPLED)	27584 (24M^3 SAMPLED)	25068 (24M^3 SAMPLED)	24910 (24M^3 SAMPLED)
Grouping	**Analyte**					
MISC.						
Field Tests	Air Volume, Client Supplied (L)	24000	24000	24000	24000	24000

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1420561-11	L1420561-12	L1420561-13	L1420561-14	L1420561-15
	Description	Air	Air	Air	Air	Air
	Sampled Date	30-NOV-13	01-OCT-13	07-OCT-13	13-OCT-13	19-OCT-13
	Sampled Time					
	Client ID	27445 (24M^3 SAMPLED)	25415 (2.4M^3 SAMPLED)	27819 (2.4M^3 SAMPLED)	27809 (2.4M^3 SAMPLED)	27305 (2.4M^3 SAMPLED)
Grouping	**Analyte**					
MISC.						
Field Tests	Air Volume, Client Supplied (L)	24000	2400	2400	2400	2400

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1420561-16	L1420561-17	L1420561-18	L1420561-19	L1420561-20
	Description	Air	Air	Air	Air	Air
	Sampled Date	25-OCT-13	31-OCT-13	06-NOV-13	12-NOV-13	18-NOV-13
	Sampled Time					
	Client ID	27572 (2.4M^3 SAMPLED)	27298 (2.4M^3 SAMPLED)	27803 (2.4M^3 SAMPLED)	27798 (2.4M^3 SAMPLED)	27311 (2.4M^3 SAMPLED)
Grouping	**Analyte**					
MISC.						
Field Tests	Air Volume, Client Supplied (L)	2400	2400	2400	2400	2400

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1420561-21	L1420561-22	L1420561-23	L1420561-24	L1420561-25
	Description	Air	Air	Air	Air	Air
	Sampled Date	24-NOV-13	30-NOV-13	01-OCT-13	07-OCT-13	13-OCT-13
	Sampled Time					
	Client ID	27302 (2.4M^3 SAMPLED)	25054 (2.4M^3 SAMPLED)	27581 (21.6M^3 SAMPLED)	24936 (21.6M^3 SAMPLED)	27296 (21.6M^3 SAMPLED)
Grouping	**Analyte**					
MISC.						
Field Tests	Air Volume, Client Supplied (L)	2400	2400	21600	21600	21600

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1420561-26	L1420561-27	L1420561-28	L1420561-29	L1420561-30
	Description	Air	Air	Air	Air	Air
	Sampled Date	19-OCT-13	25-OCT-13	31-OCT-13	06-NOV-13	12-NOV-13
	Sampled Time					
	Client ID	24947 (21.6M^3 SAMPLED)	24920 (21.6M^3 SAMPLED)	25073 (21.6M^3 SAMPLED)	24930 (21.6M^3 SAMPLED)	24921 (21.6M^3 SAMPLED)
Grouping	**Analyte**					
MISC.						
Field Tests	Air Volume, Client Supplied (L)	21600	21600	21600	21600	21600

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1420561-31	L1420561-32	L1420561-33		
	Description	Air	Air	Air		
	Sampled Date	18-NOV-13	24-NOV-13	30-NOV-13		
	Sampled Time					
	Client ID	27307 (21.6M^3 SAMPLED)	13768 (21.6M^3 SAMPLED)	27779 (21.6M^3 SAMPLED)		
Grouping	**Analyte**					
MISC.						
Field Tests	Air Volume, Client Supplied (L)	21600	21600	21600		

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
AIR VOLUME-VA	Misc.	Air volume (L)	HYGIENE METHOD
PART-DICHOT-PM10-VA	Filter	Total Particulate (Dichot-PM10) by Grav.	BCMOE Method

Total Particulate Matter (PM10) Method analysis is carried out in accordance with the BCMOE Lab Manual, Section G Air Constituents - Inorganics, "Total Particulate - PM10/PM02 - 47mm - HiVol" method. ALS provides pre-weighed filters (Pallflex TX40 HI20-WW 47mm) and clients typically sample using a "Dichotomus Partisol sequential Air Sampler" equivalent sample (EQPS-0509-179, EQPS-0509-180, EQPS-0311-198)as per U.S. EPA Reference Method RFPS-0694-098, fitted with a PM10 inlet. The particulate matter is determined gravimetrically. Three formulas are required for the mass concentration(um/M3)computation of fine PM(PM-2.5) Course PM (PM-10 minus PM2.5) and PM-10.

PART-PM2.5-VA	Filter	Total Particulate (PM2.5) by Gravimetric	BCMOE METHOD

Total Particulate Matter (PM2.5) Method analysis is carried out in accordance with the BCMOE Lab Manual, Section G Air Constituents - Inorganics, "Total Particulate - PM10/PM02 - 47mm - HiVol" method. ALS provides pre-weighed filters (Pallflex TX40 HI20-WW 47mm) and clients typically sample using a "Partisol Model 2000 Air Sampler" as per U.S. EPA Reference Method RFPS-0694-098, fitted with a PM2.5 inlet. The particulate matter is determined gravimetrically.

PART-TSP-VA	Filter	Total Particulate (TSP) by Gravimetric	BCMOE METHOD

Total Suspended Particulate Matter (TSP) Method of analysis is modified from the BCMOE Lab Manual, Section G Air Constituents - Inorganics, "Total Particulate - PM10/PM02 - 47mm - HiVol" method. ALS provides pre-weighed filters (Pallflex TX40 HI20-WW 47mm) and clients typically sample using a "Partisol Model 2000 Air Sampler" as per U.S. EPA Reference Method RFPS-0694-098, fitted with a TSP inlet. The particulate matter is determined gravimetrically.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ERM Consultants Canada Ltd.
ATTN: Jem Morrison
1111 West Hastings Street
15th Floor
Vancouver BC V6E 2J3

Date Received: 07-JUL-14
Report Date: 05-AUG-14 13:52 (MT)
Version: FINAL REV. 3

Client Phone: 604-689-9460

Certificate of Analysis

Lab Work Order #: L1482390

Project P.O. #: NOT SUBMITTED
Job Reference: 0194098-0002
C of C Numbers:
Legal Site Desc: HOPE BAY

Comments:

29-JUL-2014 Sampling dates have been updated for L1482390-11 through -15.
5-AUG-2014 Data has been removed for three filters not intended for analysis.

Amber Springer
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1482390-1	L1482390-2	L1482390-3	L1482390-4	L1482390-5
	Description	Air	Air	Air	Air	Air
	Sampled Date	04-JUN-14	10-JUN-14	16-JUN-14	22-JUN-14	28-JUN-14
	Sampled Time					
	Client ID	27299	25052	27780	25077	27726
Grouping	**Analyte**					
FILTER						
Particulates	Particulate - PM2.5 (ug)					
	Particulate - PM2.5 (ug/m3)					
	Particulate-Fine (ug/m3)					
	Particulate-Coarse (ug/m3)					
	Particulate-PM10 (ug/m3)					
	Total Suspended Particulate (ug)	263	<50	63	130	123
	Total Suspended Particulate (ug/m3)	11.0	<2.1	2.6	5.4	5.1

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1482390-6	L1482390-7	L1482390-8	L1482390-9	L1482390-10
	Description	Air	Air	Air	Air	Air
	Sampled Date	04-JUN-14	10-JUN-14	16-JUN-14	22-JUN-14	28-JUN-14
	Sampled Time					
	Client ID	27295	25080	27315	27778	27799
Grouping	**Analyte**					
FILTER						
Particulates	Particulate - PM2.5 (ug)					
	Particulate - PM2.5 (ug/m3)					
	Particulate-Fine (ug/m3)	2.8	2.6	2.6	2.5	<2.3
	Particulate-Coarse (ug/m3)	0.56	0.848	1.95	3.36	2.22
	Particulate-PM10 (ug/m3)	3.3	3.5	4.6	5.8	3.6
	Total Suspended Particulate (ug)					
	Total Suspended Particulate (ug/m3)					

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1482390-11	L1482390-12	L1482390-13	L1482390-14	L1482390-15
	Description	Air	Air	Air	Air	Air
	Sampled Date	04-JUN-14	10-JUN-14	16-JUN-14	22-JUN-14	28-JUN-14
	Sampled Time					
	Client ID	27570	25405	25445	24903	24542
Grouping	**Analyte**					
FILTER						
Particulates	Particulate - PM2.5 (ug)	60	57	57	53	<50
	Particulate - PM2.5 (ug/m3)	2.8	2.6	2.6	2.5	<2.3
	Particulate-Fine (ug/m3)					
	Particulate-Coarse (ug/m3)					
	Particulate-PM10 (ug/m3)					
	Total Suspended Particulate (ug)					
	Total Suspended Particulate (ug/m3)					

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1482390-1	L1482390-2	L1482390-3	L1482390-4	L1482390-5
	Description	Air	Air	Air	Air	Air
	Sampled Date	04-JUN-14	10-JUN-14	16-JUN-14	22-JUN-14	28-JUN-14
	Sampled Time					
	Client ID	27299	25052	27780	25077	27726
Grouping	**Analyte**					
MISC.						
Field Tests	Air Volume, Client Supplied (L)	24000	24000	24000	24000	24000

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1482390-6	L1482390-7	L1482390-8	L1482390-9	L1482390-10
	Description	Air	Air	Air	Air	Air
	Sampled Date	04-JUN-14	10-JUN-14	16-JUN-14	22-JUN-14	28-JUN-14
	Sampled Time					
	Client ID	27295	25080	27315	27778	27799
Grouping	**Analyte**					
MISC.						
Field Tests	Air Volume, Client Supplied (L)	2400	2400	2400	2400	2400

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1482390-11	L1482390-12	L1482390-13	L1482390-14	L1482390-15
	Description	Air	Air	Air	Air	Air
	Sampled Date	04-JUN-14	10-JUN-14	16-JUN-14	22-JUN-14	28-JUN-14
	Sampled Time					
	Client ID	27570	25405	25445	24903	24542
Grouping	**Analyte**					
MISC.						
Field Tests	Air Volume, Client Supplied (L)	21600	21600	21600	21600	21600

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
AIR VOLUME-VA	Misc.	Air volume (L)	HYGIENE METHOD
PART-DICHOT-PM10-VA	Filter	Total Particulate (Dichot-PM10) by Grav.	BCMOE Method

Total Particulate Matter (PM10) Method analysis is carried out in accordance with the BCMOE Lab Manual, Section G Air Constituents - Inorganics, "Total Particulate - PM10/PM02 - 47mm - HiVol" method. ALS provides pre-weighed filters (Pallflex TX40 HI20-WW 47mm) and clients typically sample using a "Dichotomus Partisol sequential Air Sampler" equivalent sample (EQPS-0509-179, EQPS-0509-180, EQPS-0311-198)as per U.S. EPA Reference Method RFPS-0694-098, fitted with a PM10 inlet. The particulate matter is determined gravimetrically. Three formulas are required for the mass concentration(um/M3)computation of fine PM(PM-2.5) Course PM (PM-10 minus PM2.5) and PM-10.

PART-PM2.5-VA	Filter	Total Particulate (PM2.5) by Gravimetric	BCMOE METHOD

Total Particulate Matter (PM2.5) Method analysis is carried out in accordance with the BCMOE Lab Manual, Section G Air Constituents - Inorganics, "Total Particulate - PM10/PM02 - 47mm - HiVol" method. ALS provides pre-weighed filters (Pallflex TX40 HI20-WW 47mm) and clients typically sample using a "Partisol Model 2000 Air Sampler" as per U.S. EPA Reference Method RFPS-0694-098, fitted with a PM2.5 inlet. The particulate matter is determined gravimetrically.

PART-TSP-VA	Filter	Total Particulate (TSP) by Gravimetric	BCMOE METHOD

Total Suspended Particulate Matter (TSP) Method of analysis is modified from the BCMOE Lab Manual, Section G Air Constituents - Inorganics, "Total Particulate - PM10/PM02 - 47mm - HiVol" method. ALS provides pre-weighed filters (Pallflex TX40 HI20-WW 47mm) and clients typically sample using a "Partisol Model 2000 Air Sampler" as per U.S. EPA Reference Method RFPS-0694-098, fitted with a TSP inlet. The particulate matter is determined gravimetrically.

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The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

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VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

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Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

L1482390-COFC

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

Report to:	**Report Format / Distribution**	**Service Requested:**
Company: ERM Rescan	☑ Standard ☐ Other	☑ Regular Service (Default)
Contact: Jem Morrison	☑ PDF ☑ Excel ☐ Fax	☐ Rush Service (2-3 Days)
Address: 15th Floor, 1111 West Hastings Street,	Email 1: jem.morrison@erm.com	☐ Priority Service (1 Day or ASAP)
Vancouver, BC V6E 2J3	Email 2: derek.shaw@erm.com	☐ Emergency Service (<1 Day / Wkend) - Contact ALS
Phone: 604-689-9460 Fax:		**Analysis Request**
Invoice To: ☐ Same as Report	Indicate Bottles: Filtered / Preserved (F/P) →	
Company: ERM Rescan	**Client / Project Information:**	
Contact: Accounts Payable (ermcanada.payables@erm.com	Job #: 0194098-0002	
Address: 15th Floor, 1111 West Hastings Street,	PO/AFE:	
Vancouver, BC V6E 2J3	Legal Site Description: HOPE BAY	
Phone: 604-689-9460 Fax:	Quote #:	
Lab Work Order # (lab use only)	**ALS Contact:** Amber Springer **Sampler** (Initials): JM	

Sample #	Sample Identification (This description will appear on the report)	Date dd-mmm-yy	Time hh:mm	Sample Type (Select from drop-down list)	TSP	PM10	Hazardous?	Highly Contaminated?	Number of Containers
	27299	04-Jun-14	24 hour sample	Air	X				
	25052	10-Jun-14	24 hour sample	Air	X				
	27780	16-Jun-14	24 hour sample	Air	X				
	25077	22-Jun-14	24 hour sample	Air	X				
	27726	28-Jun-14	24 hour sample	Air	X				
	27295	04-Jun-14	24 hour sample	Air		X			
	25080	10-Jun-14	24 hour sample	Air		X			
	27315	16-Jun-14	24 hour sample	Air		X			
	27778	22-Jun-14	24 hour sample	Air		X			
	27799	28-Jun-14	24 hour sample	Air		X			

Guidelines / Regulations	**Special Instructions / Hazardous Details**
	TSP - 24m^3 sampled; PM10 - 2.4m^3 sampled; PM2.5 - 21.6m^3 sampled

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the adjacent worksheet.

Relinquished By:	Jem Morrison	Date & Time:	03-Jul-14	Received By:	Paraje	Date & Time:	July 7 13:10	Sample Condition (lab use only)	
Relinquished By:		Date & Time:		Received By:		Date & Time:		Temperature 22°C	Samples Received in Good Condition? Y / N (if no provided details)

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878
www.alsglobal.com

L1482390-COFC

Report to:		Report Format / Distribution		Service Requested:	
Company:	ERM Rescan				Regular Service (Default)
Contact:	Jem Morrison				Rush Service (2-3 Days)
Address:	15th Floor, 1111 West Hastings Street,	Email 1:	jem.morrison@erm.com		Priority Service (1 Day or ASAP)
Vancouver, BC V6E 2J3		Email 2:	derek.shaw@erm.com		Emergency Service (<1 Day / Wkend) - Contact ALS
Phone:	604-689-9460 Fax:			Analysis Request	
Invoice To:		Indicate Bottles: Filtered / Preserved (F/P) →			
Company:	ERM Rescan	**Client / Project Information:**			
Contact:	Accounts Payable (ermcanada.payables@erm.com	Job #:	0194098-0002		
Address:	15th Floor, 1111 West Hastings Street,	PO/AFE:			
Vancouver, BC V6E 2J3		Legal Site Description:	HOPE BAY		
Phone:	604-689-9460 Fax:	Quote #:			
Lab Work Order # (lab use only)		**ALS Contact:**	Amber Springer	**Sampler** (Initials):	JM

Sample #	Sample Identification (This description will appear on the report)	Date dd-mmm-yy	Time hh:mm	Sample Type (Select from drop-down list)	PM2.5	Hazardous?	Highly Contaminated?	Number of Containers
	27570	01-Oct-13	24 hour sample	Air	X			
	25405	07-Oct-13	24 hour sample	Air	X			
	25445	13-Oct-13	24 hour sample	Air	X			
	24903	19-Oct-13	24 hour sample	Air	X			
	24542	25-Oct-13	24 hour sample	Air	X			

Guidelines / Regulations	Special Instructions / Hazardous Details
	TSP - 24m^3 sampled; PM10 - 2.4m^3 sampled; PM2.5 - 21.6m^3 sampled

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the adjacent worksheet.

								Sample Condition (lab use only)	
Relinquished By:	Jem Morrison	Date & Time:	03-Jul-14	Received By:	Paige	Date & Time:	July 7 13:10	Temperature 22°C	Samples Received in Good Condition? Y / N (if no provided details)
Relinquished By:		Date & Time:		Received By:		Date & Time:			

ERM Consultants Canada Ltd.
ATTN: Jem Morrison
1111 West Hastings Street
15th Floor
Vancouver BC V6E 2J3

Date Received: 02-SEP-14
Report Date: 09-SEP-14 17:50 (MT)
Version: FINAL

Client Phone: 604-689-9460

Certificate of Analysis

Lab Work Order #: L1511637

Project P.O. #: NOT SUBMITTED
Job Reference: 0246616-0002
C of C Numbers:
Legal Site Desc:

Amber Springer
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1511637-1	L1511637-2	L1511637-3	L1511637-4	L1511637-5
	Description	Air	Air	Air	Air	Air
	Sampled Date	04-JUL-14	10-JUL-14	16-JUL-14	22-JUL-14	28-JUL-14
	Sampled Time					
	Client ID	24922	25402	107619	24928	25401
Grouping	**Analyte**					
FILTER						
Particulates	Particulate - PM2.5 (ug)					
	Particulate - PM2.5 (ug/m3)					
	Particulate-Fine (ug/m3)					
	Particulate-Coarse (ug/m3)					
	Particulate-PM10 (ug/m3)					
	Total Suspended Particulate (ug)	107	260	273	153	413
	Total Suspended Particulate (ug/m3)	4.4	10.8	11.4	6.4	17.2

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1511637-6 Air 03-AUG-14 25053	L1511637-7 Air 09-AUG-14 17843	L1511637-8 Air 15-AUG-14 27294	L1511637-9 Air 21-AUG-14 27795	L1511637-10 Air 04-JUL-14 27309
Sample ID						
Description						
Sampled Date						
Sampled Time						
Client ID						
FILTER						
Particulates	Particulate - PM2.5 (ug)					
	Particulate - PM2.5 (ug/m3)					
	Particulate-Fine (ug/m3)					<2.3
	Particulate-Coarse (ug/m3)					1.51
	Particulate-PM10 (ug/m3)					3.1
	Total Suspended Particulate (ug)	180	120	140	320	
	Total Suspended Particulate (ug/m3)	7.5	5.0	5.8	13.3	

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1511637-11	L1511637-12	L1511637-13	L1511637-14	L1511637-15
	Description	Air	Air	Air	Air	Air
	Sampled Date	10-JUL-14	16-JUL-14	22-JUL-14	28-JUL-14	03-AUG-14
	Sampled Time					
	Client ID	25418	13097	27795	25075	25070
Grouping	**Analyte**					
FILTER						
Particulates	Particulate - PM2.5 (ug)					
	Particulate - PM2.5 (ug/m3)					
	Particulate-Fine (ug/m3)	2.6	3.4	3.1	7.4	2.9
	Particulate-Coarse (ug/m3)	4.46	3.83	2.07	2.45	2.49
	Particulate-PM10 (ug/m3)	7.1	7.2	5.2	9.9	5.4
	Total Suspended Particulate (ug)					
	Total Suspended Particulate (ug/m3)					

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1511637-16 Air 09-AUG-14 90549	L1511637-17 Air 15-AUG-14 24925	L1511637-18 Air 21-AUG-14 27731	L1511637-19 Air 04-JUL-14 27306	L1511637-20 Air 10-JUL-14 24944
Sample ID **Description** **Sampled Date** **Sampled Time** **Client ID**						
FILTER						
Particulates	Particulate - PM2.5 (ug)				<50	57
	Particulate - PM2.5 (ug/m3)				<2.3	2.6
	Particulate-Fine (ug/m3)	2.5	<2.3	2.8		
	Particulate-Coarse (ug/m3)	2.25	2.18	7.78		
	Particulate-PM10 (ug/m3)	4.7	4.0	10.6		
	Total Suspended Particulate (ug)					
	Total Suspended Particulate (ug/m3)					

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1511637-21	L1511637-22	L1511637-23	L1511637-24	L1511637-25
	Description	Air	Air	Air	Air	Air
	Sampled Date	16-JUL-14	22-JUL-14	28-JUL-14	03-AUG-14	09-AUG-14
	Sampled Time					
	Client ID	27433	29745	27308	27573	27313
Grouping	**Analyte**					
FILTER						
Particulates	Particulate - PM2.5 (ug)	73	67	160	63	53
	Particulate - PM2.5 (ug/m3)	3.4	3.1	7.4	2.9	2.5
	Particulate-Fine (ug/m3)					
	Particulate-Coarse (ug/m3)					
	Particulate-PM10 (ug/m3)					
	Total Suspended Particulate (ug)					
	Total Suspended Particulate (ug/m3)					

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1511637-26	L1511637-27			
	Description	Air	Air			
	Sampled Date	15-AUG-14	21-AUG-14			
	Sampled Time					
	Client ID	25074	27437			
Grouping	**Analyte**					
FILTER						
Particulates	Particulate - PM2.5 (ug)	<50	60			
	Particulate - PM2.5 (ug/m3)	<2.3	2.8			
	Particulate-Fine (ug/m3)					
	Particulate-Coarse (ug/m3)					
	Particulate-PM10 (ug/m3)					
	Total Suspended Particulate (ug)					
	Total Suspended Particulate (ug/m3)					

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1511637-1	L1511637-2	L1511637-3	L1511637-4	L1511637-5
	Description	Air	Air	Air	Air	Air
	Sampled Date	04-JUL-14	10-JUL-14	16-JUL-14	22-JUL-14	28-JUL-14
	Sampled Time					
	Client ID	24922	25402	107619	24928	25401
Grouping	**Analyte**					
MISC.						
Field Tests	Air Volume, Client Supplied (L)	24000	24000	24000	23900	24000

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1511637-6	L1511637-7	L1511637-8	L1511637-9	L1511637-10
	Description	Air	Air	Air	Air	Air
	Sampled Date	03-AUG-14	09-AUG-14	15-AUG-14	21-AUG-14	04-JUL-14
	Sampled Time					
	Client ID	25053	17843	27294	27795	27309
Grouping	**Analyte**					
MISC.						
Field Tests	Air Volume, Client Supplied (L)	24000	24000	24000	24000	2400

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1511637-11	L1511637-12	L1511637-13	L1511637-14	L1511637-15
	Description	Air	Air	Air	Air	Air
	Sampled Date	10-JUL-14	16-JUL-14	22-JUL-14	28-JUL-14	03-AUG-14
	Sampled Time					
	Client ID	25418	13097	27795	25075	25070
Grouping	**Analyte**					
MISC.						
Field Tests	Air Volume, Client Supplied (L)	2400	2400	2400	2400	2400

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1511637-16	L1511637-17	L1511637-18	L1511637-19	L1511637-20
	Description	Air	Air	Air	Air	Air
	Sampled Date	09-AUG-14	15-AUG-14	21-AUG-14	04-JUL-14	10-JUL-14
	Sampled Time					
	Client ID	90549	24925	27731	27306	24944
Grouping	**Analyte**					
MISC.						
Field Tests	Air Volume, Client Supplied (L)	2400	2400	2400	21600	21600

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1511637-21	L1511637-22	L1511637-23	L1511637-24	L1511637-25
	Description	Air	Air	Air	Air	Air
	Sampled Date	16-JUL-14	22-JUL-14	28-JUL-14	03-AUG-14	09-AUG-14
	Sampled Time					
	Client ID	27433	29745	27308	27573	27313
Grouping	**Analyte**					
MISC.						
Field Tests	Air Volume, Client Supplied (L)	21600	21600	21600	21600	21600

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1511637-26	L1511637-27			
	Description	Air	Air			
	Sampled Date	15-AUG-14	21-AUG-14			
	Sampled Time					
	Client ID	25074	27437			
Grouping	**Analyte**					
MISC.						
Field Tests	Air Volume, Client Supplied (L)	21600	21600			

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
AIR VOLUME-VA	Misc.	Air volume (L)	HYGIENE METHOD
PART-DICHOT-PM10-VA	Filter	Total Particulate (Dichot-PM10) by Grav.	BCMOE Method

Total Particulate Matter (PM10) Method analysis is carried out in accordance with the BCMOE Lab Manual, Section G Air Constituents - Inorganics, "Total Particulate - PM10/PM02 - 47mm - HiVol" method. ALS provides pre-weighed filters (Pallflex TX40 HI20-WW 47mm) and clients typically sample using a "Dichotomus Partisol sequential Air Sampler" equivalent sample (EQPS-0509-179, EQPS-0509-180, EQPS-0311-198)as per U.S. EPA Reference Method RFPS-0694-098, fitted with a PM10 inlet. The particulate matter is determined gravimetrically. Three formulas are required for the mass concentration(um/M3)computation of fine PM(PM-2.5) Course PM (PM-10 minus PM2.5) and PM-10.

PART-PM2.5-VA	Filter	Total Particulate (PM2.5) by Gravimetric	BCMOE METHOD

Total Particulate Matter (PM2.5) Method analysis is carried out in accordance with the BCMOE Lab Manual, Section G Air Constituents - Inorganics, "Total Particulate - PM10/PM02 - 47mm - HiVol" method. ALS provides pre-weighed filters (Pallflex TX40 HI20-WW 47mm) and clients typically sample using a "Partisol Model 2000 Air Sampler" as per U.S. EPA Reference Method RFPS-0694-098, fitted with a PM2.5 inlet. The particulate matter is determined gravimetrically.

PART-TSP-VA	Filter	Total Particulate (TSP) by Gravimetric	BCMOE METHOD

Total Suspended Particulate Matter (TSP) Method of analysis is modified from the BCMOE Lab Manual, Section G Air Constituents - Inorganics, "Total Particulate - PM10/PM02 - 47mm - HiVol" method. ALS provides pre-weighed filters (Pallflex TX40 HI20-WW 47mm) and clients typically sample using a "Partisol Model 2000 Air Sampler" as per U.S. EPA Reference Method RFPS-0694-098, fitted with a TSP inlet. The particulate matter is determined gravimetrically.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

L1511637-COFC

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Environmental Division

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
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COC # _____

Page 1 of 3

Report to:	**Report Format / Distribution**	**Service Requested:**
Company: ERM Rescan	☑ Standard ☐ Other	☑ Regular Service (Default)
Contact: Jem Morrison	☑ PDF ☑ Excel ☐ Fax	☐ Rush Service (2-3 Days)
Address: 15th Floor, 1111 West Hastings Street,	Email 1: jem.morrison@erm.com	☐ Priority Service (1 Day or ASAP)
Vancouver, BC V6E 2J3	Email 2: derek.shaw@erm.com	☐ Emergency Service (<1 Day / Wkend) - Contact ALS
Phone: 604-689-9460 Fax:		**Analysis Request**
Invoice To: ☐ Same as Report	Indicate Bottles: Filtered / Preserved (F/P) →	
Company: ERM Rescan	**Client / Project Information:**	
Contact: Accounts Payable (ermcanada.payables@erm.com	Job #: 0246616-0002	
Address: 15th Floor, 1111 West Hastings Street,	PO/AFE:	
Vancouver, BC V6E 2J3	Legal Site Description:	
Phone: 604-689-9460 Fax:	Quote #:	
Lab Work Order # (lab use only)	**ALS Contact:**	**Sampler** (Initials): A. Jokela

Sample #	Sample Identification (This description will appear on the report)	Date dd-mmm-yy	Air Volume m^3	Sample Type (Select from drop-down list)	TSP	Hazardous?	Highly Contaminated?	Number of Containers
	24922	July 4	24.0	Air	X			1
	25402	July 10	24.0	Air	X			1
	107619	July 16	24.0	Air	X			1
	24928	July 22	23.9	Air	X			1
	25401	July 28	24.0	Air	X			1
	25053	August 3	24.0	Air	X			1
	17843	August 9	24.0	Air	X			1
	27294	August 15	24.0	Air	X			1
	27795	August 21	24.0	Air	X			1

Guidelines / Regulations	**Special Instructions / Hazardous Details**

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the adjacent worksheet.

Relinquished By:	Annali Jokela	Date & Time:	Aug 26 / 9h00	Received By:	Paige	Date & Time:	Sept. 2 12:45	Sample Condition (lab use only) Temperature 12.5 °C	Samples Received in Good Condition? Y / N (If no provided details)
Relinquished By:		Date & Time:		Received By:		Date & Time:			

ALS Labor
ANALYTICAL CHEMISTRY &

L1511637-COFC

Environmental

istody / Analytical Request Form
a Toll Free: 1 800 668 9878
www.alsglobal.com

COC # _____

Page 2 of 3

Report to:		Report Format / Distribution		Service Requested:	
Company:	ERM Rescan				Regular Service (Default)
Contact:	Jem Morrison				Rush Service (2-3 Days)
Address:	15th Floor, 1111 West Hastings Street,	Email 1:	jem.morrison@erm.com		Priority Service (1 Day or ASAP)
Vancouver, BC V6E 2J3		Email 2:	derek.shaw@erm.com		Emergency Service (<1 Day / Wkend) - Contact ALS
Phone:	604-689-9460 Fax:			Analysis Request	
Invoice To:		Indicate Bottles: Filtered / Preserved (F/P) →			
Company:	ERM Rescan	Client / Project Information:			
Contact:	Accounts Payable (ermcanada.payables@erm.com	Job #:	0246616-0002		
Address:	15th Floor, 1111 West Hastings Street,	PO/AFE:			
Vancouver, BC V6E 2J3		Legal Site Description:			
Phone:	604-689-9460 Fax:	Quote #:			
Lab Work Order # (lab use only):		ALS Contact:		Sampler (Initials):	A. Jokela

Sample #	Sample Identification (This description will appear on the report)	Date dd-mmm-yy	Air Volume m^3	Sample Type (Select from drop-down list)	PM 10	Hazardous?	Highly Contaminated?	Number of Containers
	27309	July 4	2.4	Air	X			1
	25418	July 10	2.4	Air	X			1
	13097	July 16	2.4	Air	X			1
	27795	July 22	2.4	Air	X			1
	25075	July 28	2.4	Air	X			1
	25070	August 3	2.4	Air	X			1
	90549	August 9	2.4	Air	X			1
	24925	August 15	2.4	Air	X			1
	27731	August 21	2.4	Air	X			1

Guidelines / Regulations	Special Instructions / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the adjacent worksheet.

Relinquished By:		Date & Time:	Aug 26/8h00	Received By:	Paige	Date & Time:	Sept. 2 12:45	Sample Condition (lab use only)	
Relinquished By:		Date & Time:		Received By:		Date & Time:		Temperature 12.5 °C	Samples Received in Good Condition? Y / N (if no provided details)

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Canada Toll Free: 1 800 668 9878
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COC # _____

Page 3 of 3

Environme...

Report to:		Report Format / Distribution		Service Requested:	
Company:	ERM Rescan				Regular Service (Default)
Contact:	Jem Morrison				Rush Service (2-3 Days)
Address:	15th Floor, 1111 West Hastings Street,	Email 1:	jem.morrison@erm.com		Priority Service (1 Day or ASAP)
Vancouver, BC V6E 2J3		Email 2:	derek.shaw@erm.com		Emergency Service (<1 Day / Wkend) - Contact ALS
Phone:	604-689-9460 Fax:			Analysis Request	
Invoice To:		Indicate Bottles: Filtered / Preserved (F/P) →			
Company:	ERM Rescan	Client / Project Information:			
Contact:	Accounts Payable (ermcanada.payables@erm.com	Job #:	0246616-0002		
Address:	15th Floor, 1111 West Hastings Street,	PO/AFE:			
Vancouver, BC V6E 2J3		Legal Site Description:			
Phone:	604-689-9460 Fax:	Quote #:			
Lab Work Order # (lab use only)		ALS Contact:	Sampler (Initials):		

Sample #	Sample Identification (This description will appear on the report)	Date dd-mmm-yy	Air Volume m^3	Sample Type (Select from drop-down list)	PM 2.5	Hazardous?	Highly Contaminated?	Number of Containers
	27306	July 4	21.6	Air	X			1
	24944	July 10	21.6	Air	X			1
	27433	July 16	21.6	Air	X			1
	29745	July 22	21.4	Air	X			1
	27308	July 28	21.6	Air	X			1
	27573	August 3	21.6	Air	X			1
	27313	August 9	21.6	Air	X			1
	25074	August 15	21.6	Air	X			1
	27437	August 21	21.6	Air	X			1

Guidelines / Regulations	Special Instructions / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the adjacent worksheet.

Relinquished By:		Date & Time:	Aug 26 / 8h00	Received By:	Paige	Date & Time:	Sept. 2 12:45
Relinquished By:		Date & Time:		Received By:		Date & Time:	

Sample Condition (lab use only)

Temperature	Samples Received in Good Condition? Y / N (If no provided details)
12.5°C	

ERM Consultants Canada Ltd.
ATTN: Jem Morrison
1111 West Hastings Street
15th Floor
Vancouver BC V6E 2J3

Date Received: 11-OCT-14
Report Date: 21-OCT-14 12:42 (MT)
Version: FINAL

Client Phone: 604-689-9460

Certificate of Analysis

Lab Work Order #: L1531695

Project P.O. #: NOT SUBMITTED
Job Reference: 0246616-0002
C of C Numbers:
Legal Site Desc:

Amber Springer
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1531695-1	L1531695-2	L1531695-3	L1531695-4	L1531695-5
	Description	Air	Air	Air	Air	Air
	Sampled Date	27-AUG-14	02-SEP-14	08-SEP-14	14-SEP-14	20-SEP-14
	Sampled Time					
	Client ID	27442 (24M3 SAMPLED)	25412 (24M3 SAMPLED)	25403 (24M3 SAMPLED)	25905 (24M3 SAMPLED)	25428 (24M3 SAMPLED)
Grouping	**Analyte**					
FILTER						
Particulates	Particulate - PM2.5 (ug)					
	Particulate - PM2.5 (ug/m3)					
	Particulate-Fine (ug/m3)					
	Particulate-Coarse (ug/m3)					
	Particulate-PM10 (ug/m3)					
	Total Suspended Particulate (ug)	103	103	83	223	147
	Total Suspended Particulate (ug/m3)	4300	4300	3500	9300	6100

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1531695-6	L1531695-7	L1531695-8	L1531695-9	L1531695-10
	Description	Air	Air	Air	Air	Air
	Sampled Date	26-SEP-14	27-AUG-14	02-SEP-14	08-SEP-14	20-SEP-14
	Sampled Time					
	Client ID	29711 (24M3 SAMPLED)	97132 (2.4M3 SAMPLED)	27324 (2.4M3 SAMPLED)	27318 (2.4M3 SAMPLED)	27810 (2.4M3 SAMPLED)
Grouping	**Analyte**					
FILTER						
Particulates	Particulate - PM2.5 (ug)					
	Particulate - PM2.5 (ug/m3)					
	Particulate-Fine (ug/m3)		3.5	2.9	2.9	3.5
	Particulate-Coarse (ug/m3)		2.70	1.37	0.956	0.756
	Particulate-PM10 (ug/m3)		6.3	4.3	3.9	4.3
	Total Suspended Particulate (ug)	297				
	Total Suspended Particulate (ug/m3)	12400				

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1531695-11	L1531695-12	L1531695-13	L1531695-14	
	Description	Air	Air	Air	Air	
	Sampled Date	27-AUG-14	02-SEP-14	08-SEP-14	14-SEP-14	
	Sampled Time					
	Client ID	27478 (21.6M3 SAMPLED)	27574 (21.6M3 SAMPLED)	27800 (21.6M3 SAMPLED)	24926 (21.6M3 SAMPLED)	
Grouping	**Analyte**					
FILTER						
Particulates	Particulate - PM2.5 (ug)	77	63	63	77	
	Particulate - PM2.5 (ug/m3)	3500	2900	2900	3500	
	Particulate-Fine (ug/m3)					
	Particulate-Coarse (ug/m3)					
	Particulate-PM10 (ug/m3)					
	Total Suspended Particulate (ug)					
	Total Suspended Particulate (ug/m3)					

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1531695-1	L1531695-2	L1531695-3	L1531695-4	L1531695-5
	Description	Air	Air	Air	Air	Air
	Sampled Date	27-AUG-14	02-SEP-14	08-SEP-14	14-SEP-14	20-SEP-14
	Sampled Time					
	Client ID	27442 (24M3 SAMPLED)	25412 (24M3 SAMPLED)	25403 (24M3 SAMPLED)	25905 (24M3 SAMPLED)	25428 (24M3 SAMPLED)
Grouping	**Analyte**					
MISC.						
Field Tests	Air Volume, Client Supplied (L)	24	24	24	24	24

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1531695-6	L1531695-7	L1531695-8	L1531695-9	L1531695-10
	Description	Air	Air	Air	Air	Air
	Sampled Date	26-SEP-14	27-AUG-14	02-SEP-14	08-SEP-14	20-SEP-14
	Sampled Time					
	Client ID	29711 (24M3 SAMPLED)	97132 (2.4M3 SAMPLED)	27324 (2.4M3 SAMPLED)	27318 (2.4M3 SAMPLED)	27810 (2.4M3 SAMPLED)
Grouping	**Analyte**					
MISC.						
Field Tests	Air Volume, Client Supplied (L)	24	2.4	2.4	2.4	2.4

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1531695-11	L1531695-12	L1531695-13	L1531695-14	
	Description	Air	Air	Air	Air	
	Sampled Date	27-AUG-14	02-SEP-14	08-SEP-14	14-SEP-14	
	Sampled Time					
	Client ID	27478 (21.6M3 SAMPLED)	27574 (21.6M3 SAMPLED)	27800 (21.6M3 SAMPLED)	24926 (21.6M3 SAMPLED)	
Grouping	**Analyte**					
MISC.						
Field Tests	Air Volume, Client Supplied (L)	21.6	21.6	21.6	21.6	

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
AIR VOLUME-VA	Misc.	Air volume (L)	HYGIENE METHOD
PART-DICHOT-PM10-VA	Filter	Total Particulate (Dichot-PM10) by Grav.	BCMOE Method

Total Particulate Matter (PM10) Method analysis is carried out in accordance with the BCMOE Lab Manual, Section G Air Constituents - Inorganics, "Total Particulate - PM10/PM02 - 47mm - HiVol" method. ALS provides pre-weighed filters (Pallflex TX40 HI20-WW 47mm) and clients typically sample using a "Dichotomus Partisol sequential Air Sampler" equivalent sample (EQPS-0509-179, EQPS-0509-180, EQPS-0311-198)as per U.S. EPA Reference Method RFPS-0694-098, fitted with a PM10 inlet. The particulate matter is determined gravimetrically. Three formulas are required for the mass concentration(um/M3)computation of fine PM(PM-2.5) Course PM (PM-10 minus PM2.5) and PM-10.

PART-PM2.5-VA	Filter	Total Particulate (PM2.5) by Gravimetric	BCMOE METHOD

Total Particulate Matter (PM2.5) Method analysis is carried out in accordance with the BCMOE Lab Manual, Section G Air Constituents - Inorganics, "Total Particulate - PM10/PM02 - 47mm - HiVol" method. ALS provides pre-weighed filters (Pallflex TX40 HI20-WW 47mm) and clients typically sample using a "Partisol Model 2000 Air Sampler" as per U.S. EPA Reference Method RFPS-0694-098, fitted with a PM2.5 inlet. The particulate matter is determined gravimetrically.

PART-TSP-VA	Filter	Total Particulate (TSP) by Gravimetric	BCMOE METHOD

Total Suspended Particulate Matter (TSP) Method of analysis is modified from the BCMOE Lab Manual, Section G Air Constituents - Inorganics, "Total Particulate - PM10/PM02 - 47mm - HiVol" method. ALS provides pre-weighed filters (Pallflex TX40 HI20-WW 47mm) and clients typically sample using a "Partisol Model 2000 Air Sampler" as per U.S. EPA Reference Method RFPS-0694-098, fitted with a TSP inlet. The particulate matter is determined gravimetrically.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

L1531695-COFC

ALS Environmental

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC # _____

Page 1 of 2

Report To:	Report Format / Distribution	Service Requested (Rush for routine analysis subject to availability)
Company: ERM Rescan	☑ Standard ☐ Other	◉ Regular (Standard Turnaround Times - Business Days)
Contact: Jem Morrison	☑ PDF ☑ Excel ☐ Digital ☐ Fax	○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address: 15th Floor 1111 West Hastings St Vancouver BC. V6E 2J3	Email 1: jem.morrison@erm.com	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Email 2:	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone: Fax:	Email 3: Derek.shaw@erm.com	
Invoice To Same as Report ?	Client / Project Information	Analysis Request
Hardcopy of Invoice with Report?	Job #: 0246611-0002	Please Indicate below Filtered, Preserved or both (F, P, F/P)
Company:	PO / AFE:	
Contact: Accounts Payable (ERMcanadapayable@erm.com)	LSD:	
Address:	Job Ref: Compliance Sampling Program	
Phone: Fax:	Quote #:	
Lab Work Order # (lab use only)	ALS Contact: Erin Bolster	Sampler:

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	TSP	PM10	Number of Containers
	27442 (24 m³ Sampled)	Aug 27	24hour	Air ~~Water~~	✓		
	25412 (" ")	Sep 2	"	"	✓		
	25403 (" ")	Sep 8	"	"	✓		
	25905 (" ")	Sep 14	"	"	✓		
	25428 (" ")	Sep 20	"	"	✓		
	29711 (" ")	Sep 26	"	"	✓		
	97132 (2.4 m³ Sampled)	Aug 27	"	"		✓	
	27324 (" ")	Sep 2	"	"		✓	
	27318 (" ")	Sep 8	"	"		✓	
	27810 (" ")	Sep 20	"	"		✓	

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Jem Morrison	Oct 7		JH	oct 11	10.30	7 °C				

GENF 18.01 Front

ALS Environmental

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC # _____

Report To:	Report Format / Distribution	Service Requested (Rush for routine analysis subject to availability)
Company:	☑ Standard ☐ Other	◉ Regular (Standard Turnaround Times - Business Days)
Contact:	☑ PDF ☑ Excel ☐ Digital ☐ Fax	○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	Email 1:	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Email 2:	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone: Fax:	Email 3:	Analysis Request
Invoice To Same as Report ?	Client / Project Information	Please Indicate below Filtered, Preserved or both (F, P, F/P)
Hardcopy of Invoice with Report?	Job #:	
Company:	PO / AFE:	
Contact:	LSD:	
Address:	Job Ref: Compliance Sampling Program	
Phone:	Quote #:	
Le	ALS Contact: Erin Bolster	Sampler:

L1531695-COFC

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	PM2.5	Number of Containers
	27418	Aug 27	24hr	Water	/	
	27574	Sep 2	"	"	/	
	27800	Sep 8	"	"	/	
	24926	Sep 14	"	"	/	

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Jem Morrison	Oct 7		JK	Oct 11	10:30	4 °C				

Appendix D

Passive Air Sampling (PASS) Results

Maxxam

Your P.O. #: 0194098
Your Project #: 2013/09/30 - 2013/12/01
Site Location: HOPE BAY

Attention: JEM MORRISON
RESCAN ENVIRONMENTAL SERVICES LTD.
SIXTH FLOOR
1111 WEST HASTINGS STREET
VANCOUVER, BC
CANADA V6E 2J3

Report Date: 2014/04/03
Report #: R1545902
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B423650
Received: 2014/03/25, 14:58

Sample Matrix: Air
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis (1)	1	2014/03/31	2014/04/03	PTC SOP-00148	Passive NO2 in ATM
O3 Passive Analysis (1)	1	2014/04/03	2014/04/03	PTC SOP-00197	EPA 300 R2.1
SO2 Passive Analysis (1)	1	2014/03/31	2014/04/03	PTC SOP-00149	Tang Passive SO2 in

* Results relate only to the items tested.

(1) The detection limit is based on a 30 day sampling period.

Encryption Key

Maxxam

03 Apr 2014 13:49:28 -06:00

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

Levi Manchak, Customer Service
Email: LManchak@maxxam.ca
Phone# (780) 378-8500

==========

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Total cover pages: 1

Maxxam Job #: B423650
Report Date: 2014/04/03

RESCAN ENVIRONMENTAL SERVICES LTD.
Client Project #: 2013/09/30 - 2013/12/01
Site Location: HOPE BAY
Your P.O. #: 0194098

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		JD2547		
Sampling Date		2013/09/30		
	UNITS	**DORIS**	**RDL**	**QC Batch**
Passive Monitoring				
Calculated NO2	ppb	1.3	0.1	7434496
Calculated O3	ppb	32.51	0	7439422
Calculated SO2	ppb	<0.1	0.1	7434528

RDL = Reportable Detection Limit

General Comments

Notes on field sheet indicate deployed samples were discovered outside of shelter, on the ground.

Sample start date listed on COC as 2013/09/29. Previous set of samples removed 2013/09/30; 2013/09/30 used as start date for this set of samples. -LM

Maxxam Job #: B423650
Report Date: 2014/04/03

RESCAN ENVIRONMENTAL SERVICES LTD.
Client Project #: 2013/09/30 - 2013/12/01
Site Location: HOPE BAY
Your P.O. #: 0194098

QUALITY ASSURANCE REPORT

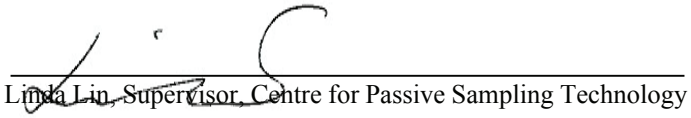
			Spiked Blank		Method Blank		Calibration Check	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	UNITS	% Recovery	QC Limits
7434496	Calculated NO2	2014/03/31	102	90 - 110	<0.1	ppb	97	90 - 110
7434528	Calculated SO2	2014/03/31	98	90 - 110	<0.1	ppb	100	90 - 110
7439422	Calculated O3	2014/04/03	100	90 - 110	0.0, RDL=0	ppb	98	90 - 110

N/A = Not Applicable
RDL = Reportable Detection Limit
Calibration Check: A calibration standard analyzed at different times to evaluate on-going calibration 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.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Validation Signature Page

Maxxam Job #: B423650

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



Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Your P.O. #: 0194098
Your Project #: 2013/12/01 - 2014/01/01
Site Location: HOPE BAY

Attention: JEM MORRISON
RESCAN ENVIRONMENTAL SERVICES LTD.
SIXTH FLOOR
1111 WEST HASTINGS STREET
VANCOUVER, BC
CANADA V6E 2J3

Report Date: 2014/04/03
Report #: R1545903
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B423653
Received: 2014/03/25, 15:03

Sample Matrix: Air
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis (1)	1	2014/03/31	2014/04/03	PTC SOP-00148	Passive NO2 in ATM
O3 Passive Analysis (1)	1	2014/04/03	2014/04/03	PTC SOP-00197	EPA 300 R2.1
SO2 Passive Analysis (1)	1	2014/03/31	2014/04/03	PTC SOP-00149	Tang Passive SO2 in

* Results relate only to the items tested.

(1) The detection limit is based on a 30 day sampling period.

Encryption Key

Maxxam

03 Apr 2014 13:49:31 -06:00

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

Levi Manchak, Customer Service
Email: LManchak@maxxam.ca
Phone# (780) 378-8500

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Total cover pages: 1

Maxxam Job #: B423653
Report Date: 2014/04/03

RESCAN ENVIRONMENTAL SERVICES LTD.
Client Project #: 2013/12/01 - 2014/01/01
Site Location: HOPE BAY
Your P.O. #: 0194098

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		JD2566		
Sampling Date		2013/12/01		
	UNITS	**DORIS**	**RDL**	**QC Batch**
Passive Monitoring				
Calculated NO2	ppb	3.7	0.1	7434496
Calculated O3	ppb	35.12	0	7439422
Calculated SO2	ppb	0.2	0.1	7434528

RDL = Reportable Detection Limit

General Comments

Sample JD2566 (Doris) for O3 parameter was returned to the lab. with perforation in filter membrane. - OZ

Maxxam Job #: B423653
Report Date: 2014/04/03

RESCAN ENVIRONMENTAL SERVICES LTD.
Client Project #: 2013/12/01 - 2014/01/01
Site Location: HOPE BAY
Your P.O. #: 0194098

QUALITY ASSURANCE REPORT

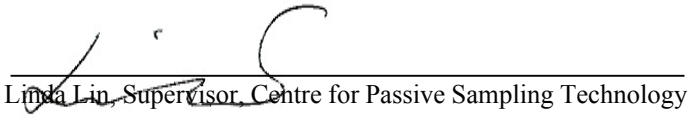
			Spiked Blank		Method Blank		Calibration Check	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	UNITS	% Recovery	QC Limits
7434496	Calculated NO2	2014/03/31	102	90 - 110	<0.1	ppb	97	90 - 110
7434528	Calculated SO2	2014/03/31	98	90 - 110	<0.1	ppb	100	90 - 110
7439422	Calculated O3	2014/04/03	100	90 - 110	0.0, RDL=0	ppb	98	90 - 110

N/A = Not Applicable
RDL = Reportable Detection Limit
Calibration Check: A calibration standard analyzed at different times to evaluate on-going calibration 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.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Validation Signature Page

Maxxam Job #: B423653

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



Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Maxxam

Your P.O. #: 0194098
Your Project #: 2014/01/01 - 2014/01/31
Site Location: HOPE BAY

Attention: JEM MORRISON
RESCAN ENVIRONMENTAL SERVICES LTD.
SIXTH FLOOR
1111 WEST HASTINGS STREET
VANCOUVER, BC
CANADA V6E 2J3

Report Date: 2014/04/03
Report #: R1545910
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B423654
Received: 2014/03/25, 15:06

Sample Matrix: Air
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis (1)	1	2014/03/31	2014/04/03	PTC SOP-00148	Passive NO2 in ATM
O3 Passive Analysis (1)	1	2014/04/03	2014/04/03	PTC SOP-00197	EPA 300 R2.1
SO2 Passive Analysis (1)	1	2014/03/31	2014/04/03	PTC SOP-00149	Tang Passive SO2 in

* Results relate only to the items tested.

(1) The detection limit is based on a 30 day sampling period.

Encryption Key

Maxxam

03 Apr 2014 14:00:36 -06:00

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

Levi Manchak, Customer Service
Email: LManchak@maxxam.ca
Phone# (780) 378-8500

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Total cover pages: 1

Maxxam Job #: B423654
Report Date: 2014/04/03

RESCAN ENVIRONMENTAL SERVICES LTD.
Client Project #: 2014/01/01 - 2014/01/31
Site Location: HOPE BAY
Your P.O. #: 0194098

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		JD2568		
Sampling Date		2014/01/01		
	UNITS	**DORIS**	**RDL**	**QC Batch**
Passive Monitoring				
Calculated NO2	ppb	3.5	0.1	7434496
Calculated O3	ppb	43.94	0	7439422
Calculated SO2	ppb	0.2	0.1	7434528

RDL = Reportable Detection Limit

General Comments

Sample JD2568 (Doris) for O3 parameter was returned to the lab. with perforation in filter membrane. - OZ

Maxxam Job #: B423654
Report Date: 2014/04/03

RESCAN ENVIRONMENTAL SERVICES LTD.
Client Project #: 2014/01/01 - 2014/01/31
Site Location: HOPE BAY
Your P.O. #: 0194098

QUALITY ASSURANCE REPORT

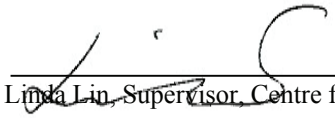
			Spiked Blank		Method Blank		Calibration Check	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	UNITS	% Recovery	QC Limits
7434496	Calculated NO2	2014/03/31	102	90 - 110	<0.1	ppb	97	90 - 110
7434528	Calculated SO2	2014/03/31	98	90 - 110	<0.1	ppb	100	90 - 110
7439422	Calculated O3	2014/04/03	100	90 - 110	0.0, RDL=0	ppb	98	90 - 110

N/A = Not Applicable
RDL = Reportable Detection Limit
Calibration Check: A calibration standard analyzed at different times to evaluate on-going calibration 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.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Validation Signature Page

Maxxam Job #: B423654

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



Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Maxxam

Your P.O. #: 0194098
Your Project #: 2014/01/31 - 2014/02/28
Site Location: HOPE BAY

Attention: JEM MORRISON
RESCAN ENVIRONMENTAL SERVICES LTD.
SIXTH FLOOR
1111 WEST HASTINGS STREET
VANCOUVER, BC
CANADA V6E 2J3

Report Date: 2014/04/03
Report #: R1545911
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B423656
Received: 2014/03/25, 15:07

Sample Matrix: Air
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis (1)	1	2014/03/31	2014/04/03	PTC SOP-00148	Passive NO2 in ATM
O3 Passive Analysis (1)	1	2014/04/03	2014/04/03	PTC SOP-00197	EPA 300 R2.1
SO2 Passive Analysis (1)	1	2014/03/31	2014/04/03	PTC SOP-00149	Tang Passive SO2 in

* Results relate only to the items tested.

(1) The detection limit is based on a 30 day sampling period.

Encryption Key

Maxxam

03 Apr 2014 14:00:52 -06:00

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

Levi Manchak, Customer Service
Email: LManchak@maxxam.ca
Phone# (780) 378-8500

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Total cover pages: 1

Maxxam Job #: B423656
Report Date: 2014/04/03

RESCAN ENVIRONMENTAL SERVICES LTD.
Client Project #: 2014/01/31 - 2014/02/28
Site Location: HOPE BAY
Your P.O. #: 0194098

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		JD2572		
Sampling Date		2014/01/31		
	UNITS	**DORIS**	**RDL**	**QC Batch**
Passive Monitoring				
Calculated NO2	ppb	0.2	0.1	7434496
Calculated O3	ppb	34.49	0	7439422
Calculated SO2	ppb	1.4	0.1	7434528

RDL = Reportable Detection Limit

Maxxam Job #: B423656
Report Date: 2014/04/03

RESCAN ENVIRONMENTAL SERVICES LTD.
Client Project #: 2014/01/31 - 2014/02/28
Site Location: HOPE BAY
Your P.O. #: 0194098

QUALITY ASSURANCE REPORT

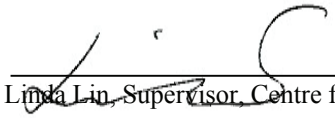
			Spiked Blank		Method Blank		Calibration Check	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	UNITS	% Recovery	QC Limits
7434496	Calculated NO2	2014/03/31	102	90 - 110	<0.1	ppb	97	90 - 110
7434528	Calculated SO2	2014/03/31	98	90 - 110	<0.1	ppb	100	90 - 110
7439422	Calculated O3	2014/04/03	100	90 - 110	0.0, RDL=0	ppb	98	90 - 110

N/A = Not Applicable
RDL = Reportable Detection Limit
Calibration Check: A calibration standard analyzed at different times to evaluate on-going calibration 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.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Validation Signature Page

Maxxam Job #: B423656

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



Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Maxxam

Your P.O. #: 0194098
Your Project #: 2014/02/28 - 2014/03/28
Site Location: HOPE BAY

Attention: JEM MORRISON
ERM Consultants Canada Ltd.
15TH FLOOR
1111 WEST HASTINGS STREET
VANCOUVER, BC
CANADA V6E 2J3

Report Date: 2014/05/22
Report #: R1571281
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B437156
Received: 2014/05/09, 13:39

Sample Matrix: Air
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis (1)	1	2014/05/21	2014/05/22	PTC SOP-00148	Passive NO2 in ATM
O3 Passive Analysis (1)	1	2014/05/22	2014/05/22	PTC SOP-00197	EPA 300 R2.1
SO2 Passive Analysis (1)	1	2014/05/22	2014/05/22	PTC SOP-00149	Tang Passive SO2 in

* Results relate only to the items tested.

(1) The detection limit is based on a 30 day sampling period.

Encryption Key Levi Manchak
Levi Manchak
22 May 2014 14:34:13 -06:00

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

Levi Manchak, Customer Service
Email: LManchak@maxxam.ca
Phone# (780) 378-8500

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Total cover pages: 1

Maxxam Job #: B437156
Report Date: 2014/05/22

ERM Consultants Canada Ltd.
Client Project #: 2014/02/28 - 2014/03/28
Site Location: HOPE BAY
Your P.O. #: 0194098

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		JO6768		
Sampling Date		2014/04/28		
	UNITS	**DORIS**	**RDL**	**QC Batch**
Passive Monitoring				
Calculated NO2	ppb	0.6	0.1	7492240
Calculated O3	ppb	27.49	0	7493995
Calculated SO2	ppb	0.4	0.1	7493990

RDL = Reportable Detection Limit

Maxxam Job #: B437156
Report Date: 2014/05/22

ERM Consultants Canada Ltd.
Client Project #: 2014/02/28 - 2014/03/28
Site Location: HOPE BAY
Your P.O. #: 0194098

QUALITY ASSURANCE REPORT

			Spiked Blank		Method Blank	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	UNITS
7492240	Calculated NO2	2014/05/21	102	90 - 110	<0.1	ppb
7493990	Calculated SO2	2014/05/22	101	90 - 110	<0.1	ppb
7493995	Calculated O3	2014/05/22	102	90 - 110	0.00, RDL=0	ppb

N/A = Not Applicable
RDL = Reportable Detection Limit
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.

Validation Signature Page

Maxxam Job #: B437156

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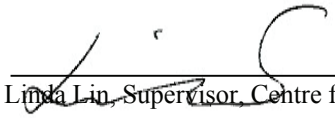

Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Maxxam

Your P.O. #: 0194098
Your Project #: 2014/03/28 - 2014/05/03
Site Location: HOPE BAY

Attention: JEM MORRISON
ERM Consultants Canada Ltd.
15TH FLOOR
1111 WEST HASTINGS STREET
VANCOUVER, BC
CANADA V6E 2J3

Report Date: 2014/05/22
Report #: R1571282
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B437159
Received: 2014/05/09, 13:41

Sample Matrix: Air
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis (1)	1	2014/05/21	2014/05/22	PTC SOP-00148	Passive NO2 in ATM
O3 Passive Analysis (1)	1	2014/05/22	2014/05/22	PTC SOP-00197	EPA 300 R2.1
SO2 Passive Analysis (1)	1	2014/05/22	2014/05/22	PTC SOP-00149	Tang Passive SO2 in

* Results relate only to the items tested.

(1) The detection limit is based on a 30 day sampling period.

Encryption Key Levi Manchak
Levi Manchak
22 May 2014 14:34:31 -06:00

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

Levi Manchak, Customer Service
Email: LManchak@maxxam.ca
Phone# (780) 378-8500

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Total cover pages: 1

Maxxam Job #: B437159
Report Date: 2014/05/22

ERM Consultants Canada Ltd.
Client Project #: 2014/03/28 - 2014/05/03
Site Location: HOPE BAY
Your P.O. #: 0194098

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		JO6773		
Sampling Date		2014/03/28 08:00		
	UNITS	**DORIS**	**RDL**	**QC Batch**
Passive Monitoring				
Calculated NO2	ppb	<0.1	0.1	7492240
Calculated O3	ppb	26.23	0	7493995
Calculated SO2	ppb	<0.1	0.1	7493990

RDL = Reportable Detection Limit

Maxxam Job #: B437159
Report Date: 2014/05/22

ERM Consultants Canada Ltd.
Client Project #: 2014/03/28 - 2014/05/03
Site Location: HOPE BAY
Your P.O. #: 0194098

QUALITY ASSURANCE REPORT

			Spiked Blank		Method Blank	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	UNITS
7492240	Calculated NO2	2014/05/21	102	90 - 110	<0.1	ppb
7493990	Calculated SO2	2014/05/22	101	90 - 110	<0.1	ppb
7493995	Calculated O3	2014/05/22	102	90 - 110	0.00, RDL=0	ppb

N/A = Not Applicable
RDL = Reportable Detection Limit
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.

Validation Signature Page

Maxxam Job #: B437159

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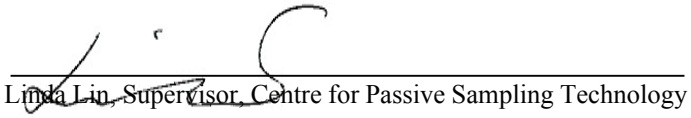

Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Maxxam

Your P.O. #: 0194098
Your Project #: 2014/05/03 - 2014/06/01
Site Location: HOPE BAY

Attention: JEM MORRISON
ERM Consultants Canada Ltd.
15TH FLOOR
1111 WEST HASTINGS STREET
VANCOUVER, BC
CANADA V6E 2J3

Report Date: 2014/07/08
Report #: R1599146
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B455093
Received: 2014/07/02, 09:11

Sample Matrix: Air
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis (1)	1	2014/07/07	2014/07/08	PTC SOP-00148	Passive NO2 in ATM
O3 Passive Analysis (1)	1	2014/07/04	2014/07/08	PTC SOP-00197	EPA 300 R2.1
SO2 Passive Analysis (1)	1	2014/07/04	2014/07/08	PTC SOP-00149	Tang Passive SO2 in

* Results relate only to the items tested.

(1) The detection limit is based on a 30 day sampling period.

Encryption Key Levi Manchak
Levi Manchak
09 Jul 2014 08:18:57 -06:00

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

Levi Manchak, Customer Service
Email: LManchak@maxxam.ca
Phone# (780) 378-8500

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Total cover pages: 1

Maxxam Job #: B455093
Report Date: 2014/07/08

ERM Consultants Canada Ltd.
Client Project #: 2014/05/03 - 2014/06/01
Site Location: HOPE BAY
Your P.O. #: 0194098

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		JZ3999		
Sampling Date		2014/05/03 18:30		
	UNITS	**DORIS**	**RDL**	**QC Batch**
Passive Monitoring				
Calculated NO2	ppb	0.6	0.1	7554488
Calculated O3	ppb	43.36	0.1	7551613
Calculated SO2	ppb	0.2	0.1	7552247

RDL = Reportable Detection Limit

General Comments

Travel blanks <JZ4000>and <JZ4635> outside QA acceptability criteria, default lab blank value used in the calculation of final results. SS

Maxxam Job #: B455093
Report Date: 2014/07/08

ERM Consultants Canada Ltd.
Client Project #: 2014/05/03 - 2014/06/01
Site Location: HOPE BAY
Your P.O. #: 0194098

QUALITY ASSURANCE REPORT

			Spiked Blank		Method Blank	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	UNITS
7551613	Calculated O3	2014/07/04	100	90 - 110	<0.1	ppb
7552247	Calculated SO2	2014/07/04	102	90 - 110	<0.1	ppb
7554488	Calculated NO2	2014/07/07	102	90 - 110	<0.1	ppb

N/A = Not Applicable
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.

Validation Signature Page

Maxxam Job #: B455093

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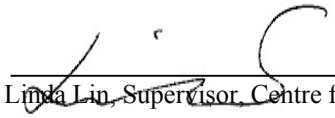

Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Your P.O. #: 0194098
Your Project #: 2014/06/01 - 2014/07/03
Site Location: HOPE BAY

Attention:JEM MORRISON

ERM Consultants Canada Ltd.
15TH FLOOR
1111 WEST HASTINGS STREET
VANCOUVER, BC
CANADA V6E 2J3

Report Date: 2014/07/22
Report #: R1607412
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B458606
Received: 2014/07/11, 10:19

Sample Matrix: Air
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis (1)	1	2014/07/22	2014/07/22	PTC SOP-00148	Passive NO2 in ATM
O3 Passive Analysis (1)	1	2014/07/15	2014/07/22	PTC SOP-00197	EPA 300 R2.1
SO2 Passive Analysis (1)	1	2014/07/22	2014/07/22	PTC SOP-00149	Tang Passive SO2 in

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) The detection limit is based on a 30 day sampling period.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Levi Manchak, Customer Service
Email: LManchak@maxxam.ca
Phone# (780) 378-8500
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Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B458606
Report Date: 2014/07/22

ERM Consultants Canada Ltd.
Client Project #: 2014/06/01 - 2014/07/03
Site Location: HOPE BAY
Your P.O. #: 0194098

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		KB4197		
Sampling Date		2014/06/01		
	Units	DORIS	RDL	QC Batch
Passive Monitoring				
Calculated NO2	ppb	0.3	0.1	7573578
Calculated O3	ppb	28.79	0.1	7563541
Calculated SO2	ppb	0.2	0.1	7573534
RDL = Reportable Detection Limit				

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B458606
Report Date: 2014/07/22

ERM Consultants Canada Ltd.
Client Project #: 2014/06/01 - 2014/07/03
Site Location: HOPE BAY
Your P.O. #: 0194098

GENERAL COMMENTS

SO2 sample Doris and Blank suspected to be switched. SS

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B458606
Report Date: 2014/07/22

QUALITY ASSURANCE REPORT

ERM Consultants Canada Ltd.
Client Project #: 2014/06/01 - 2014/07/03
Site Location: HOPE BAY
Your P.O. #: 0194098

			Spiked Blank		Method Blank	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**Value**	**Units**
7563541	Calculated O3	2014/07/14	99	90 - 110	<0.1	ppb
7573534	Calculated SO2	2014/07/22	101	90 - 110	<0.1	ppb
7573578	Calculated NO2	2014/07/22	98	90 - 110	<0.1	ppb

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.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B458606
Report Date: 2014/07/22

ERM Consultants Canada Ltd.
Client Project #: 2014/06/01 - 2014/07/03
Site Location: HOPE BAY
Your P.O. #: 0194098

VALIDATION SIGNATURE PAGE

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

Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Maxxam

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Your P.O. #: 0194098
Your Project #: 2014/07/03 - 2014/08/03
Site Location: HOPE BAY

Attention:JEM MORRISON

ERM Consultants Canada Ltd.
15TH FLOOR
1111 WEST HASTINGS STREET
VANCOUVER, BC
CANADA V6E 2J3

Report Date: 2014/08/21
Report #: R1626011
Version: 2R

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B468256
Received: 2014/08/08, 12:51

Sample Matrix: Air
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis (1)	1	2014/08/21	2014/08/21	PTC SOP-00148	Passive NO2 in ATM
O3 Passive Analysis (1)	1	2014/08/19	2014/08/21	PTC SOP-00197	EPA 300 R2.1
SO2 Passive Analysis (1)	1	2014/08/19	2014/08/21	PTC SOP-00149	Tang Passive SO2 in

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) The detection limit is based on a 30 day sampling period.

Encryption Key

Levi Manchak
22 Aug 2014 08:56:25 -06:00

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Levi Manchak, Customer Service
Email: LManchak@maxxam.ca
Phone# (780) 378-8500
==========
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Maxxam Job #: B468256
Report Date: 2014/08/21

ERM Consultants Canada Ltd.
Client Project #: 2014/07/03 - 2014/08/03
Site Location: HOPE BAY
Your P.O. #: 0194098

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		KH3651		
Sampling Date		2014/07/03		
	Units	DORIS	RDL	QC Batch
Passive Monitoring				
Calculated NO2	ppb	0.2	0.1	7609233
Calculated O3	ppb	22.59	0.1	7606143
Calculated SO2	ppb	<0.1	0.1	7606191
RDL = Reportable Detection Limit				

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B468256
Report Date: 2014/08/21

ERM Consultants Canada Ltd.
Client Project #: 2014/07/03 - 2014/08/03
Site Location: HOPE BAY
Your P.O. #: 0194098

GENERAL COMMENTS

NO2 travel blank (KH3652) outside QA acceptability criteria, default blank value used in the calculation of final results. SS

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B468256
Report Date: 2014/08/21

QUALITY ASSURANCE REPORT

ERM Consultants Canada Ltd.
Client Project #: 2014/07/03 - 2014/08/03
Site Location: HOPE BAY
Your P.O. #: 0194098

			Spiked Blank		Method Blank	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**Value**	**Units**
7606143	Calculated O3	2014/08/19	100	90 - 110	<0.1	ppb
7606191	Calculated SO2	2014/08/19	99	90 - 110	<0.1	ppb
7609233	Calculated NO2	2014/08/21	97	90 - 110	<0.1	ppb

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.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 6744 - 50th Street T6B 3M9 Telephone(780) 378-8500 FAX(780) 378-8699

Maxxam Job #: B468256
Report Date: 2014/08/21

ERM Consultants Canada Ltd.
Client Project #: 2014/07/03 - 2014/08/03
Site Location: HOPE BAY
Your P.O. #: 0194098

VALIDATION SIGNATURE PAGE

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

Linda Lin, Supervisor, Centre for Passive Sampling Technology

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Your P.O. #: 0194098
Your Project #: 2014/08/03 - 2014/09/11
Site Location: HOPE BAY

Attention:JEM MORRISON

ERM Consultants Canada Ltd.
15TH FLOOR
1111 WEST HASTINGS STREET
VANCOUVER, BC
CANADA V6E 2J3

Report Date: 2014/09/23
Report #: R1647471
Version: 1

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B481558
Received: 2014/09/15, 12:33

Sample Matrix: Air
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
NO2 Passive Analysis (1)	1	2014/09/17	2014/09/23	PTC SOP-00148	Passive NO2 in ATM
O3 Passive Analysis (1)	1	2014/09/22	2014/09/23	PTC SOP-00197	EPA 300 R2.1
SO2 Passive Analysis (1)	1	2014/09/19	2014/09/23	PTC SOP-00149	Tang Passive SO2 in

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) The detection limit is based on a 30 day sampling period.

Encryption Key

Levi Manchak
Levi Manchak
23 Sep 2014 10:54:40 -06:00

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Levi Manchak, Customer Service
Email: LManchak@maxxam.ca
Phone# (780) 378-8500
==========
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Maxxam Job #: B481558
Report Date: 2014/09/23

ERM Consultants Canada Ltd.
Client Project #: 2014/08/03 - 2014/09/11
Site Location: HOPE BAY
Your P.O. #: 0194098

RESULTS OF CHEMICAL ANALYSES OF AIR

Maxxam ID		KP2266		
Sampling Date		2014/08/03 15:00		
	Units	DORIS	RDL	QC Batch
Passive Monitoring				
Calculated NO2	ppb	0.3	0.1	7641492
Calculated O3	ppb	23.72	0.1	7647682
Calculated SO2	ppb	<0.1	0.1	7644932
RDL = Reportable Detection Limit				

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GENERAL COMMENTS

O3 travel blank was not returned to the lab. Defaul lab.blank value used in the calculation of fial results. - OZ

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

ERM Consultants Canada Ltd.
Client Project #: 2014/08/03 - 2014/09/11
Site Location: HOPE BAY
Your P.O. #: 0194098

			Spiked Blank		Method Blank	
QC Batch	**Parameter**	**Date**	**% Recovery**	**QC Limits**	**Value**	**Units**
7641492	Calculated NO2	2014/09/17	99	90 - 110	<0.1	ppb
7644932	Calculated SO2	2014/09/19	99	90 - 110	<0.1	ppb
7647682	Calculated O3	2014/09/22	100	90 - 110	<0.1	ppb

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.

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VALIDATION SIGNATURE PAGE

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

Linda Lin, Supervisor, Centre for Passive Sampling Technology

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